BIOLOGY CODE NO. 044
MARKING SCHEME
CLASS – XII (2026–27)

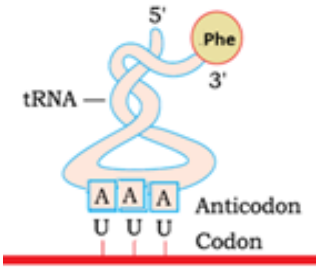
Q. No.	Answer	Marks
	Section - A	
1	C. It ensures cross-pollination	1
2	A. Blockage of sperm transport into the ejaculatory duct and urethra	1
3	B. It provides essential nutrients to developing embryo and helps in its implantation.	1
4	C. Directional selection as giraffes with longer neck lengths are selected. *For Visually impaired students* B. Nature selects for fitness.	1
5	D. A - Promoter, B - RNA polymerase, C - Sigma factor, D-DNA helix *For Visually impaired students* B. 5′ (upstream) end and 3′ (downstream) end, respectively of the transcription unit	1
6	A. No transformation *For Visually impaired students* C. Both (A) and (B)	1
7	A. 25% hybrid and 75% light	1
8	B. Sickle cell anaemia *For Visually impaired students* D. Sex-linked recessive	1
9	B. Inflammation or fluid buildup in the lungs	1
10	C. 40,000 bp and $13{,}600 \times 10^{-9}$ m	1
11	C. Ensuring sterile handling, sterilised equipment, and aseptic transfer before and during fermentation.	1
12	C. Adding spores of *Glomus* to the soil	1
13	A. Both **Assertion** (A) and **Reason** (R) are true, and **Reason** (R) is the correct explanation of **Assertion** (A).	1
14	D. A is false but R is true.	1
15	C. A is true but R is false.	1
16	B. Both A and R are true but R is not the correct explanation of A.	1

Section - B		
17	***Attempt either option A or B.*** A. Geitonogamy involves transfer of pollen grains from the anther to the stigma of another flower of the same plant. (1) Although geitonogamy is functionally cross-pollination involving pollinating agents, genetically it is similar to autogamy since the pollen grains come from the same plant. (1) **OR** B. Mohit can emasculate (remove anthers) from selected flowers before pollen release and then manually pollinate them with pollen from the chosen male parent, followed by bagging. (1) This prevents self-pollination and unwanted pollen and ensures that only the desired cross produces seeds. (1)	2
18	There were in South America mammals resembling horse, hippopotamus, bear and rabbit. Due to continental drift, when South America joined North America, these animals were overridden by North American fauna. (1) Due to continental drift, a number of Australian marsupials, each different from the other, evolved from an ancestral stock, but all within the Australian island continent. These pouched mammals of Australia survived because of lack of competition from any other mammals. (1)	2
19	A. As tumor size increases, glucose levels decrease, suggesting that larger tumors consume more glucose due to higher metabolic demand, possibly indicating a more aggressive growth pattern. (1) B. As tumor size increases, the viability of neighboring cells decreases suggesting that growing tumors create a hostile microenvironment, due to nutrient competition and less oxygen is available leading to stress or death of surrounding normal cells. /As these cells actively divide and grow they also starve the normal cells by competing for vital nutrients. (1)	2
20	***Attempt either option A or B.*** A. I. Normal cow's milk (~0.1 g/L) is least suitable. Reason: Very low α-lactalbumin compared to human milk. (1) II. (i) Going beyond morality genetical modification of organisms can have long term unpredictable results. (ii) patenting for resource (iii) loss of genetic diversity of natural cows (iv) economic exploitation Any one (1) **OR** B. (i) Increased pesticide use due to lack of pest resistance. (ii) Lower yield under abiotic stress conditions. (iii) Faster depletion of soil nutrients due to inefficient mineral usage. Any two (1+1)	2

21	***Attempt either option A or B.*** A. I. Region X will have greater species diversity/Tropical region because Temperatures are near-constant across seasons in X (27–28–27–26 °C), which supports stable conditions / higher diversity/ Higher productivity/GPP 3500/ higher NPP in X vs lower productivity in Y. (1) II. NPP of Region X = GPP − R = 3500 − 1300 = 2200 g/m²/year. Net primary productivity is the available biomass for the consumption to heterotrophs (herbiviores and decomposers) (1) **OR** B. I. P3 → drop of over 50 percentage points without main pollinator/ other plants show comparatively less drop in seed set without pollinator. (1) II. The relationship is Mutualism as both species benefit; here, plants gain pollination and pollinators obtain nectar/food. (1)	2
	Section – C	
22	ART 1: Intracytoplasmic Sperm Injection (ICSI) Justification: ICSI is required to address Male B's low sperm count. It is an advanced procedure to form the embryo in vitro, where a sperm is directly injected into the ovum. (1.5) ART 2: In vitro fertilisation followed by Intrauterine Transfer (IUT) Justification: IVF followed by IUT is required to address Female A's blocked fallopian tubes. Since the natural path for the egg is blocked, the embryo (formed via IVF/ICSI) must be transferred directly to the uterus. (1.5)	3
23	A. Structure P (Zygote) is diploid and Structure Q (Primary Endosperm Nucleus) is triploid. (1) B. The statement is False. The Primary Endosperm Nucleus (PEN/'Q') divides much earlier than zygote ('P') to form the endosperm tissue for nutrition of embryo. (1) C. The cells of endosperm tissue are filled with reserve food materials which act as the primary source of nutrition for the developing embryo. (1) - - - - - - - - - - - - - - - - - - *For Visually impaired students* A. Zygote/Embryo and Primary Endosperm Nucleus/Endosperm. (1) B. Zygote/Embryo is diploid and Primary Endosperm Nucleus/Endosperm is triploid. (1) C. The Primary Endosperm Nucleus (PEN) divides much earlier than zygote to form the endosperm tissue. The cells of endosperm tissue are filled with reserve food materials which act as the primary source of nutrition for the developing embryo. (1)	3

<table>
<tr><td>24</td><td>A. Female mice: Heterozygous for running (Rr) and brown hair (bb), so its genotype is Rrbb. Male mice: Heterozygous for running (Rr) and heterozygous for black hair (Bb), so its genotype is RrBb.
Possible gametes
Female (Rrbb): Rb, Rb, rb, rb Male (RrBb): RB, Rb, rB, rb (1)
Punnett square
<table><tr><td></td><td>RB</td><td>Rb</td><td>rB</td><td>rb</td></tr><tr><td>Rb</td><td>RRBb</td><td>RRbb</td><td>RrBb</td><td>Rrbb</td></tr><tr><td>Rb</td><td>RRBb</td><td>RRbb</td><td>RrBb</td><td>Rrbb</td></tr><tr><td>rb</td><td>RrBb</td><td>Rrbb</td><td>rrBb</td><td>rrbb</td></tr><tr><td>rb</td><td>RrBb</td><td>Rrbb</td><td>rrBb</td><td>rrbb</td></tr></table>B. Probable phenotypes of the progeny
Running black (RRBb x 2, RrBb x 4,): 6/16
Running brown (RRbb x 2, Rrbb x 4): 6/16
Walking black (rrBb x 2,): 2/16
Walking brown (rrbb x 2): 2/16 Ratio will be 6:6:2:2 OR 3:3:1:1 (1)
C. 24 will show running black phenotype. (1)</td><td>3</td></tr>
<tr><td>25</td><td>The disease is caused by a single gene mutation resulting in an inborn error of metabolism where the affected individual lacks an enzyme that converts the amino acid phenylalanine into tyrosine. (1)
As a result of this phenylalanine is accumulated and converted into phenyl pyruvic acid and other derivatives. Accumulation of these in the brain results in mental retardation. (1)
In pleiotropy a single gene can exhibit multiple phenotypic expressions by affecting metabolic pathways in different ways. (1)</td><td>3</td></tr>
<tr><td>26</td><td>Addiction - – Psychological attachment to effects of drugs/alcohol (½) → driven by desire for euphoria/well-being even when not needed (½). (1)
Dependence – Physical tendency of the body → manifests withdrawal symptoms (anxiety, shakiness, nausea, sweating) when drug is stopped. (1)
Reason for increased intake – Repeated drug use increases tolerance level of body receptors → receptors respond only to higher doses for the same effect. (1)</td><td>3</td></tr>
<tr><td>27</td><td>I. Certain pathogens naturally have the ability to transfer their DNA into host cells. Scientists have modified these pathogens by removing their disease-causing genes, while retaining their ability to deliver DNA, making them useful cloning vectors. (1)
II. In animals, retroviruses have been engineered to remove cancer-causing genes, while keeping their capacity to integrate DNA into the host genome, making them effective vectors for gene delivery. (1)</td><td>3</td></tr>
</table>

	III. In transgenic plants, nematode-specific genes were introduced via Ti plasmid of *Agrobacterium tumefaciens* to produce dsRNA, which triggered RNA interference (RNAi) and silenced nematode mRNA, protecting the plant from the parasite. (1)	
28	A. If the ant dies too soon, the nematode won't complete its development and won't be transmitted to new hosts. (1) B. Natural selection favors nematodes that keep the ant alive until it can be eaten by a bird, ensuring better dispersal and survival of the nematode. The birds eat only the red-bellied ant. This ensures complete maturation of nematode and its dispersal and protects the other ants from predation. (1) C. Type: Parasitism, Definition: An interaction where one organism benefits and the other is harmed. (1)	3
	Section – D	
29	A. Anaemia due to excessive blood loss. (1) B. Without a distinct LH surge, ovulation may not occur, so no corpus luteum forms to secrete progesterone. As a result, the endometrial lining grows excessively under unopposed estrogen and is then unpredictably or heavily shed, causing irregular and heavy periods. (2) *Attempt either subpart C or D.* C. It suggests lack of ovulation due to hormonal imbalance affecting ovarian function. (1) **OR** D. GnRH secretion from hypothalamus and subsequent LH/FSH secretion from pituitary would be disrupted. (1)	4
30	A. NPV is species-specific and affects only target insect pests, narrow spectrum insecticide; causes no harm to plants, pollinators, mammals, birds, fish, or non-target insects. (1) B. He could have sprayed the spores of Bacillus thuringiensis, in the gut of the larvae, the bacterial toxin is released and the larvae get killed. (2) C. Baculovirus (1) **OR** D. Because it is a biological method for controlling plant diseases and pests. (1)	4
	Section – E	
31	***Attempt either option A or B.*** A. I. The term given to a segment of DNA that codes for a polypeptide is Cistron. (0.5) II. (a) 3'-- TACAAAAAGAAGAAAAAGAAAATT--5'—Point Mutation. (1) (b) 3'—TACAAAAAGAAGAAAAAGAAATT--5'—Deletion / Frameshift mutation. (1)	5

	III. Methionine -Phenylalanine -Phenylalanine -Phenylalanine - Phenylalanine -Phenylalanine –Phenylalanine; 7 amino acids. (2) IV. Degenerate. (0.5) **OR** B. I. AUGACC**GUA**GCGUUU**GUA**UCUUUA**GUA**GUG**GUA**UUA**GUA**GGC Nine amino acids will be translated from the mature or processed RNA. (1) 5'**ACGUCG** ---------- **UAAAAA**3' Location of the untranslated region from the above messenger RNA will be at the 5' end and 3'prime end and their sequences are 5'ACGUCG and 3' end UAAAAA. (2) They are required for efficient translation process. (0.5) II.  (1) 4th triplet codon codes for phenylalanine. (0.5)	
32	***Attempt either option A or B.*** A. I. Plate B fails to show radioactivity because the probe could not hybridise with its DNA sequence, indicating the presence of the mutated β-globin gene (sickle mutation). Plates A and C show signals since their DNA has the normal complementary sequence. (2) II. ● Normal individual: Probe binds fully → strong radioactivity observed ● Carrier (heterozygote): Both normal and mutated sequences present → partial hybridisation (mixed pattern). ● Patient (homozygous mutant): No hybridisation with the probe → no radioactivity seen. (2) III. Insertional inactivation (1) **OR** B. I. Test tube A (bacteria): DNA isolation will fail because bacteria require lysozyme, not cellulase, to digest the peptidoglycan cell wall. ● Test tube B (plant): DNA isolation will succeed because plants require cellulase to digest cellulose walls. ● Test tube C (fungus): DNA isolation will fail because fungi require chitinase to digest chitin walls. ● Correction: Use lysozyme for bacteria, cellulase for plants, and chitinase for fungi. (2)	5

II. The further steps are
- Break open cells → DNA released with RNA, proteins, polysaccharides, and lipids.
- Remove contaminants:
  - RNase digests RNA
  - Protease digests proteins
- Remove polysaccharides and lipids by specific treatments.
- Add chilled ethanol → DNA precipitates as white threads, spooled on a glass rod. (2)

III. Spooled DNA can be used in genetic engineering, PCR amplification, DNA fingerprinting, or sequencing. (1)

33 ***Attempt either option A or B.*** 5

A.

(a)

Biodiversity Threat	**Explanation of the effect it will have**
Overexploitation	Unsustainable sourcing of wild medicinal plants by the cosmetic brand threatens plant species/may lead to depletion and extinction of valuable species. (1)
Invasion by alien species	Ornamental grass from another country spreading aggressively into native grassland/outcompetes native grasses, reduces local biodiversity. (1)
Co-extinction	Disappearance of nesting tree species causing sharp decline in migratory bird population/ disrupts ecological balance, loss of niches. (1)
Habitat loss and fragmentation	Forest fires lead to habitat loss and fragmentation by destroying forest vegetation and breaking continuous habitats into smaller, isolated patches. This forces species to migrate, reduces population sizes, and alters species distribution, often resulting in local extinction and decline in biodiversity. (1)

(b) Example: Declaration of *Green Valley X* as a **protected area** (wildlife sanctuary/national park/biosphere reserve/sacred grove/hotspot). Justification: Maintains species in their natural habitat, preserves ecological interactions, and allows long-term protection of genetic, species, and ecosystem diversity. (1)

OR

B.

I.

Step / Process	**Description**
Fragmentation	Breaking down of waste into smaller particles by detritivores (e.g., earthworms, termites). (1)
Leaching	Soluble inorganic nutrients dissolve in water and percolate into the composting soil. (1)

Catabolism	Enzymatic breakdown of complex organic matter into simpler inorganic substances by bacteria/fungi. (1)
Humification & Mineralisation	Formation of humus and release of inorganic nutrients into the compost by microbes. (1)

II. A dry spell would lower moisture content, slowing microbial activity and enzymatic breakdown, thereby reducing the rate of decomposition and delaying the reduction in waste volume. (1)

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BIOLOGY – CODE NO. 044
SAMPLE QUESTION PAPER*
CLASS – XII (2026-27)

Maximum Marks: 70 **Time: 3 hours**

General Instructions:

(i) All questions are compulsory.
(ii) The question paper has five sections and 33 questions.
(iii) Section–A has 16 questions of 1 mark each; Section–B has 5 questions of 2 marks each; Section– C has 7 questions of 3 marks each; Section– D has 2 case-based questions of 4 marks each; and Section–E has 3 questions of 5 marks each.
(iv) There is no overall choice. Answer all 33 questions. However, internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.
(v) Wherever necessary, neat and properly labeled diagrams should be drawn.

Section – A

Q. Nos. 1 to 12 are multiple choice questions. Only one of the choices is correct. Select and write the correct choice as well as the answer to these questions.

Q. No.	Question	Marks
1	A researcher observes that in a particular flowering plant, the pistil matures several days before the stamens in all flowers of the plant. What is the most significant consequence of this timing difference? A. It guarantees self-pollination B. It promotes autogamy C. It ensures cross-pollination D. It leads to geitonogamy	1
2	A male patient undergoes a medical procedure where a small section of the vas deferens is cut and tied at both ends. Which of the following effects is the intended and direct result of this procedure? A. Blockage of sperm transport into the ejaculatory duct and urethra. B. Inhibition of testosterone production by the testes. C. Suppression of the formation of seminal plasma by accessory glands. D. Prevention of spermatogenesis in the seminiferous tubules.	1
3	During the early stage of human embryonic development, the blastomeres are arranged into an outer layer and an inner group of cells known as the Inner Cell Mass (ICM). What is the fundamental significance of the outer layer, the trophoblast? A. It is responsible for forming the primary germ layers (ectoderm, mesoderm, endoderm).	1

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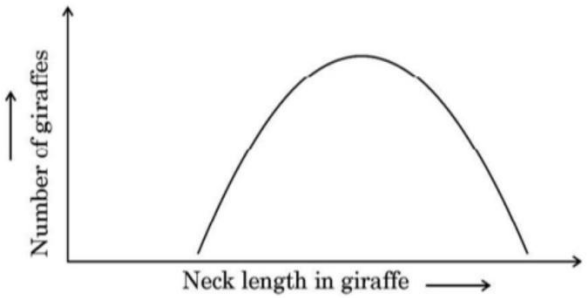
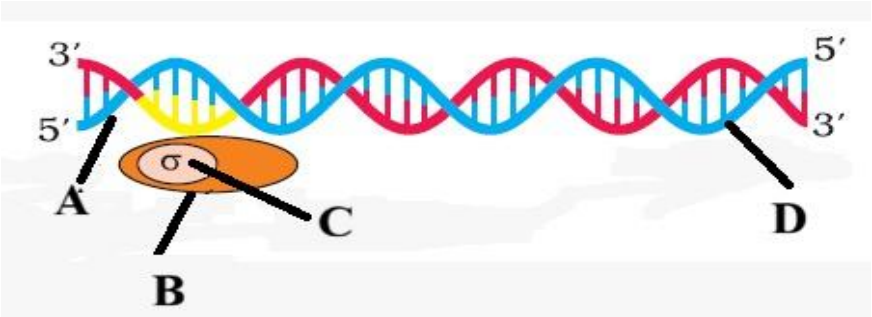
	B. It provides essential nutrients to developing embryo and helps in its implantation. C. It secretes colostrum which contains antibodies. D. It gives rise to all the organs of the future embryo (organogenesis).	
4	Select the option that gives the correct description of the process of natural selection with respect to the length of the neck of the giraffe.  A. Stabilising selection as giraffes with longer neck lengths are selected further. B. Disruptive selection as giraffes with smaller and longer neck lengths are selected. C. Directional selection as giraffes with longer neck lengths are selected. D. Stabilising selection as giraffes with medium neck lengths are selected. - - - - - - - - - - - - - - - - - - - *For Visually impaired students* Evolution of antibiotic-resistant bacterial population signifies the information that A. Acquired traits are inherited. B. Nature selects for fitness. C. Genetic variations are not a prerequisite factor for natural selection. D. The theory of spontaneous generation of life holds true.	1
5	The initiation step during the process of transcription in bacteria is shown below. Identify A, B, C and D by selecting the option:  A. A-RNA polymerase, B-Promoter, C-Sigma factor, D-DNA helix B. A-Promoter, B-Sigma factor, C-RNA polymerase, D-DNA helix C. A-Promoter, B-RNA polymerase, C-DNA helix, D-Sigma factor D. A-Promoter, B-RNA polymerase, C-Sigma factor, D-DNA helix	1

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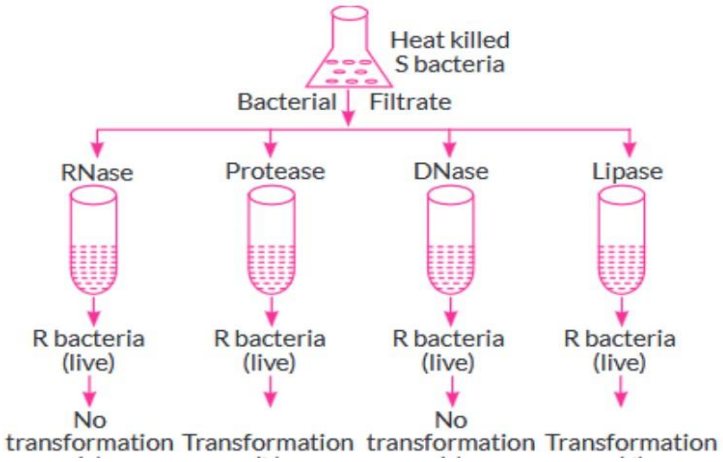
	- - - - - - - - - - - - - - - - - - *For Visually impaired students* The promoter site and the terminator site for transcription are located at: A. 3′ (downstream) end and 5′ (upstream) end, respectively of the transcription unit B. 5′ (upstream) end and 3′ (downstream) end, respectively of the transcription unit C. the 5′ (upstream) end D. the 3′ (downstream) end	
6	Given below is the illustration of the different steps of experiments conducted by MacLeod, McCarty and Avery to find the chemical nature of the 'transforming principle' as DNA. Select the option that **incorrectly** depicts the step of the experiment.  A B C D - - - - - - - - - - - - - - - - - - *For Visually impaired students* In the Griffith experiment, which of the following, when injected into mice, did not cause pneumonia? A. Heat-killed S strain only B. Live R strain only C. Both (A) and (B) D. Live S strain only	1
7	A scientist was culturing *E.coli* in a $^{15}NH_4Cl$ medium initially, then he shifted *E.coli* to a $^{14}NH_4Cl$ medium. The DNA was extracted from *E.coli* after 60 minutes of transfer to $^{14}NH_4Cl$ Medium and performed density gradient centrifugation to check the isotope distribution in newly replicated DNA. What will be the densities of DNA molecules formed? A. 25% hybrid and 75% light B. 50% hybrid and 50% light C. 75% hybrid and 25% light D. 85% hybrid and 15% light	1

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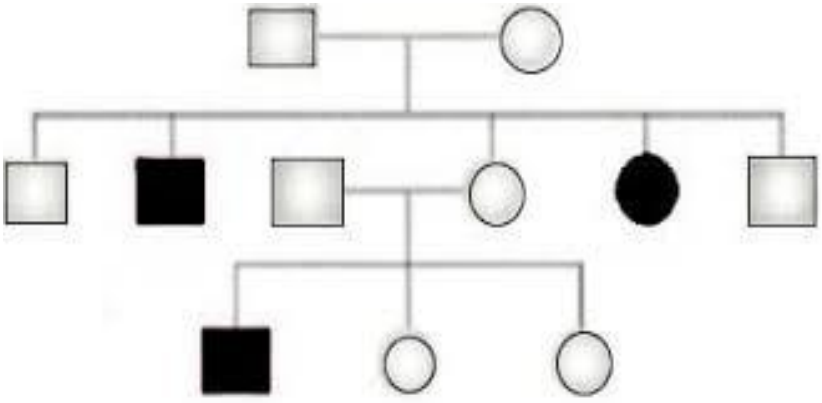
8	Study the given pedigree and identify the disease represented  A. Myotonic Dystrophy B. Sickle cell anaemia C. Haemophilia D. Colour blindness - - - - - - - - - - - - - - - - - - - *For Visually impaired students* If a genetic disease is transferred from a phenotypically normal but carrier female to only some of the male progeny the disease is: A. Autosomal dominant B. Autosomal recessive C. Sex-linked dominant D. Sex-linked recessive	1
9	A patient with fever, chest pain, cough and breathing difficulty undergoes a chest X-ray. The film shows patchy opacities and reduced clarity of lung fields. Which observation best supports pneumonia? A. Enlarged heart size B. Inflammation or fluid buildup in the lungs C. Fractured ribs D. Air pockets in the lungs	1
10	A stretch of an euchromatin has 200 nucleosomes, how many base pairs (bp) will be there in the stretch and what would be the length of the typical euchromatin? A. 20,000 bp and $13{,}000 \times 10^{-9}$ m B. 10,000 bp and $10{,}000 \times 10^{-9}$ m C. 40,000 bp and $13{,}600 \times 10^{-9}$ m D. 40,000 bp and $13{,}900 \times 10^{-9}$ m	1
11	A biotechnology company grew Streptomyces in a fermenter to produce an antibiotic. It was observed that Day 7 onwards, the actual yield drops sharply, even though nutrient level, temperature, and aeration remain	1

	unchanged. Also, Microscopy revealed new colonies of bacteria which were not present in the original culture. So the fermenter was stopped. What measures should be taken to prevent the fall in yield in future fermentations? A. Increasing temperature only at the end of fermentation to kill contaminants. B. Adding antibiotics to the culture so unwanted microbes cannot grow. C. Ensuring sterile handling, sterilised equipment, and aseptic transfer before and during fermentation. D. Using a genetically modified strain designed to grow faster than contaminants.	
12	A rice farmer's field, which typically thrives in waterlogged conditions and requires soil rich in nutrients like phosphorus, is experiencing a severe drought this year. The crop is also susceptible to root infestation by pathogens. Which of the following techniques is best to address all these issues? A. Adding nitrogen-fixing bacteria to the soil B. Applying chemical fertilizers C. Adding spores of *Glomus* to the soil D. Flooding the field artificially to mimic normal conditions	1

Question No. 13 to 16 consist of two statements – **Assertion** (A) and **Reason** (R). Answer these questions selecting the appropriate option given below:

A. Both A and R are true and R is the correct explanation of A.
B. Both A and R are true but R is not the correct explanation of A.
C. A is true but R is false.
D. A is False but R is true.

13	**Assertion** (A): Spermatogenesis is an ongoing process throughout the reproductive life of a human male, while oogenesis is a discontinuous process. **Reason** (R): Oogenesis begins during the embryonic stage, gets arrested at prophase-I, resumes after puberty, and is arrested again at metaphase-II.	1
14	**Assertion** (A)**:** There is no variation in the percentage recombination due to loosely or tightly linked genes. **Reason** (R): Linked genes result in occurrence of higher proportion of parental gene combinations.	1
15	**Assertion** (A)**:** The primary goal of sewage treatment is to eliminate all organic matter from the effluent. **Reason** (R)**:** High BOD indicates a low level of organic matter in the water, which can lead to increased oxygen consumption by microorganisms, potentially harming aquatic life.	1
16	**Assertion** (A)**:** Tissue culture is used when traditional breeding technique is insufficient to keep pace with the demand of crop improvement.	1

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	Reason (R)**:** Totipotency is the ability of a single plant cell or explant to regenerate into a whole plant under sterile conditions in nutrient media.	
	Section - B	
17	***Attempt either option A or B.*** A. Geitonogamy can be compared with cross-pollination as well as self-pollination. Comment. **OR** B. Mohit wants to produce hybrid seeds in a plant in his field in which male and female flowers mature at the same time and are close together. Suggest one strategy to promote only desired cross pollination and justify your answer.	2
18	The movement of landmasses over geological time changed the distribution and evolution of animals. Explain this idea using two examples from different regions of the world.	2
19	The following is a realistic example dataset and not a real world patient dataset: A. Interpret the relationship between tumor size and glucose level. B. Evaluate the data to determine how tumor progression may affect the viability/vitality of neighboring cells. Provide a brief explanation.	2
20	***Attempt either option A or B.*** A. The table below shows hypothetical data comparing α-lactalbumin concentration in three types of milk, including that of Rosie, a transgenic cow designed to express human milk proteins.	2

Sample ID	Tumor size (mm^3)	Glucose level mM/litre	Oxygen level (mmHg)	Neighboring cell's viability/ vitality (%)
1	150	2.0	15	60
2	50	4.5	30	85
3	200	1.3	10	50
4	100	3.0	20	70
5	250	0.9	7	40

Source of Milk	α-lactalbumin Content approximately (g/L)
Normal cow's milk	0.1
Rosie cow's milk	2.4
Human milk	3.5

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I. Assuming all other nutritional components are identical, which milk would provide the lowest nutritional contribution from α-lactalbumin?.

II. If further genetic modification increases α-lactalbumin levels in Rosie to 3.5 g/L, predict one ethical concern that might arise from such a development.

OR

B. A farmer replaces the GM crop with a conventional variety. Predict any two challenges she/he may face. Support your answer with two reasons.

21 ***Attempt either option A or B.*** 2

A. The table below is a hypothetical data on Seasonal Temperatures seen over two different zones

Region	Temp. in Spring (^oC)	Temp. in Summer (^oC)	Temp. in Autumn (^oC)	Temp. in Winter (^oC)	Primary Productivity (GPP) (g/m^2/ year)	Respiration (R) (g/m^2/year)
Region X	27	28	27	26	3500	1300
Region Y	12	20	14	4	2000	800

I. Justify which region will have greater species diversity based on the given data?

II. Calculate the net primary productivity (NPP) of the region mentioned in (I) and give its significance?

OR

B. Following is a hypothetical data on Plant Pollinator interaction

Plant	Main Pollinator	Seed set (%) with pollinator	Seed set (%) without pollinator
P1	H1 (Bee)	80	40
P2	H2 (Butterfly)	75	45
P3	H3 (Moth)	85	35

I. From the data above, justify which plant shows the highest dependence on its main pollinator?

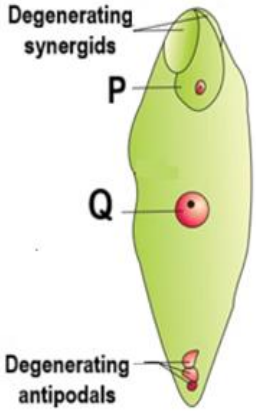
II. What kind of ecological interaction is shown in the table above? Define it in one sentence.

Section - C

22 A couple, A and B, visit a fertility clinic. Examination reveals that female A has a blockage in her fallopian tubes, but her ovaries can produce viable ova. Male B produces sperm with a very low sperm count, making natural fertilization unlikely. 3

Which two different Assisted Reproductive Technologies (ARTs) would a doctor

**There is no change in the Question Paper Design and Assessment Pattern for Academic Session 2026-27.*

	most likely recommend for this couple to increase their chances of conceiving? Justify your selection by briefly stating the principle behind each chosen technique concerning the couple's specific issues.	
23	In the post-fertilization embryo sac shown in figure, structure 'P' results from the fusion of one male gamete with the egg cell, and structure 'Q' results from the fusion of the other male gamete with the polar nuclei.  Figure: Fertilised embryo sac in a flowering plant A. Identify structure 'P' and structure 'Q' and state their ploidy. B. Evaluate the following statement: "The division of 'P' always precedes the division of 'Q'." Justify your evaluation based on the nutritional requirements for seed development. C. Which characteristic feature of endosperm helps in its nutritive role? - - - - - - - - - - - - - - - - - - - *For Visually impaired students* A. Which two products are formed after double fertilization in the embryo sac of a flowering plant? B. State the ploidy of these two structures. C. Which of these two structures develops first during embryonic development? State its significance.	3
24	In mice, the traits for running ability and hair colour assort independently. Running (R) is dominant over walking in circles (r). Black hair (B) is dominant over brown hair (b). A heterozygous running, brown-haired female mouse was artificially inseminated using sperm from a heterozygous running, heterozygous black male. A. Write the genotypes of both parents and draw a Punnett square showing all possible offspring combinations. (1) B. Using the Punnett square, state the phenotypic ratio for: Running–Black, Running–Brown, Walking–Black, Walking–Brown. (1) C. If 64 offspring were produced, calculate how many would be expected to show the Running–Black phenotype. (1)	3

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25	How can a single gene defect caused by the mutation result in Phenylketonuria (PKU)? Explain the molecular mechanism underlying pleiotropy.	3
26	Drug-use disorders often begin with occasional consumption but may progress into a compulsive state. Analyse how addiction differs from dependence in both origin and consequence, and justify why long-term drug intake forces the user to increase dose over time.	3
27	Pathogens are often considered harmful, yet they have been adapted as powerful tools in genetic engineering. Explain how pathogens have been modified into useful vectors. Describe the role of a similarly modified plant vector and animal vector.	3
28	The nematode *Myrmeconema neotropicum* lives inside the abdomen of certain tropical ants (*Cephalotes atratus*). Inside the ant's body, the nematode develops slowly without killing it. Once mature, it changes the color of the ant's abdomen to bright red, making it resemble a berry. Birds, mistaking it for a fruit, eat the ant. The nematode's eggs survive in the bird's digestive system and pass out in droppings, which other ants contact while foraging, starting the cycle again. A. Why would harming the ant too early be disadvantageous for the nematode? (1) B. How is natural selection playing a vital role in maintaining this interaction? (1) C. What kind of ecological interaction is seen between nematode and ant? Define it in one sentence. (1)	3
	Section - D	
29	Madhuri, a 17-year-old girl, has been experiencing irregular periods for the past one year. Sometimes, her cycles are as short as 20 days and sometimes as long as 45 days. She occasionally has very heavy bleeding that lasts over a week, causing fatigue and weakness. A doctor reviews her menstrual diary and explains that these changes can be linked to hormonal fluctuations in the hypothalamic-pituitary-ovarian (HPO) axis. He shows Madhuri the lack of a clear ovulation peak and low progesterone levels in her recent cycles. A. Madhuri experiences heavy bleeding lasting over a week causing fatigue. What possible complication could arise from this condition? (1) B. Examine how the absence of a distinct LH (luteinizing hormone) surge in the menstrual cycle might explain both the irregularity and heaviness of Madhuri's periods. (2) *Attempt either subpart C or D.* C. Madhuri's cycles vary between 20 and 45 days. What might this irregularity indicate about her ovarian function? (1)	4

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	OR D. If a doctor suspects hypothalamic-pituitary dysfunction in Madhuri, which hormone secretion pattern would you expect to be disrupted? (1)	
30	A tribal farmer is cultivating *Brassica oleracea* (cabbage) in a forest region rich in pollinators and rare butterflies. Recently, his crops have been heavily damaged by cabbage looper caterpillars. To manage the pest outbreak, he applies Nucleopolyhedrovirus (NPV). After a few weeks, the pest population decreases significantly without affecting other insects or animals in the area. A. Justify with reasons why the use of Nucleopolyhedrovirus (NPV) was a suitable choice for controlling cabbage looper caterpillars. (1) B. Suggest another IPM strategy suitable for controlling caterpillar pests, and briefly describe its mode of action. (2) *Attempt either subpart C or D.* C. Name the group of pathogens to which *Nucleopolyhedrovirus* belong. (1) **OR** D. Justify why the use of NPV is considered a biocontrol method. (1)	4
	Section - E	
31	***Attempt either option A or B.*** A. A short stretch of DNA strand that codes for a polypeptide is shown below: 3'—TACAAAAAGAAGAAAAAGAAGATT--5' Due to exposure to harmful UV radiation two different types of errors occurred during DNA replication affecting their sequences of bases in the DNA in two different cells. I. What is the term given to a segment of DNA that codes for a polypeptide? II. Which type of mutation could have occurred in each of the following due to the error during replication? a) 3'-- TACAAAAAGAAGAAAAAGAAAATT--5' b) 3'-- TACAAAAAGAAGAAAAAGAGATT--5' III. If DNA strand (a) codes for Methionine and sequences of Phenylalanine, mention the sequence of amino acids that will constitute the polypeptide chain after translation. How many amino acids will be translated from this strand? IV. If all the codons of the stretch code for Phenylalanine excluding the initiator codon which feature does it depict? **OR** B. I. If GUA is an intron how many amino acids will be translated from the mature or processed RNA. Pick out the untranslated region from the following messenger RNA and mention their location and sequence.	5

	What is its significance? 5'ACGUCGAUGACCGUAGCGUUUGUAUCUUUAGUAGUGGUAUUA GUAGGCUAAAAA3' II. If AAA is the anticodon of phenylalanine, draw the tRNA adaptor molecule, Mention the position of amino acid Phenylalanine in the sequence of polypeptide counting the triplet codons.	
32	***Attempt either option A or B.*** A. A scientist is screening bacterial transformants engineered with DNA fragments of the β-globin gene. A radioactive DNA probe complementary to the normal β-globin sequence is used. After autoradiography: • Plates A and C show strong and week radioactive signals respectively. • Plate B shows no radioactivity. Answer the following: I. Why does plate B fail to show radioactivity, while A and C do? (2) II. How can this experiment help in distinguishing a normal individual, a carrier, and a patient of sickle cell anaemia? (2) III. Name one other commonly used technique (apart from autoradiography) to differentiate recombinants from non-recombinants. (1) **OR** B. A student placed DNA from three different sources: bacteria, plant tissue, and fungal cells in a test tube A, B and C respectively. During the process of isolating and purifying DNA, the student added cellulase to all test tubes. I. Predict and explain in which trial(s) DNA isolation would fail, and why? Also suggest how it could be corrected. (2) II. After rectifying the mistake made in 'a', outline the steps to obtain visible spooled DNA from the sample. (2) III. Suggest one application of the spooled DNA in biotechnology. (1)	5
33	***Attempt either option A or B.*** A. A Green Valley *X*, home to rare medicinal plants and several migratory bird species, is facing multiple environmental challenges. I. A luxury brand of cosmetics with little regulation has been sourcing wild medicinal plants from the valley. II. The company has introduced an ornamental grass species from another country, which has taken over large areas of native grassland. III. There is also a reported drastic decline in the endemic trees. IV. Large scale forest fire in a part of the valley. a) From the above hypothetical case, identify and explain the four major biodiversity threats. (4) b) Suggest one in-situ conservation practice that could help protect the biodiversity of Green Valley *X*, and justify your choice. (1)	5

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	OR B. At a composting ground, after a community clean-up drive, large amounts of vegetable peels, garden leaves, and other organic waste are piled up. Over the next few weeks, the volume of the waste decreases noticeably. I. Explain the sequence of processes that could have led to this transformation, and name the major organisms involved at each step. (4) II. If a prolonged dry spell occurs during this composting period, explain how it could affect the rate of the above processes. (1)	

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**There is no change in the Question Paper Design and Assessment Pattern for Academic Session 2026-27.*

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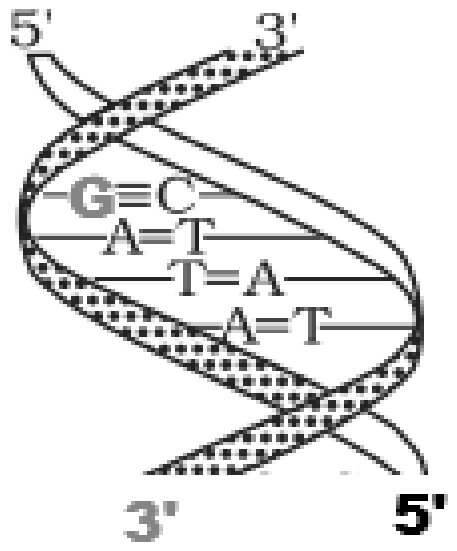

ortho *para*

and undergoes oxidation ($Mg \rightarrow Mg^{2+}$

$\frac{Ea}{2.303RT}$

$\frac{Ea}{2.303R}$

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		allyl ca rbocation (CH_2=CH-CH_2^+) is mo re stabilise d than secon dary ca rbocation fo rme d (CH_3CH_2CH+. Due to resonance in allyl ca rbocation, whe re positive cha rge is delocalise d on two ca rbons, makes it mo re stable.	1
28	I.	The relative lowe ring of vapou r pressu re is given by: $$\frac{P^\circ - P_S}{P^\circ} = \chi_B = \frac{n_B}{n_A + n_B}$$	½
		n_A = numbe r of moles of wate r = 1000/18= 55.56 mol	
		n_B = numbe r of moles of solute = □ □M□	
		$\frac{P^\circ - P_S}{P^\circ}$ = 0.5 (as 50 % red uction is the re)	½
		Substituting the value:	
		0.5= n_B / (n_B +55.56)	
		0.5 n_B + 0.5 X 55.56 = □□	
		□r	
		0.5 n_B □ 0.5 X55.56	½
		n_B= 55.56 mol = □□M□	
		On calculation:	
		M□ =100/55.56 = 1.8 g/mol	½
	II.	Ni tric □□d solution containing 32% of wate r by mass fo rms an azeot opic solution. It has the *same composition* in both the liqu d and vapo r phases. Hence cannot be sepa rate d into its components through fractional distillation.	1
29	I.	D. less than 4.09	1
	II.	A. p-b romophenol > p-chlo rophenol > p-flou rophenol > phenol	1
	III.	A. Phenol is mo re s tronge r □□d than the cyclohexanol so will have less pKa value than cyclohexanol.	1
		Phenol loses hy drogen ion to fo rm its conjugate base - phenox de ion, which is stabilise d by resonance.	1
		Whe re as in the Cyclohexanol, conjugate base fo rme d is less stable due to localisation of negative cha rge on oxygen atom.	
		□R□	
	III.	B. pKa of p-nit ophenol is 7.2 while p-chlo rophenol is 9.38. Following this t en d, mo re the ni tro g roups, lowe r will be the pKa value. The refo re, pKa value of 4 chlo ro-2,6- dint ophenol is highe r than	1

	[illegible] M [illegible] [illegible] [illegible] [illegible] D [illegible] [illegible] –M [illegible] [illegible] R [illegible]	[illegible]
[illegible]	[illegible] Benedict's [illegible] [illegible] R [illegible] M [illegible]	[illegible]
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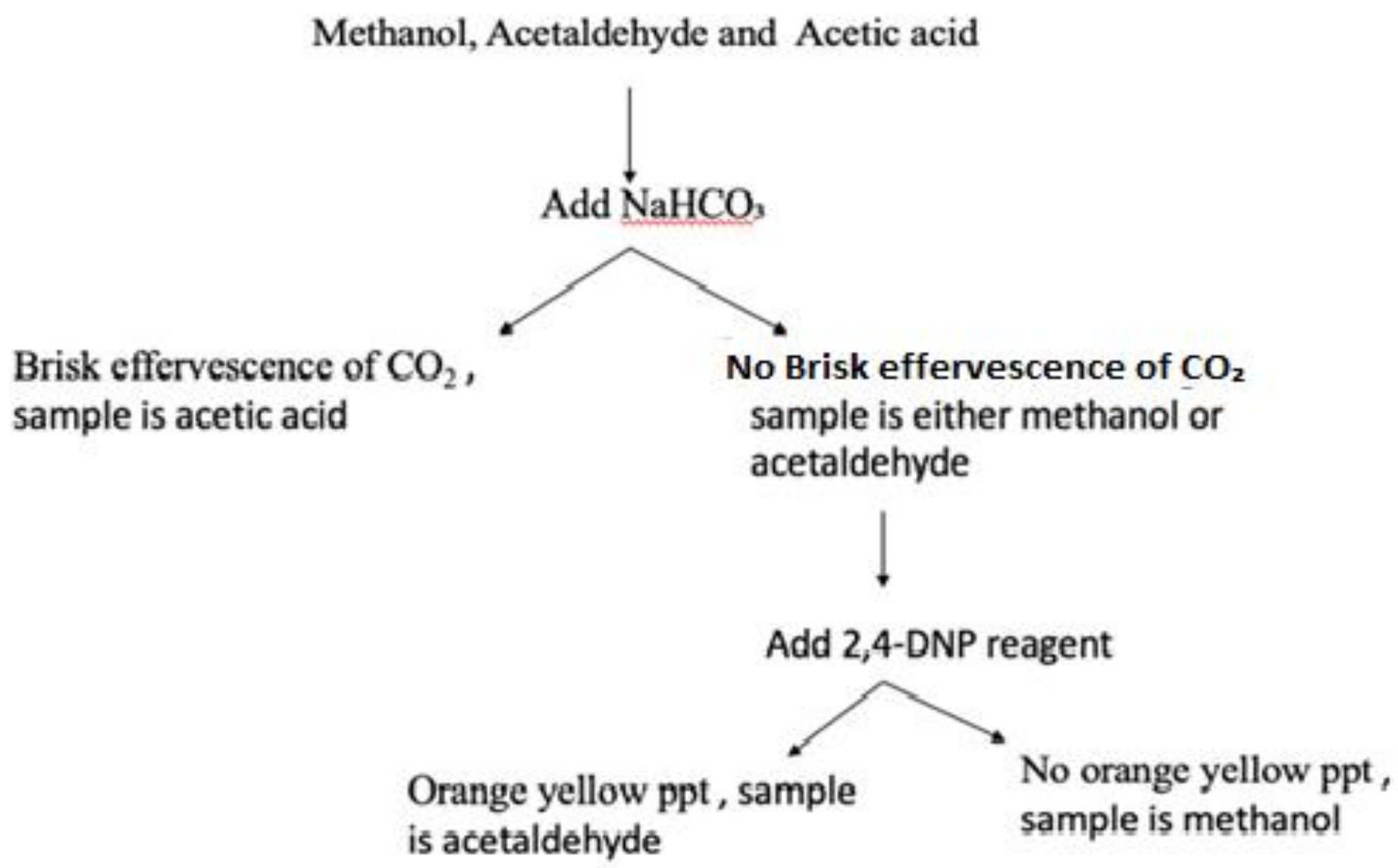
	[illegible] 	[illegible]
	[illegible] R [illegible]	
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	[illegible] $_3$ [illegible] $_2$CHO) gives a positive Tollens' test (silver mirror). Tollens' reagent oxidises [illegible] $^+$ [illegible]	[illegible]

[illegible]

R

[illegible]

A → $[Co(NH_3)_6]$ [illegible]

B → $[Co(NH_3)_5$ [illegible]

C → $[Co(NH_3)_4$ [illegible]

[illegible]

[illegible] splitting (Δ), so they absorb different wavelengths of l[illegible]

[illegible] d–d [illegible]

33(A)	I. a) Cell potential □r□□ the Ne rnst equation inc ·eases when the reaction quotient Q=[Zn □+][Cu 2□] dec ·eases. In expe riment 4, [Zn □+]=0.01 M (ve ry low) an d [Cu 2□]=1.00 M (high), so Qc is ve ry small , log Qc is ve ry negative , the −0.0591/2 log Q te rm is positive an d la rge, giving the highest E. b) E=E °−0.059/2 log Qc E=E □−0.059/2 log [Zn □+]/[Cu □□] = 1.1-0.059/2 log [1/0.10] =1.1-0.02955 log 10 = 1.1 − 0.02955 = 1.07045 V The measu red E MF differs because when cu rrent flows th rough a cell, it faces some inte rnal resistance □r) due to resistance of elect olyte, elect odes □r salt □r□d□□ which lowe rs the obse rve d cell voltage. II. $\Lambda_m(\text{S cm}^2\text{ mol}^{-1}) = \frac{\kappa\ (\text{S cm}^{-1}) \times 1000\ (\text{cm}^3/\text{L})}{\text{molarity (mol/L)}}$ Both type of units are used in literature and are related to each other by the equations: 1 S m^2mol^{-1} = 10^4 S cm^2mol^{-1} or 1 S cm^2mol^{-1} = 10^{-4} S m^2mol^{-1}. III. During cha rging, the specific g ravity of elect olyte in a lea d stora ge batte ry inc ·eases, while discha rging it dec ·eases. □R□	1 ½ ½ ½ ½ 1 ½ + ½
33(B)	I. Fo r c□=0.010 123.9=$\Lambda°_m - A\sqrt{0.0100}$ 123.9= $\Lambda°_m - A(0.100)$ .....(1) Fo r c□=0.040 M 120.7= $\Lambda°_m - A\sqrt{0.040}$ 120.7= $\Lambda°_m - A(0.2)$.....(2) Subt act (2) f om (1): 123.9−120.7=[$\Lambda°_m$- 1°$_m$]+[−0.100A−(−0.200A)] 3.2=0.100A A= 3.2/0.100 A = 32.0 Scm □ mol □M[1□□ Now substitute A into (1) to get $\Lambda°_m$ 123.9= $\Lambda°_m$ − 32 (0.100) $\Lambda°_m$ =123.9 + 3.2 $\Lambda°_m$ = 127.1 Scm ^{2}mol ^{1}	½ ½ ½ ½ ½ ½

	[illegible] [illegible] r d R [illegible] [illegible] dr [illegible] – [illegible] [illegible] [illegible] [illegible] [illegible] d [illegible] $\rightarrow 4H^{+}$ [illegible] [illegible] d [illegible] [illegible] [illegible] $\rightarrow 2H_2$ [illegible] [illegible] r [illegible] R [illegible] [illegible] [illegible] $\rightarrow 2H_2O$ [illegible] [illegible] d [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] r [illegible] r [illegible] • [illegible] r [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] r [illegible] [illegible] [illegible] r [illegible] [illegible] r [illegible] [illegible] [illegible] [illegible] r [illegible] • [illegible] [illegible] r [illegible] [illegible] [illegible] [illegible] dr [illegible] [illegible] d [illegible] d [illegible] [illegible] [illegible] r [illegible] [illegible] d [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] r [illegible] [illegible] [illegible] d r [illegible] r [illegible]	[illegible] [illegible] [illegible] [illegible]

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[illegible]	[illegible]	[illegible]
R	[illegible]	[illegible]

[illegible] 1

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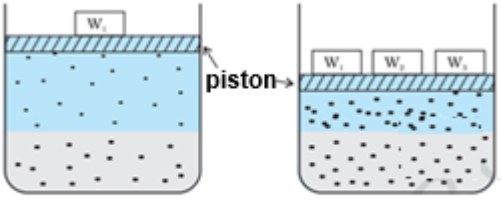

3	The quantity of cha rge r□□□r□d to obtain one mole of metal "M" from M_2O_3 is: A. 1F B. 6F C. 3F D. 2F	1
4	An organic compound "X" on reaction with chloroform and alcoholic KOH gives foul smelling p roduct. In which of the following case compoun d X wou d be p roduce d: A. Chlo romethane is t eate d with AgCN. B. Ni obenzene is r□d□□□d. C. Benzene diazonium chlo r□de is t eate d with Cu/KCN D. Aniline reacts with Acetyl chlo r□de.	1
5	Cons der a system in a state of dynamic equilib rium, as shown in Fig. 1(a). The lowe r pa rt is solution an d the uppe r pa rt is gaseous system at p ressu re p an d tempe ratu re T. If the p ressu re is inc ease d ove r the solution phase by comp ressing the gas to a smalle r volume as shown in Fig 1(b). Figure 1 Which of the following statements is r□□ about figu re 1(b) A. solubility of gas will inc ease until dynamic equilib rium is reache d B. solubility of gas will dec ease until dynamic equilib rium is reache d C. solubility of gas will inc ease until static equilib rium is reache d D. solubility of gas will dec ease until static equilib rium is reache d ***(For Visually Challenged Learners)*** According to Henry's law partial pressure P of a gas above the liquid at constant tempe ratu re is d rectly p opo rtional to A. volume of the gas B. mole f action of the gas in the solution C. atmosphe ric p ressu re D. vapou r p ressu re of the solution	1
6	Aavya ca rries out hy drolysis of acetyl chlo r□de. The reaction is rep resente d by the following equation: $CH_3COCl + H_2O \longrightarrow CH_3COOH + HCl$ She ca rries out the reaction with (i) equimola r amounts of acetyl chlo r□de an d wate r (ii) excess of wate r. The rate law obeye d in the two cases will be: A. (i) F rst □rd□r (ii) Secon d □rd□r B. (i) F rst □rd□r (ii) F rst □rd□r C. (i) Secon d □rd□r (ii) Secon d □rd□r D. (i) Secon d □rd□r (ii) F rst □rd□r	1

* □□□r□ □□ □□ □□□□□□□ □□ □□□□ □ □estio □ □□□□r D□□□□□ □□d □□□□□□□ □□□□ □□□□r□ □□r □□d□□ □□ □□□□□□□ □□□□□□□.

[illegible]	[illegible] [illegible] [illegible] [illegible] [illegible] D [illegible]	[illegible]
[illegible]	[illegible] [illegible] [illegible] [illegible] $CH_3CHO + C_2H_5-\underset{\displaystyle MgCl}{\underset{\vert}{C}}H\cdot C_2H_5$ [illegible] $C_2H_5CHO + CH_3-\underset{\displaystyle MgCl}{\underset{\vert}{C}}H\cdot C_2H_5$ [illegible] [illegible] [illegible] D [illegible]	[illegible]
[illegible]	[illegible] [illegible] r [illegible] M [illegible] D [illegible]	[illegible]
[illegible]	[illegible] [illegible] [illegible] [illegible] D [illegible]	[illegible]
[illegible]	[illegible] [illegible] [illegible] [illegible] D [illegible]	[illegible]
[illegible]	[illegible] [illegible] M [illegible] M $_3$ [illegible] [illegible] M D [illegible] M [illegible]	[illegible]

* [illegible]

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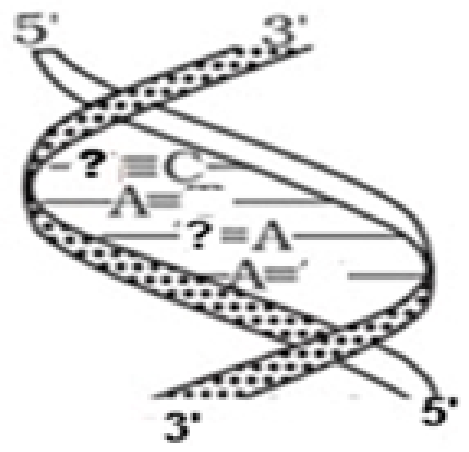
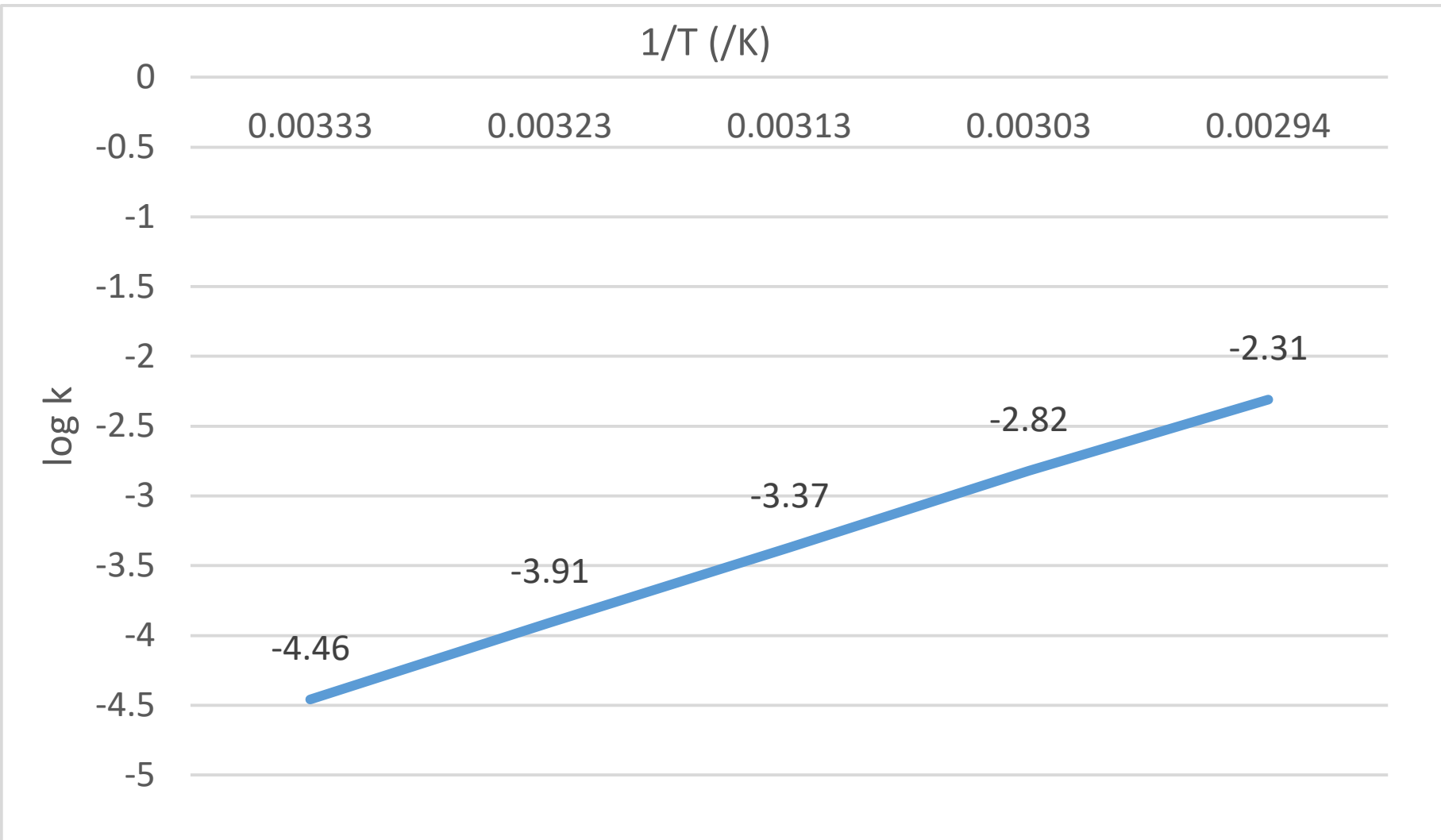
[illegible]	[illegible]	[illegible]
[illegible]	“The rate of reaction remains constant during the course of reaction.” Is [illegible]	[illegible]
[illegible]	[illegible]  Figure 2 **(For Visually Challenged Learners)** [illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]		
[illegible]	[illegible] Haber’s process. [illegible]	[illegible]

* [illegible]

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]



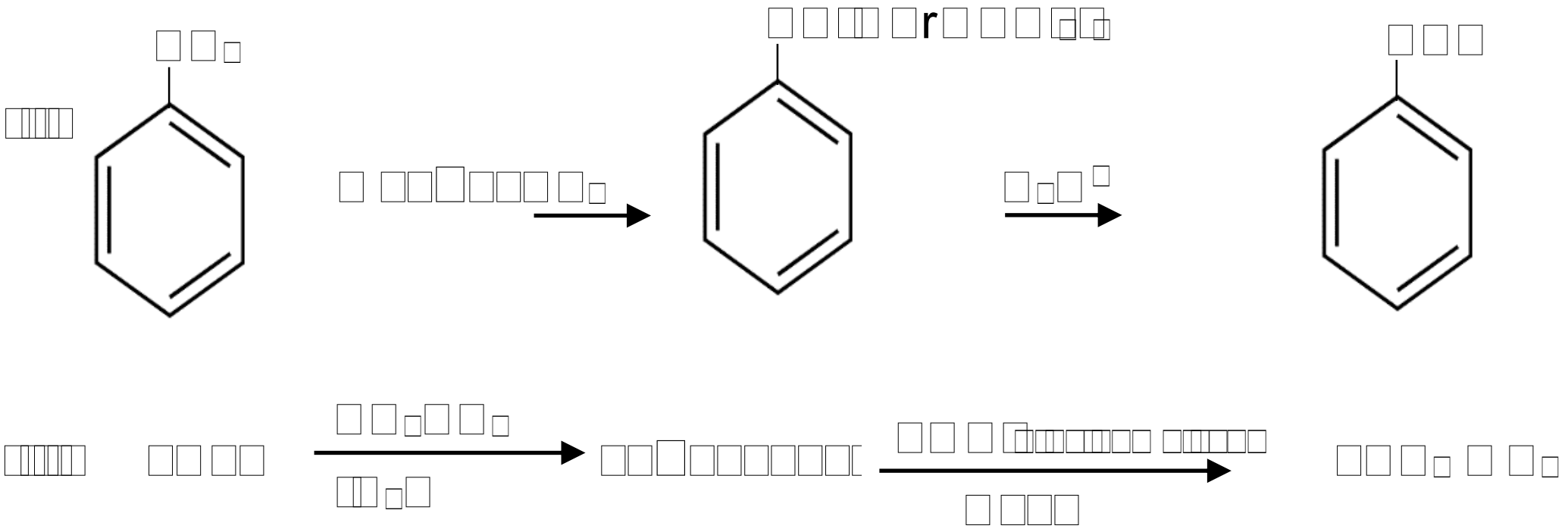
(For Visually Challenged Learners)

R[illegible] of a reaction varies with temperature 'T' according to the [illegible]

$$\frac{Ea}{2.303RT}$$

[illegible] Ea [illegible] Ea [illegible] R [illegible]

*[illegible] D [illegible]



[illegible]

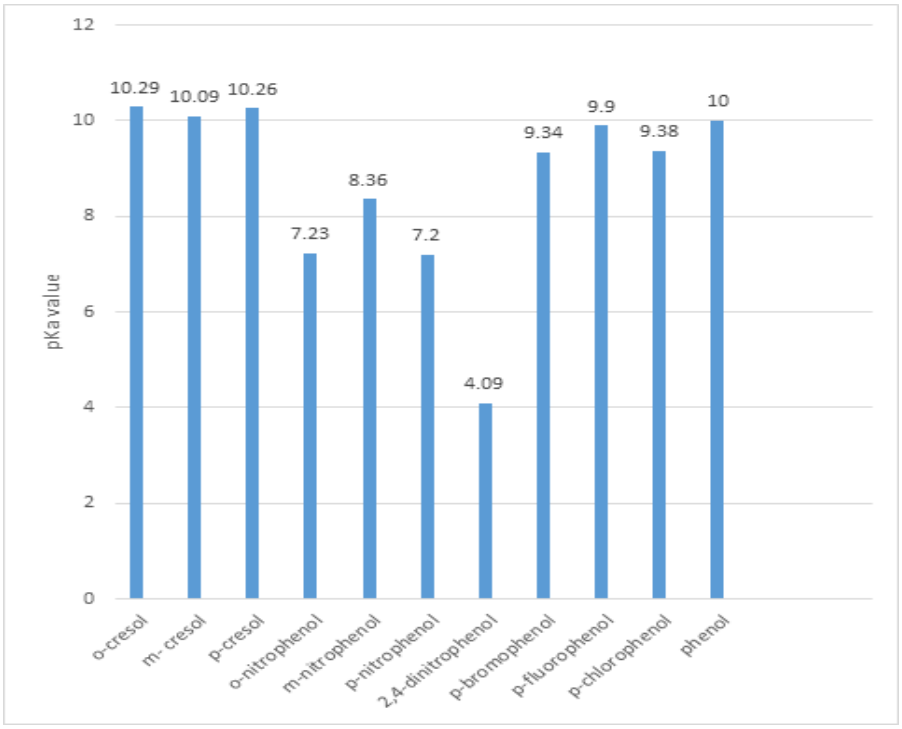


[illegible] and KCN, Compound "X" and "Y" respectively are formed. Identify "X" and "Y". Support your [illegible]

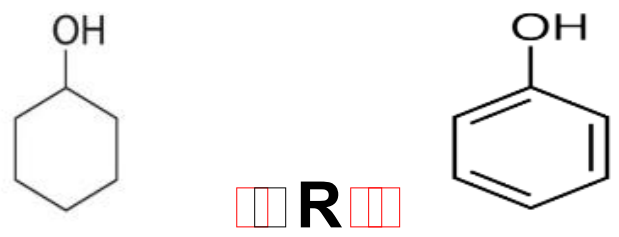
[illegible]

	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

[illegible]

[illegible]	[illegible]  12 10 8 6 4 2 0 pKa value 10.29 10.09 10.26 7.23 8.36 7.2 4.09 9.34 9.9 9.38 10 o-cresol m- cresol p-cresol o-nitrophenol m-nitrophenol p-nitrophenol 2,4-dinitrophenol p-bromophenol p-fluorophenol p-chlorophenol phenol [illegible]	
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

* [illegible]



	D. phenol > p-flou rophenol > p-b romophenol > p-chlo rophenol	
	Attempt eithe r (IIIA) r (IIIB).	
	(IIIA) P redict which one of the following two compoun ds will have lowe r value of pKa . R Give reason in suppo rt of you r reason.	2
	R (IIIB) P redict whethe r 4 chlo ro-2, 6- dint ophenol is mo re r less ac dic than 2,4,6-t ini ophenol? Use the values in the g raph to suppo rt you r answe r. (Fo r Visually Challenge d ea rne rs)	2
	R d the passage an d answe r the questions that follow The p resence of elec ron with drawing g roups such as nit o g roup, enhances the ac dic st ength of phenol. It is due to the effective delocalisation of negative cha rge in phenox de ion. On the othe r han d, elec ron releasing g roups, such as alkyl g roups, in gene ral, d not favou r the fo rmation of phenox de ion resulting in dec ease in d s ength. C resols, fo r example, a re less ac dic than phenol. The pKa value is a quantitative measu re of the ac dic st ength. Highe r the pKa value lowe r is the ac dic s ength. (I) Which of the following will fo rm least stable phenox de ion? A. phenol B. o-c esol C. o-nit ophenol D. o-chlo rophenol	1
	(II) Which g roup causes the maximum inc ease in pKa value of phenol: A. – CH 3 B. – OCH 3 C. – NO 2 D. – Cl	1
	Attempt eithe r (IIIA) r (IIIB)	
	(IIIA). Which of the following will be mo re ac dic? Nit ophenol r 2,4 D init ophenol. Suppo rt you r answe r with app rop riate reason?	2
	R (IIIB). P redict whethe r pka value of p-c esol r p-ni ophenol will be highe r r lowe r than phenol. Give reason to suppo rt you r answe r.	2

* r m ay ha ve chosen to attempt any one part of Question Number 33 and any one part of Question Number 34.

[illegible]	[illegible]	
	[illegible]	
	(i) The sample gives a positive Benedict's test. We can conclude [illegible]	
	A [illegible]	
	B [illegible]	
	C [illegible]	
	D [illegible]	
	(ii) [illegible]	
	A [illegible]	
	B [illegible]	
	C [illegible]	
	D [illegible]	
	[illegible]	
	[illegible]	
[illegible]	[illegible]	

*[illegible]

	[illegible]	
	OR	
[illegible]	[illegible]	[illegible]
	[illegible] Tollen's test and explain the reason.	[illegible]
[illegible]	[illegible]	[illegible]
	[illegible] $PdCl_2 .4NH_3$ [illegible]	
	[illegible]	
	OR	
[illegible]	[illegible]	[illegible]
	[illegible] ion if Δ [illegible]	
	[illegible]	

* [illegible]

[illegible]

$/Zn) = -0.76$ [illegible]

[illegible]	[illegible] M	[illegible] M	M [illegible] M
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

[illegible] M [illegible]

R

[illegible]

$\Lambda_m(0.010\ M) = 123.9\ S\ cm^2\ mol^{-1}$

$\Lambda_m(0.040\ M) = 120.7\ S\ cm^2\ mol^{-1}$

M [illegible]

$\Lambda_m = \Lambda^\circ_m - A\sqrt{c}$ D [illegible] Λ° [illegible] A [illegible]

[illegible]

* [illegible] D [illegible]

ENGLISH CORE -Code No. 301

MARKING SCHEME

CLASS-XII-(2026-27)

General Instructions: -

1. The Marking Scheme carries only suggested value points for the answers. These are in the nature of Guidelines only and do not constitute the complete answer. The students can have their own expression and if the expression is correct, then due marks should be awarded accordingly.
2. If a student has attempted an extra question, answer of the question deserving more marks should be retained and the other answer scored out with a note 'Extra Question'.
3. If more than one option is mentioned in the answer of multiple-choice questions, then no marks to be awarded.

	SECTION A: READING SKILLS	**22**
Q1. Answer the following questions, based on the given passage. (Factual Passage)		**12**
I	Observation rates can exceed 100 meteors per hour. [This numerical evidence directly indicates unusually high activity compared to other meteor showers.]	1
II	the Geminids originate from them and not from a comet which is the common source of meteor showers.	1
III	Friction causes the incoming dust and rock fragments to heat up as they pass through Earth's atmosphere, making them glow and produce bright streaks of light that can be seen from the ground.	1
IV	B. It serves as a visual guide for observers to locate the shower. [The passage explains that the radiant helps identify the shower's apparent point of origin.]	1
V	They can be observed with the unaided eye. Additional value points. They produce brighter and longer-lasting streaks of light. They occur during a predictable annual window in mid-December. They have a high meteor count, sometimes exceeding 100 meteors per hour. They are visible across different regions of the sky, not confined to one narrow area. No specialised equipment like telescopes or binoculars is required. [Accept any one reason that shows ease of observation or accessibility, supported by the passage.].	1
VI	A. Their activity has shown a steady increase over time. [Long-term consistency and growth make the Geminids scientifically valuable for study.]	1
VII	Mentioning documentation since the mid-nineteenth century establishes a long observational history. This strengthens the credibility of claims about increasing activity and reliability, as they are supported by sustained scientific observation rather than recent data alone.	2

VIII	B. explanatory and informative, aimed at scientific understanding [The passage presents factual explanations about the Geminids—its origin, causes, observation conditions, and scientific significance—in a neutral and objective manner. It informs and explains rather than persuading, speculating, or expressing emotion.]	1
IX	The moderate speed allows the meteors to burn longer in the atmosphere, producing brighter and more sustained streaks of light. This enhances visibility and gives observers more time to notice and appreciate each meteor.	2
X	D. scientific explanation and practical observation of Geminids [The passage combines a scientific explanation of the origin and nature of the Geminids with practical guidance on when, where, and how to observe the meteor shower, making option D the most comprehensive representation of the main idea.]	1
Q2. Answer the following questions, based on the given passage. (Case-based Passage)		10
I	B. To understand changes in payment behaviour among different user groups [The passage explicitly states that the charts provide an 'insightful glimpse into how everyday financial habits are changing across the country' and tell a 'human story' of a country shifting from cash to digital payments.]	1
II	The percentage growth in the total value of UPI transactions is greater than the percentage growth in the number of transactions. Justification: From October 2021 to October 2024, transaction volume increased from 4.21 billion to 16.58 billion (nearly four times), while transaction value rose from ₹7.71 lakh crore to ₹23.49 lakh crore (more than three times). This indicates faster growth in the value handled, reflecting increased trust and use of UPI for higher-value payments.	Identification – ½ Justification – ½
III	A. Both the number of transactions and the total value of transactions increase steadily over the four years. [a consistent year-on-year rise in both the volume and the value of UPI transactions from 2021 to 2024, indicating sustained growth rather than fluctuation or decline.]	1
IV	B. Widespread adoption across formal and informal settings [The reference to shops, homes, workplaces, and small roadside vendors shows that UPI is used across both organised and unorganised sectors, indicating broad, inclusive adoption rather than limited or restricted usage.]	1
V	The expansion of UPI into formal financial systems significantly improves financial management for small business owners by enabling digital transaction records, easier tracking of income, and reduced reliance on cash. However, the extent of benefit may depend on factors such as digital literacy and access to technology. Judgement on extent of impact (significantly/partially/to a large extent) - 1 Logical justification with reference to benefits or limitations - 1	1+1 (2)

VI	C. The policy framework governing digital payment systems [The passage discusses transaction growth, changing user attitudes, and the impact on small businesses, but it does not mention government policies, regulations, or the policy framework related to digital payments.]	1
VII	inclusive [The passage states that UPI is used not only in shops and workplaces but also by small roadside vendors. This shows that digital payments have reached both formal and informal sectors, indicating that the system includes a wide range of users rather than being limited or marginal.]	1
VIII	• Higher transaction value reflects user confidence • Greater reliability due to massive transaction volumes • Increased volumes indicate system stability and acceptance, making UPI dependable for daily use. • Wider acceptance across everyday settings • Reduced dependence on physical cash [Any two points]	(1+1) 2
SECTION B-CREATIVE WRITING SKILLS (18 marks)		
Q 3.	• Format - 1 [Box, name of issuing authority- organisation/ agency (top centre), NOTICE (centre), date of issue (aligned left) Authorisation name, designation & signature (bottom left)] NOTE-full credit if all aspects included. Partial credit (½ mark) if one-two aspects are missing. No credit if more than two aspects are missing. • Content - 2 • Accuracy of Spelling and Grammar -1	4
Q 4	• Format - 1 • Content - 2 • Accuracy of spelling and grammar - 1 A- (Letter type formal / third person) B- (Letter type formal, first person)	4
Q 5.	A. Letter to the Editor • Format: 1 (Note- Use ‘Yours truly’ as complimentary closure) • Organisation of Ideas: 1 • Content: 2 (As per cues + ideas) • Accuracy of Spelling and Grammar :1 B. Job Application • Format -1 (Note- Use ‘Yours sincerely’ as complimentary closure)	5

- Organisation of Ideas - 1
- Content - 2
- Accuracy of Spelling and Grammar - 1

➢ Covering Letter
→ Reference to the advertisement
→ Conveying suitability for the position (as advertised)
→ Submission of application

- Bio data as separate enclosure

→ Personal Details
→ Educational Qualifications (include advertised requirements)
→ Work experience (if relevant)
→ References
→ Any other relevant information

Q 6.

- Format – 1 mark
- Content -2 marks
- Organisation of ideas -1 mark
- Accuracy of Spelling and Grammar -1 mark

A. Article:

Title
-By line

Paragraph 1 - Introduction
- **Relevant topic sentence with supporting points**

Paragraph(s) 2 (& 3) - Body – Content
- **Various aspects of the topic- pros & cons / cause and effect**
- **Supporting points/strong evidences**

Paragraph 4 – Conclusion
- **Writer's opinion, comments, recommendations/solutions/suggestions**
- **hope/warning/call for action**

B. Report:

HEADLINES	Short and catchy phrase
BY-LINE	Name and designation of the reporter
PLACE & DATE	Mention the place of event and the date of issue of the newspaper
PARA 1	What – happened; Why – it happened Who – were involved When – day, date and time Where – it happened

			[convey the essential facts concisely]	
		PARA 2	How – it happened [convey the essential facts concisely] [Can be written in two paragraphs also]	
		PARA 3	steps taken/will be taken	

SECTION C-LITERATURE (40 marks)

Q 7.	**Read the following extracts and solve ANY ONE of the given two, (A) or (B)**	6
A.		
I	inner fulfilment	1
II	A thing of beauty remains a lasting source of joy because its loveliness never fades and continues to offer peace, comfort, and emotional nourishment to the human mind over time.	1
III	C. protective inner refuge offering calm [The metaphor suggests a safe, peaceful mental space created by beauty, providing emotional shelter rather than a physical structure.]	1
IV	B. attainment of emotional and mental peace [These expressions evoke calmness, relaxation, and psychological comfort, not material pleasure or physical exertion.]	1
V	The metaphor presents beauty as a comforting inner refuge that offers peace and rest to the human mind. It reinforces the idea that beauty soothes mental distress and provides lasting emotional support.	1
VI	The poet contrasts beauty, which endures and nurtures the human spirit, with nothingness, which suggests emptiness and absence. While beauty offers continuity and comfort, nothingness represents loss and negation.	1
B.		
I	economic fragility [The repetition of 'little' emphasises poverty, marginal existence, and limited resources rather than aesthetic simplicity or independence.]	1
II	The phrase 'traffic sped' highlights the contrast between the fast-moving urban world and **the slow, struggling rural life of the roadside sellers.**	1
III	The poet clarifies this to show that the villagers are not seeking charity but fair economic participation. They want dignity through earning, not dependence on handouts.	1
IV	D. continuous circulation of wealth	1
V	The phrase creates a tone of quiet desperation and helpless appeal. It evokes sympathy by highlighting the villagers' powerless condition and their ignored plea for economic justice.	1
VI	B. Rural–urban economic imbalance	1

	[The extract exposes the unequal relationship between prosperous cities and impoverished rural communities, where rural labour sustains urban wealth without fair returns.]	
Q 8.	**Read the following extracts and solve ANY ONE of the given two, (A) or (B)**	4
A.		
I	B. Anyone is free to enter or leave without restriction. [Mr Lamb uses the open gate as a symbol of freedom, choice, and acceptance. He does not impose himself on Derry and allows him complete autonomy.	1
II	Mr Lamb's calm, reflective, and accepting manner shows warmth and openness rather than oddity. His thoughtful observations and lack of judgement gradually reveal depth and sensitivity, challenging Derry's assumption that peculiarity means strangeness or threat.	1
III	A. perceive ordinary sounds with sensitivity and imagination [By interpreting buzzing as singing, Mr Lamb shows a positive, imaginative outlook that finds beauty and meaning in everyday experiences.]	1
IV	Derry feels a sense of comfort and acceptance in Mr Lamb's presence. For the first time, he experiences emotional ease and belonging, indicating a shift from fear and isolation to tentative trust.	1
B.		
I	D. They are born into a socially marginalised sector. Annan explicitly states that being 'born into this community' leads to the denial of dignity, showing that discrimination is based on birth, not individual merit.	1
II	C. transform social status and restore lost dignity. [Annan views education as a tool to overcome social indignities and gain respect, not merely material success.]	1
III	Intense determination / complete commitment to education / deep resolve to overcome social discrimination.	1
IV	It portrays Annan as a visionary and compassionate guide who believes in education as a means of empowerment and social equality.	1
Q 9.	**Read the following extracts and solve ANY ONE of the given two, (A) or (B)**	6
A.		
I	C. 4 and 5	1
II	Complete the following. (any one) • practical • indifferent • routine-bound • unceremonious • matter-of-fact	1
III	to suggest that genuine associations with famous people are distant and indirect, contrasting with Sophie's improbable claim.	1

IV	It reveals Sophie's nervousness and discomfort, showing her anxiety about her father's reaction.	1
V	Geoff acts as a mediator by supporting Sophie's claim, attempting to validate her statement in front of their father.	1
VI	A. Tension between imagination and realism [The interaction contrasts Sophie's imaginative claim of meeting Danny Casey with her father's sceptical and dismissive reaction. Geoff's hesitant support further highlights the divide between youthful fantasy and practical realism. The scene foregrounds the conflict between aspiration-driven imagination and grounded, everyday reality.]	1
B.		
I	A. 1, 2 and 4	1
II	The phrase 'fiery misery' suggests that the intense lighting made the experience physically uncomfortable and almost unbearable for actors undergoing make-up.	1
III	The ironic tone suggests that studio life, while glamorous in appearance, involved discomfort and impractical working conditions behind the scenes.	1
IV	C. To emphasise diversity within shared workspace	1
V	To show that genuine national integration was practised informally in the studio much before it was officially promoted by state-run media.	1
VI	The irony lies in the fact that a space meant to enhance appearance and glamour actually caused discomfort and misery due to harsh working conditions.	1
Q 10.	**Answer any five of the following six questions in 40 50 words each.**	**5x2= 10**
I	Umberto Eco made his academic writing accessible by blending scholarly ideas with clarity, humour, and narrative elements. He avoided obscure jargon, used examples familiar to readers, and treated writing as a form of intellectual communication rather than mere technical exposition.	2
II	The bangle makers of Firozabad remain trapped by poverty, caste stigma, and exploitative systems. Social conditioning, lack of education, and fear of breaking inherited occupations prevent them from imagining alternative futures, making suffering seem inevitable rather than changeable.	2
III	William Douglas' experience shows that fear is intensified by anticipation rather than the actual event. His terror arose from imagined consequences, not drowning itself. Systematic training helped him confront this anticipation, proving that fear can be controlled through rational practice.	2
IV	The Christmas episode transforms the peddler's cynical view of relationships as traps. Edla's kindness and trust awaken his conscience, making him realise that compassion can inspire moral responsibility and change, even in someone hardened by suspicion and loneliness.	2

V	Kamala Das' quiet observations of her mother's ageing face, looking out of the window, and the repeated reassurance reflect suppressed fear of loss, showing how unspoken emotions can be more powerful than explicit expressions of grief.	2
VI	Aunt Jennifer's tigers symbolise her suppressed desire for freedom, strength, and fearlessness. Unlike her constrained life, the tigers move confidently and dominantly, reflecting her inner longing to escape patriarchal oppression and assert her identity beyond marital limitations.	2
Q 11.	**Answer any two of the following three questions in 40–50 words each.**	**2x2= 4**
I	Charley's fascination with the third level reflects his desire to escape modern stress into a simpler, secure past. The third level symbolises psychological refuge, where nostalgia replaces anxiety, showing how individuals often romanticise the past to cope with present uncertainties.	2
II	The Tiger King's actions ironically fulfil the prophecy he tries to defeat. His obsessive attempts to control fate lead to his death, proving that arrogance and blind faith in power cannot alter destiny, and that human control over fate is ultimately illusory.	2
III	Antarctica is portrayed as a warning about environmental destruction rather than a tourist destination. The continent highlights the fragile balance of nature and the consequences of human interference, urging reflection on ecological responsibility before irreversible damage occurs.	2
Q 12.	**Answer any one of the following two questions, in about 120-150 words.**	**1x5 = 5**
A.	*Keeping Quiet* by Pablo Neruda and *Going Places* by A. R. Barton present two contrasting ways in which individuals respond to inner conflict—through silence and through imagination. In *Keeping Quiet*, Neruda advocates purposeful silence as a means of self-reflection. By pausing our restless activity and withdrawing from constant action, individuals are encouraged to confront their inner conflicts honestly. This moment of stillness fosters self-awareness, empathy, and emotional healing, suggesting that silence can lead to personal and collective growth. In contrast, *Going Places* portrays imagination as an escape from reality. Sophie's fantasies reflect her dissatisfaction with her present life, but her imagined future lacks practical grounding. Instead of resolving her inner conflict, imagination deepens her frustration and isolation, preventing meaningful growth. Together, the poems reveal that silence, when used consciously, promotes maturity and understanding, whereas unchecked imagination, divorced from reality, may hinder genuine human growth.	5
B.	Indigo and Poets and Pancakes present authority operating in very different contexts—colonial administration and cultural institutions—showing how power can be questioned through moral action and irony.	5

	In Indigo, authority is exercised by the British planters who compel the Champaran peasants to grow indigo on part of their land and surrender the produce at unfair prices. This exploitation is challenged when Gandhi refuses to obey the official order to leave Champaran, choosing instead to face arrest. His calm defiance, the spontaneous gathering of peasants in support, and the eventual official inquiry expose the injustice of colonial authority and lead to meaningful reform for the peasants. In Poets and Pancakes, authority within Gemini Studios operates through hierarchy, status, and insecurity rather than force. Figures like the Legal Adviser, whose influence far exceeds his actual contribution, reflect hollow authority sustained by fear and pretence. The author's ironic tone exposes these power structures by subtly mocking their self-importance. Together, the texts reveal that authority can be challenged either through ethical resistance or by exposing its emptiness, depending on the context.	
Q 13.	**Answer any one of the following two questions, in about 120-150 words.**	**1x5 = 5**
A.	The meeting between Derry and Mr Lamb becomes a crucial turning point in Derry's life as it challenges the fear and self-pity that dominate his self-image. Derry views himself as ugly and unwanted because of his burnt face, believing that people see only his physical deformity. This fear has isolated him emotionally and socially. Mr Lamb, however, offers a radically different outlook. Despite having an artificial leg, he refuses to see himself as disabled or incomplete. Through his open gate, beehive, and garden, he symbolises acceptance and freedom. His statement that 'there are plenty of things to stare at' urges Derry to focus on life's possibilities rather than limitations. By treating Derry with respect and warmth, Mr Lamb helps him realise that self-worth comes from attitude, not appearance. This interaction empowers Derry to move beyond fear and begin redefining himself with confidence and hope.	**5**
B.	Dr Sadao's decision to shelter and treat an enemy soldier places him at the centre of a profound moral dilemma, where professional ethics conflict with national loyalty. As a Japanese citizen during wartime, Sadao is expected to report the American prisoner, fully aware that harbouring him could lead to severe punishment. His fear of social disgrace and the possibility of execution underline the gravity of his choice. However, Sadao's actions reflect moral courage rather than betrayal. Guided by his identity as a doctor, he prioritises the universal value of human life over political allegiance. His statement that a doctor's duty is to save lives regardless of nationality reinforces this ethical stance. Though conflicted, he shelters the soldier, performs surgery, and later helps him escape. Sadao's decision demonstrates that true courage lies in upholding humanitarian principles even when they oppose dominant national expectations.	**5**

ENGLISH CORE-Code No. 301
SAMPLE QUESTION PAPER
CLASS-XII-(2026-27)

Time allowed: 3 Hrs **Maximum Marks: 80**

General Instructions

Read the following instructions carefully.

i. This question paper has 13 questions. All questions are compulsory.
ii. This question paper contains three sections:
- Section A: Reading Skills
- Section B: Creative Writing Skills
- Section C: Literature

iii. Attempt all questions based on specific instructions for each part. Write the correct question number and part thereof in your answer sheet.
iv. Separate instructions are given with each question/part, wherever necessary.
v. Adhere to the prescribed word limit while answering the questions.

Q No	SECTION A READING SKILLS	Marks 22

1. Read the following passage. **12**

1. Every December, the Geminids meteor shower occurs as the Earth passes through a stream of cosmic debris associated with a near-Earth asteroid. It is classified as one of the most active annual meteor showers based on recorded meteor counts and the regularity of its appearance. The Geminids are expected to reach peak activity on the night of 13–14 December, during which observers across India may record a high frequency of visible meteors. Under favourable atmospheric conditions, observation rates can exceed 100 meteors per hour, making the Geminids one of the most productive meteor showers observable from Earth.

2. Meteor showers occur when fragments of dust and rock enter the Earth's atmosphere at extremely high speeds and disintegrate due to friction, producing brief streaks of light. The Geminids are distinctive because they originate from a rocky asteroid known as 3200 Phaethon, rather than from a comet, which is the usual source of meteor showers. When Phaethon approaches the Sun during its orbit, it releases material that spreads along its orbital path. Each year in mid-December, the Earth intersects this debris stream, leading to increased meteor activity.

3. The meteors appear to radiate from the constellation Gemini, located in the northern sky. This apparent point of origin, known as the radiant, is used to identify the shower, although the meteors themselves may be seen across different regions of the sky. The most suitable time for observation is from midnight to the early morning hours, when the radiant rises higher above the horizon, improving the chances of sightings.

4. Observation of the Geminids does not require telescopes or binoculars, as such equipment limits the field of view. The unaided eye is considered the most effective

method for observing meteor showers. Observers are advised to allow adequate time for their eyes to adjust to darkness. Viewing conditions are influenced by cloud cover, atmospheric clarity, moonlight, and light pollution. Locations away from urban lighting generally provide better visibility.

5. Historical records indicate that the Geminids were first documented in the mid-nineteenth century. Since then, their activity has increased steadily, making them one of the most reliable and frequently studied meteor showers. The meteors travel at a relatively moderate speed compared to those of other showers, which often results in brighter and longer-lasting streaks.

6. For students, educators, and amateur astronomers, the Geminids offer a valuable opportunity to observe a recurring astronomical phenomenon and understand Earth's interaction with near-Earth objects. The event supports scientific learning by demonstrating how celestial debris produces visible effects in the Earth's atmosphere.

Source: https://www.indiatoday.in/science/story/geminids-meteor-shower-in-mid-december-offers-over-100-meteors-per-hour-for-indian-observers-2835534-2025-12-13 [417 words]

Answer the following questions, based on the given passage.

I Which evidence from paragraph 1 tells us that the Geminids are exceptionally active? 1

II Complete the following with a suitable reason. (paragraph 2) 1

The writer refers to 3200 Phaethon as a 'rocky asteroid' rather than a 'comet' in order to tell the reader that _____.

III Based on the passage, how does friction help in making the Geminids visible to observers on Earth? (paragraph 2) 1

IV Which of the following statements best captures the functional role of the 'radiant' as described in the passage? (paragraph 3) 1

A. It is the physical location where cosmic debris is created.
B. It serves as visual guide for observers to locate the shower.
C. It determines the speed fragments enter the atmosphere.
D. It represents the exact area where all meteors disappear

V How can we say that the Geminids are more 'observer-friendly' than other showers? (Any one reason) (Paragraph 5), 1

VI Which of the following best explains why the Geminids are frequently studied by scientists? 1

A. Their activity has shown a steady increase over time.
B. Their meteors travel at extremely high speeds.
C. Their observation requires specialised equipment.
D. Their radiant shifts position across the sky.

VII How does the mention of the 'mid-nineteenth century' documentation contribute to the authority of the claims made about the shower? (Answer in about 40 words) 2

VIII The writer's tone throughout the passage can best be described as _____. 1

A. persuasive and promotional, encouraging mass participation
B. explanatory and informative, aimed at scientific understanding
C. speculative and argumentative, questioning existing theories
D. celebratory and emotional, highlighting wonder over facts

IX What does the moderate speed of the Geminids and the resulting 'longer-lasting streaks' suggest about the quality of the viewing experience? (Answer in about 40 words) 2

X Complete the following with the most suitable option. 1

The main idea of the passage is the _____.

A. technical process of how asteroids shed cosmic debris
B. impact of light pollution on modern scientific learning
C. historical evolution of astronomy since the nineteenth century
D. scientific explanation and practical observation of Geminids

2. Read the following passage carefully. **10**

1. A recent study on the growth of India's Unified Payments Interface (UPI) provides an insightful glimpse into how everyday financial habits are changing across the country. The first study tracks the volume of transactions over four Octobers.

2. In October 2021, UPI processed 4.21 billion payments—a number that already reflected a growing preference for digital transactions. By October 2022, this figure rose to 7.30 billion, suggesting that more people were discovering the convenience of transferring money with just a tap on their phones. The momentum continued into October 2023, when volumes touched 11.40 billion, and by October 2024, the platform reached an impressive 16.58 billion transactions.

3. The second study traces the value of these transactions, revealing a similar pattern of rising confidence. In October 2021, UPI transactions were worth ₹7.71 lakh crore. A year later, the value climbed to ₹12.11 lakh crore, indicating that users were comfortable using the platform for higher-value payments as well. This trust deepened in October 2023, with the value rising to ₹17.15 lakh crore, and peaked in October 2024, reaching ₹23.49 lakh crore.

4. Together, the two studies tell a human story—one of a country steadily shifting from cash to digital payments. The rising numbers suggest that UPI is no longer limited to tech-savvy users; it has reached shops, homes, workplaces, and even small roadside vendors. With QR codes becoming familiar sights and smartphones becoming more accessible, people now pay for groceries, services, transport, and bills through quick digital transfers.

5. The studies also hint at a broader change in mindset. As digital payments become routine, users appear more confident that these systems are secure, reliable, and easier to manage than handling cash. This transition has supported small businesses, reduced the need for physical currency, and encouraged more people to participate in formal financial systems.

6. Overall, the four-year data captures a simple yet powerful trend: UPI has grown from being a convenient payment option to becoming an essential part of daily financial life for millions of Indians.

Source: https://www.pib.gov.in/PressReleasePage.aspx?PRID=2079544&reg=3&lang=2 [333 words]

Answer the following questions based on the given passage.

I What was the purpose of tracking the four-year growth of India's Unified Payments Interface (UPI)? (paragraph 1) 1

A. To analyse the technical infrastructure supporting digital banking systems
B. To understand changes in payment behaviour among different user groups
C. To determine the number of vendors using smartphone-based payments
D. To compare patterns of digital transactions with traditional cash practices

II Analyse whether the percentage growth in the total value of UPI transactions is greater than, less than, or roughly the same as the percentage growth in the number of transactions. State your choice and briefly justify your answer with reference to paragraph 2. 1

III Which of the following statements best describes the overall pattern with reference to paragraph 3? 1

A. Both the number of transactions and the total value of transactions increase steadily over the four years.
B. The number of transactions increases, but the total value of transactions decreases year after year.
C. The total value of transactions increases, but the number of transactions stays almost unchanged.
D. Both the number of transactions and the total value of transactions decrease after an initial increase.

IV Paragraph 4 mentions that UPI is used in 'shops, homes, workplaces, and even small roadside vendors'. 1

What does this suggest about the nature of UPI adoption?

A. Dependence on organised commercial establishments
B. Widespread adoption across formal and informal settings
C. Usage limited to digitally advanced urban spaces
D. Usage restricted to specific consumer groups

V Evaluate the impact of UPI's expansion into formal financial systems on small business owners, with reference to the paragraph 5. (Answer in about 40 words) 2

VI Which of the following aspects is NOT directly discussed in the passage? 1

A. The growth pattern of UPI transactions over time
B. The changing public attitude towards digital payments
C. The policy framework governing digital payment systems
D. The effect of UPI adoption on small businesses

VII Fill in the blank with the correct option from those given in brackets. 1

UPI's usage by small roadside vendors primarily suggests that digital payment systems in India have become _____. (inclusive / exclusive / marginal)

VIII Rohan prefers to carry almost no cash and pays for groceries and transport using his phone. Using information from Paragraph 3 and the charts, explain giving two reasons why UPI is a more suitable option for him in 2024 than it might have been in 2021. (Answer in about 40 words). 2

SECTION B 18

CREATIVE WRITING SKILLS

All the names and addresses used in the questions are fictitious. Resemblance, if any, is purely coincidental.

3. Attempt any one of the two, (A) or (B), in about 50 words. 1x4 = 4

A. You are Rishitha Menon, a member of the Horizon Club of Bala Vidyalaya Senior Secondary School, Chennai. The school is organising a one-day workshop to help senior students improve their project work and presentation skills. Draft a notice inviting students to participate. Include necessary details and the registration process. Put your notice in a box.

OR

B. You are Vijesh Kumar, the Secretary of Shantiniketan Residents' Welfare Association, Chandigarh. The Association is organising a Marathon to create awareness on animal conservation, in collaboration with local animal welfare organisations. Write a notice inviting residents to participate. Include necessary details and registration process. Put your notice in a box.

4. Attempt any one of the two, (A) or (B), in about 50 words. 1x4 = 4

A. You are Ananya, the lead coordinator of the Media Club at St. Xavier's School, Odisha. Your club is organising a seminar titled Digital Storytelling & Ethics. Draft a formal invitation to Ishaan Grover, a popular local educational online expert and filmmaker, inviting him to be the keynote speaker and lead a hands-on editing session. Include essential details.

OR

B. You are Dr. Sameer, an environmental scientist living in Bengaluru. You have received an invitation from Greenwood International School, Mysuru, to judge the 'Waste-to-Wealth' project competition. Write a formal reply accepting the invitation, and confirming your arrival.

5. Attempt any one of the two, (A) or (B), in 120-150 words. 1x5 = 5

A. Instances of food wastage at weddings, parties, and large social gatherings have been steadily increasing in your city. As Kavya, a student volunteer residing at 45, Lake View Road, Jaipur, write a letter to the Editor of a local newspaper proposing a **'**Community Food Redistribution Initiative' to address this issue.
You may use the following cues to draft your letter:
- Extent of food wastage at social events
- Social and environmental consequences
- Collaboration with NGOs / food banks
- Mobilising volunteers for collection and distribution
- Promoting responsible consumption

OR

B. You are Ranjay Thakur, a resident of 12, Mall Road, Shimla. You recently saw the following advertisement in 'The Himalayan Times' newspaper, for the post of a Sustainable Tourism Coordinator at 'EcoTrails India', a start-up focusing on responsible travel. You have a deep interest in environmental conservation and have volunteered for local cleanliness drives. Write a letter of application for a job in 120–150 words along with a detailed bio-data.



WANTED

EcoTrails India

— A Responsible Travel Startup —

SUSTAINABLE TOURISM COORDINATOR

Requirements:

- Graduate/Postgraduate in Tourism, Environmental Studies or related field
- Passionate about conservation and sustainable travel
- Experience in volunteering or cleanliness drives preferred
- Good communication & organizational skills

Job Role:

- Plan and coordinate eco-friendly travel initiatives
- Work with local communities on responsible tourism
- Assist in awareness and sustainability campaigns

Location: Shimla (with field travel)

Apply with letter & bio-data within 7 days to:

The Hiring Manager
EcoTrails India
Email: careers@ecotrailsindia.org

6. Attempt any one of the two, (A) or (B), in 120-150 words. 1x5 = 5

A. As a teenager, you observe that an increasing number of your peers are affected by excessive social media use, particularly the habit of doom-scrolling*. Algorithm-driven content exposure is beginning to influence students' mental well-being, attention span, and academic focus. Write an article for your school magazine highlighting why Digital Wellness should be integrated into the school curriculum. You are Smitha Jinan, Class 12 student reporter of SVA Public School, Thrissur.

You may organise your ideas around the following cues.

- Prevalence of doom-scrolling among adolescents
- Impact of algorithm-driven content on teenage minds
- Effects on emotional health, concentration, and learning
- Role of schools in promoting responsible digital habits
- Encouraging mindful, purposeful use of technology

**doomscrolling: the action of constantly scrolling through, especially on a phone*

OR

B. You are Prem Kumar, Secretary of the Health Club at Sarvodaya Vidyalaya, New Delhi. Your school recently participated in the launch of the 'Tobacco Free Youth Campaign'. Write a report in 120–150 words for your school magazine, detailing the event and the various activities planned under this national campaign.

- Organisation, launch date, and ties to national tobacco-free goals
- Rally route, slogans, pledges, and awareness activities
- Student participation in marches and interactions
- Outcomes, health pledges, and future campaigns

SECTION C 40

LITERATURE

7. Read the following extracts and solve ANY ONE of the given two, (A) or (B). 1x6 = 6

A. *A thing of beauty is a joy for ever:*
Its loveliness increases; it will never
Pass into nothingness; but still will keep
A bower quiet for us, and a sleep
Full of sweet dreams, and health, and quiet breathing. (A Thing of Beauty)

I Complete the following appropriately by choosing the correct option from those given in brackets. 1

The phrase 'a joy for ever' suggests that beauty continues to offer _____ beyond the limits of time. (inner fulfilment / physical permanence / social approval)

II Complete the following appropriately: 1
A thing of beauty remains a lasting source of joy because _____.

III The image of '*a bower quiet for us'* is best interpreted as beauty functioning as a _____. 1

A. natural shelter formed by the physical world
B. deliberate escape from social obligations
C. protective inner refuge offering calm
D. symbolic reminder of human weakness

IV Which experience is most clearly conveyed through the expressions '*sweet dreams*' and '*quiet breathing*'? 1

A. enjoyment of material comfort and luxury
B. attainment of emotional and mental peace
C. development of physical strength and endurance
D. appreciation of artistic and aesthetic pleasure

V How does the metaphor '*a bower quiet for us'* contribute to the poet's idea of beauty in the extract? 1

VI What contrast does the poet imply between '*beauty'* and '*nothingness"*? 1

OR

B. *The little old house was out with a little new shed*
In front at the edge of the road where the traffic sped,
A roadside stand that too pathetically pled,
It would not be fair to say for a dole of bread,
But for some of the money, the cash, whose flow supports
The flower of cities from sinking and withering faint. *(A Roadside Stand)*

I Complete the following appropriately by choosing the correct option from those given in brackets. 1

The repeated use of the word 'little' suggests the _____ of the roadside stand and the house (economic fragility / decorative simplicity / rural independence).

II Complete the following appropriately: 1

The phrase 'traffic sped' highlights the contrast between the fast-moving urban world and _____.

III Why does the poet clarify that the stand is not asking for 'a dole of bread'? 1

IV The phrase 'whose flow supports / The flower of cities' suggests that urban prosperity depends on _____. 1

A. natural agricultural abundance
B. independent urban development
C. aesthetic appeal of city life
D. continuous circulation of wealth

V How does the poet's choice of diction in the phrase 'pathetically pled' contribute to the tone of the extract? 1

VI Which idea is most strongly conveyed through the extract? 1

A. Rural dependence on city charity
B. Rural–urban economic imbalance
C. Traffic as modern progress
D. Urban indifference to nature

8. Read the following extracts and solve ANY ONE of the given two, (A) or (B). 1x4 = 4

A. *Derry: You're… peculiar. You say peculiar things. You ask questions I don't understand.*
Mr Lamb: I like to talk. Have company. You don't have to answer questions. You don't have to stop here at all. The gate's open.
Derry: Yes, but…
Mr Lamb: I've a hive of bees behind those trees over there. Some hear bees and they say, bees buzz. But when you listen to bees for a long while, they humm… and hum means 'sing'. I hear them singing, my bees.
Derry: But… I like it here. I came in because I liked it… when I looked over the wall.
(*On the Face of It*)

I What does Mr Lamb mean when he says, "The gate's open"? 1

A. Visitors must ask permission before entering.
B. Anyone is free to enter or leave without restriction.

C. He does not want visitors to stay long.
D. The gate is broken and cannot be closed.

II How does Mr Lamb's way of speaking challenge Derry's initial perception of him as 'peculiar'? 1

III Mr Lamb's description of bees as 'singing' rather than 'buzzing' reveals his tendency to _____. 1

A. perceive ordinary sounds with sensitivity
B. interpret familiar experiences in a reflective way
C. describe natural sounds with poetic emphasis
D. respond to nature with thoughtful attentiveness

IV What can be inferred about Derry's emotional state from his statement, '*I like it here"*? 1

OR

B. *And he added, "Because we are born into this community, we are never given any honour or dignity or respect; we are stripped of all that. But if we study and make progress, we can throw away these indignities. So study with care, learn all you can. If you are always ahead in your lessons, people will come to you of their own accord and attach themselves to you. Work hard and learn." The words that Annan spoke to me that day made a very deep impression on me. And I studied hard, with all my breath and being, in a frenzy almost.*

(Memories of Childhood II)

I According to Annan, what is the main reason the community is denied honour and respect? 1

A. They lack access to formal education opportunities.
B. They refuse to follow dominant social customs.
C. They fail to assert themselves in public spaces.
D. They are born into a socially marginalised sector.

II Annan's advice to 'study with care' reflects his belief that education can _____. 1

A. ensure material comfort and financial stability.
B replace traditional knowledge systems completely.
C. transform social status and restore lost dignity.
D. help individuals escape personal responsibility.

III What can be inferred about the narrator from the phrase '*with all my breath and being"*? 1

IV List any one way how Annan's advice, "*Work hard and learn*," contributes to his characterisation in this extract. 1

9. Read the following extracts and solve ANY ONE of the given two, (A) or (B). 1x6 = 6

A. *Their father had washed when he came in and his face and arms were shiny and pink and he smelled of soap. He switched on the television, tossed one of little Derek's shoes from his chair onto the sofa, and sat down with a grunt.*

"Sophie meet Danny Casey," Geoff said. Sophie wriggled where she was sitting at the table. Her father turned his head on his thick neck to look at her. His expression was one of disdain.
"It's true," Geoff said.
"I once knew a man who had known Tom Finney," his father said reverently to the television. "But that was a long time ago."
"You told us," Geoff said.

(*Going Places*)

I Which description of Sophie's father in the extract indicates that he does not take her claim seriously? 1

1. He smells of soap.
2. He sits down with a grunt.
3. He turns his head to look at Sophie.
4. He continues to watch television.
5. His expression is one of disdain.

Select the most suitable option.

A. 1 and 2
B. 2 and 3
C. 4 and 5
D. 3 and 5

II Complete the following appropriately. 1

The father's casual actions at the beginning of the extract suggest a _____ attitude towards his surroundings.

III Why does Sophie's father refer to knowing 'a man who had known Tom Finney'? 1

IV What does Sophie's physical reaction (wriggled) reveal about her emotional state at that moment? 1

V The line "It's true," spoken by Geoff, highlights his role in the interaction between Sophie and their father. Explain. 1

VI Which central conflict is most likely highlighted through the interaction among Sophie, Geoff, and their father? 1

A. Tension between imagination and realism
B. Emotional distance within working-class families
C. Generational disagreement over attitudes and beliefs
D. Contrast between admiration and sceptical realism

OR

B. The make-up room had the look of a hair-cutting salon with lights at all angles around half a dozen large mirrors. They were all incandescent lights, so you can imagine the fiery misery of those subjected to make-up. The make-up department was first headed by a Bengali who became too big for a studio and left. He was succeeded by a Maharashtrian who was assisted by a Dharwar Kannadiga, an Andhra, a Madras Indian Christian, an Anglo-Burmese and the usual local Tamils. All this shows that

there was a great deal of national integration long before A.I.R. and Doordarshan began broadcasting programmes on national integration. (*Poets and Pancakes*)

I Which of the following details about the make-up room are explicitly mentioned in the extract? 1

1. The room was fitted with many large mirrors and bright lights.
2. The lighting caused discomfort to those subjected to make-up.
3. The make-up work required technical expertise in lighting.
4. The department included people from different regions of India.
5. The writer expresses personal emotional involvement with the room.

Select the most suitable option.

A. 1, 2 and 4
B. 2, 3 and 5
C. 1, 3 and 4
D. 3, 4 and 5

II Complete the following sentence appropriately. 1
The phrase 'fiery misery' suggests that the intense lighting _____.

III What can be inferred about studio life from the writer's ironic tone in the extract? 1

IV How does the detailed listing of people from different regions function in the extract? 1

A. To highlight efficiency within the studio system
B. To mock rigid systems of official classification
C. To emphasise diversity within shared workspace
D. To criticise imbalance among regional groups

V What is the most likely reason the author compares studio integration with A.I.R. and Doordarshan? 1

VI Identify the irony in the professional setup of the Gemini Studios make-up room as described in the extract. 1

10. Answer any five of the following six questions in 40 50 words each. 5x2= 10

I According to the interview, how did Umberto Eco make his academic writing accessible to readers? *(The Interview II)*

II Explain why the bangle makers of Firozabad are unable to imagine an alternative future despite their hardships. *(Lost Spring)*

III What does William Douglas's experience in *Deep Water* suggest about the nature of fear and anticipation?

IV How does the Christmas episode influence the peddler's perception of human relationships? *(The Rattrap)*

V Kamala Das uses imagery and restraint to convey unspoken anxiety rather than overt grief. Comment. *(My Mother at Sixty-six)*

VI What does Aunt Jennifer's portrayal of the tigers suggest about her suppressed desires? *(Aunt Jennifer's Tigers)*

11. Answer any two of the following three questions in 40–50 words each. 2x2 = 4

I Based on the events of the story, elaborate on Charley's fascination with the third level and the way he relates to the past? *(The Third Level)*

II Examine the outcome of the Tiger King's actions in the light of the prophecy and comment on his belief about controlling fate. *(The Tiger King)*

III Describe the idea that emerges from the author's portrayal of Antarctica as a warning rather than a destination. *(Journey to the End of the Earth)*

12. Answer any one of the following two questions, in about 120-150 words. 1x5 = 5

A. How do *Keeping Quiet* by Pablo Neruda and *Going Places* by A. R. Barton present different responses to inner conflict, and what do these responses reveal about the impact of silence and imagination on human growth?

B. *Indigo and Poets* and *Pancakes* present power operating in very different contexts. Gandhi's actions in Champaran and the ironic portrayal of Gemini Studios bring out ways in which authority is questioned in these texts. Discuss.

13. Answer any one of the following two questions, in about 120-150 words. 1x5 = 5

A. The meeting between Derry and Mr Lamb marks a turning point in Derry's life. Discuss how Mr Lamb's outlook challenges Derry's fear-driven self-image and shapes his understanding of self-worth beyond physical limitations.

B. Dr Sadao's decision to shelter an enemy soldier places him in a moral dilemma. Assess whether this decision can be seen as an act of moral courage in the face of competing national loyalties in *The Enemy*.

[illegible]

[illegible] should be retained and the other answer scored out with a note “Extra Question”.

[illegible]

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[illegible]	The gardener’s remark underscores the value of consistency and presence over recognition. It reinforces the passage’s theme that small, repeated efforts have [illegible]	[illegible]
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[illegible]	[illegible] ▪ Content – 2 marks ▪ Organisation – 1 mark (fluency, coherence, logical flow) ▪ Expression – 2 marks (vocabulary, originality of ideas, grammatical accuracy)	[illegible]
[illegible]	▪ Unlike the "blue dot" on a GPS, paper maps require spatial awareness. Describe the initial "withdrawal symptoms"—the phantom itch to reach for a phone when a	

	turn is missed. ▪ Following a local's recommendation (the "scenic route") often leads to "hidden gems" (cafés, viewpoints) not indexed by popular travel algorithms. ▪ Relying on people allows you to pick up on local dialects, gestures, and hospitality—elements that are absent in a voice-guided AI. ▪ Without a screen as an intermediary, the brain becomes more attuned to sights, smells, and sounds. You "see" the city rather than just "following" a path. ▪ Digital fasting reveals how much of our identity is tied to being "reachable." The trip becomes an internal journey of self-reliance. [illegible]	
[illegible]	▪ Youth today are often driven by a "pre-scripted" definition of success—high grades, prestigious degrees, and conventional careers. ▪ Creating a psychological burden where self-worth is tied exclusively to external approval. ▪ Chronic pressure to conform leads to "performance anxiety," burnout, and a sense of alienation. ▪ When personal desire is suppressed for too long, the result is often a deep-seated resentment toward the very society one sought to please. [illegible]	
[illegible]	▪ AI is no longer a sub-branch of Computer Science but a "horizontal" technology. AI literacy is the foundational tool required to navigate 21st-century data structures in any field. ▪ Science: AI accelerates data analysis and predictive modeling (e.g., climate change or genomics). ▪ Commerce: It redefines market logistics, algorithmic trading, and consumer behavior analysis. ▪ Arts: It challenges the definitions of "creativity" and "authorship" through generative art and digital humanities. ▪ Students must understand algorithmic bias, data privacy, and the "black box" problem to become responsible citizens in an automated society. ▪ This isn't about teaching every student to code, but about teaching them to collaborate with machines, ensuring they complement AI rather than being replaced by it. [illegible]	
[illegible]	▪ When women succeed on a global stage, it forces a conservative society to re-evaluate the "physical and mental capabilities" of women, shifting the cultural needle toward equity. ▪ A World Cup win provides tangible proof to young girls that sports is a viable career path, not just a hobby. This representation is essential in dismantling the psychological barriers that prevent girls in traditional societies from pursuing their ambitions. ▪ A Women's World Cup win creates a new iconography where strength, strategy, and national pride are embodied by women, thereby diversifying the nation's collective identity. ▪ While a win brings temporary visibility, it does not automatically fix institutional disparities such as the gender pay gap, lack of infrastructure at the school level, or the scarcity of female coaches and administrators. ▪ Sporting glory is a necessary but insufficient condition for bridging the gender gap. [illegible]	
[illegible]	[illegible]	[illegible]

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□	▪ She feels bound by her promise to her dying mother to keep the home together and care for her family. ▪ Eveline is overwhelmed by anxiety about leaving familiar surroundings, even though her life in Dublin is unhappy. ▪ She is incapable of decisive action at the critical moment. □□□□□ □□□□ □□□□□□□□ □R □□□□ □ □□□□R R□□□□□□□□□ □□□□□□□□□□	
	□**R**□	
□□□	▪ Selling dreams is a means of economic survival, reflecting human ingenuity in uncertain circumstances. ▪ Her dream interpretations show how narratives can shape reality and influence people's lives. ▪ Her accurate interpretations suggest that destiny is inescapable. □□□□□ □□□□ □□□□□□□□ □R □□□□ □ □□□□R R□□□□□□□□□ □□□□□□□□□□	
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□	▪ The speaker contrasts his own aging and weariness with the swans' unchanged vitality. ▪ He emphasizes that the swans remain beautiful and energetic, while he feels loss and decline. ▪ The swans symbolize permanence and continuity, unlike the speaker's changing life. ▪ This contrast highlights the theme of time passing and human transience. □□□□□ □□□ □ □□□□□□□□□ □R □□□□ □ □□□□R R□□□□□□□□□ □□□□□□□□□□	
	□**R**□	
□□□	▪ Sen refers to India's long history of reasoned debate and dialogue in public life.	

	▪ It includes discussions in religion, philosophy, politics, and society. ▪ This tradition values pluralism and tolerance of differing views. ▪ A major positive consequence is the strengthening of democracy and critical thinking in Indian society. (ANY TWO RELEVANT POINTS INCLUDING LAST POINT OR ANY OTHER RELEVANT POINT/S)	
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□	▪ Donne uses shadows to represent concealment and misunderstanding in the early stages of love. ▪ At noon, when shadows disappear, love reaches a phase of complete honesty and clarity. ▪ As shadows lengthen again, they signify decline, doubt, and emotional vulnerability in mature love. ▪ The shifting shadows reflect love's changing nature over time, not its permanence. ▪ Donne suggests love is most fragile when self□interest and fear replace mutual openness. □□□□ □□R□□ □□ □□□ □□ □R □□□ □ □□□□R R□□□□□□□□ □□ □□ □□□□)	
	□**R**□	
□□	▪ The stream□of□consciousness style allows Woolf to move freely between thought, memory, and perception. ▪ Reflections on war emerge indirectly, showing its psychological impact rather than physical events. ▪ Gender norms are questioned through the narrator's resistance to male□dominated authority and logic. ▪ The fluid narration challenges rigid, conventional ways of thinking and categorizing reality. ▪ This technique emphasizes subjective truth, suggesting reality is shaped by individual consciousness. □□□□ □□R□□ □□ □□ □□□ □R □□□ □ □□□□R R□□□□□□□□ □□ □□ □□□□	
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□	▪ The Master seeks to assert moral and spiritual control over the Tiger through self□sacrifice. ▪ The act symbolizes his belief in non□violence and inner transformation rather than physical domination. ▪ It marks a turning point where teacher and beast confront fear and instinct, leading to the Tiger's submission. □□□□ □□□ □□ □□ □R □□□ □ □□□□R R□□□□□□□□ □□ □□ □□□□	
	□**R**□ □	
□□	▪ Margayya desires social respectability and recognition in Malgudi. ▪ His humiliation by authority fuels a need to prove his worth and power. ▪ Economic success becomes, for him, the means to social dominance and self□validation. □□□□ □□□ □□ □□ □R □□□ □ □□□□R R□□□□□□□□ □□ □□ □□□□	
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□	▪ The villagers are initially terrified, highlighting Raja's reputation as a powerful and dangerous creature. ▪ Their fear reflects the natural awe and respect humans have for untamed wildness. ▪ As they observe him over time, some show curiosity and fascination, symbolizing the human tendency to be drawn to the exotic and unknown. ▪ Narayan uses this moment to contrast instinctive fear with moral understanding. (ANY TWO POINTS OR ANY OTHER RELEVANT POINT/S)	
	□**R**□	
□□	▪ Margayya procures sacred threads, incense, charms, and astrological charts. (e.g., charms tied around his body for luck). ▪ He performs rituals advised by priests to appease deities associated with wealth. ▪ These objects show his superstitious dependence on external forces for success. ▪ His reliance on ritual suggests a shortcut mentality, blending faith with financial ambition rather than ethical practice. □□□□ □□ □ □□ □□ □□ □R □□□ □ □□□R R□□□□□□□ □□ □□ □□	
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□	▪ R.K. Narayan presents freedom not as physical independence but as inner awakening and moral understanding, traced through Raja's changing life stages. ▪ Raja's early life in the jungle appears free, yet he is ruled by instinct, fear, and hunger (his constant need to hunt and kill), showing freedom without awareness is incomplete. ▪ Though physically enslaved, Raja begins to observe human cruelty and discipline, marking the first stage of consciousness, even while chained and beaten. ▪ Living in the cage with the Master limits Raja physically, but the Master's non□violence and compassion awaken Raja's reflective self (e.g., the Master refusing to use force). ▪ Raja ultimately understands restraint, acceptance, and compassion, proving that freedom comes from self□control and awareness, not from escape or dominance. □□□□ □□R□□ □□ □□ □□ □R □□□ □ □□□R R□□□□□□□ □□ □□ □□	
	□**R**□	
□□	▪ Balu is not merely Margayya's son but a symbolic extension of his unchecked greed and moral decay, shaping the novel's cycle of rise and fall. ▪ Margayya sees Balu as a means to social success (e.g., excessive spending on education and indulgence), reflecting his belief that money can manufacture respectability. ▪ Balu's recklessness—drinking, gambling, and squandering wealth—directly causes Margayya's financial collapse, symbolizing how ill□gotten wealth self□destructs. ▪ Margayya's failure to instill values in Balu mirrors his own ethical emptiness, showing that material success without morality produces decay. ▪ Each financial rise tied to Balu ends in catastrophe, making the father□son relationship a metaphor for the inherent instability of greed□driven success. □□□□ □□R□□ □□ □□ □□ □R □□□ □ □□□R R□□□□□□□ □□ □□ □□	

[illegible]

1 [illegible] R[illegible]d [illegible]

[illegible]

[illegible] o'clock, carrying nothing but a not[illegible]

[illegible]

to read from a torn textbook. The child's lips moved hesitantly over the words, his
small exercises to engage the children's curiosity. Sometimes
growth of understanding. Often, he would smile at a child's tentative progress or
spark of understanding in a child's eyes—

[illegible]

[illegible] him that life's quiet acts carried meaning beyond the world's notice.

[illegible] said, "You come every day. That matters." The remark was simple, almost [illegible]

[illegible]

[illegible]

What best describes Raghav's relationship with his [illegible]

[illegible]

D [illegible]

[illegible] *'quiet, deliberate sense of purpose'* suggests that Raghav's actions [illegible]

D [illegible]

Raghav's feeling of *'invisibility'* [illegible]

D [illegible]

[illegible]

D [illegible]

The author's use of [illegible]

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□□ □□□□□□ □□ □□□erred that Raghav's satisfaction from teaching the children is rooted □
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□□□ □□□ statement "Praise, he had discovered, felt less necessary than it once had" □
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□□ What change occurs in Raghav's response to gratitude offered by parents? □
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□□□□ What is the significance of the gardener's remark, "You come every day, That □
matters?"

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Raghav's sense of fulfilment in the park d□□□□□□d□ □□□r□□□□□ □□□ □□□□ r□□□□□□□□□□□□□□ □□□d

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[illegible]

[illegible] [illegible] [illegible]

"[illegible]
[illegible]
[illegible]
[illegible]"
[illegible]

[illegible] Raghav's dedication to teaching the children reflects his personal [illegible]

[illegible] **1** [illegible]

[illegible] phrase 'statures touch the skies' represent in the following line – 'Our statures touch the skies'?

[illegible] define the trait of 'heroism'?

[illegible]

[illegible]

The world of women's sports is undergoing a game [illegible]

[illegible]

emphasising the profound impact of early exposure to sports on women's

two per cent of global audiences surveyed by Parity Now agree it's 61 per cent deeming it "very important".

Women's Sports		

	FIFA Women's World Cup	
a women's sports		
	7 out of 10 people watch women's	
	73% watch women's sports at least a few times a year; 81% watch men's	
	54% of women's sports fans began	

Source-https://knowledge.unwomen.org/en/articles/facts-and-figures/facts-and-figures-women-in-sport

[illegible] (He was appointed…)

[illegible] (Having…)

[illegible] (Not only…but also…)

''Bravo! You have [illegible]" [illegible] (The coach applauded…)

[illegible]

Dr[illegible] reflective Essay on the theme: '[illegible] [illegible]rsonal Desire vs. Societal Norms.' [illegible]

[illegible]

The recent triumph of the Women's Football Team in the [illegible] hailed as a 'watershed moment' [illegible]

R[illegible]d [illegible]

[illegible]

[illegible] a youth magazine on the topic: '[illegible] [illegible]g Students for the Gig Economy.' [illegible]

M[illegible]r[illegible]

[illegible]

R[illegible]d [illegible]

Dr[illegible] M[illegible]r[illegible]

[illegible]

(A Wedding in Brownsville)

[illegible]

[illegible]

(Chandalika)

I. Who is the 'him' [illegible]

II. What does the 'dust' symbolize in the context of Prakriti's social standing?

III. What 'marvellous truth' [illegible]

[illegible] se the contrasting images of a 'flower' and a 'poison plant'[illegible]

[illegible] 'dust'[illegible]

[illegible]

7 (II) Attempt any ONE of the two ext acts (A) an d (B) given below: 1x6=6

(A) R□□d the ext acts given below an d answe r the questions that follow: □

□ In Xana du d□d Kubla Khan
A stately pleasu re□dome dec ree:
Whe re Alph, the sac red rive r, ran
Th rough cave rns measu reless to man
Down to a sunless sea.
So twice five miles of fe rtile g roun d
With walls an d towe rs we re □rd□d roun d:
An d the re we re ga rdens b right with sinuous rills,
Whe re blossome d many an incense-bea ring r□□;
An d he re we re fo rests ancient as the hills,
Enfo □ding sunny spots of g reene ry. *(Kubla Khan)*

I. What is the cent al s tructu re d□□r□□d by Kubla Khan, an d whe re is it locate d?

II. What is the significance of the rive r Alph running "Th rough cave rns measu reless to man "?

III. What cont ast in the env □onment is establishe d by the final two lines of the ex □act?

IV. The description of the gardens as '□rdled round' suggests a sen□□ of ___

(A) Boun dless □□d□□ an d natu ral spontaneity.
(B) A rtificial enclosu re an d cont olle d pe rfection.
(C) Sp □ritual openness an d accessibility.
□D) Th reatening w □dness an d d ange r.

V. □dentify the figure of speech in the phrase 'Down to a sunless sea.'

VI. Fin d a □□rd in the ext act that means ' □rd□r□d' □r 'comman ded.'

□ □R□ □

(B) □ R□□d the ex □acts given below an d answe r the questions that follow.

□ One day you look up an d see one of them
eyeless, silent, a zigzag sky showing
through the knocke d-out clockwo rk, afte r a riot,
a peace-ma rch time bomb, □r a precise act
Of natu re in a night of lightnings. *(Time and Time Again)*

I. □dentify the □□etic device used in the phrase 'eyeless, silent.'

II. How does the poet distinguish between human-ma de chaos an d natu ral chaos in this ext act?

III. What is the significance of the word 'precise' when desc ribing the act of natu re?

IV. The 'knocked□out clockwork' and the 'zigzag sky' through the eyeless towe r symbolise _____

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[illegible]

V. Find a word in the extract which means ‘crooked’.

[illegible]xplain the irony in the phrase ‘peace [illegible]march time bomb.’

[illegible]

[illegible] *(Eveline)*

[illegible]

[illegible]

[illegible] *(The Wild Swans at Coole)*

[illegible] *(The Argumentative Indian)*

1[illegible]

[illegible]

[illegible]

[illegible]

[illegible] *(A Tiger for Malgudi)*

[illegible] *(The Financial Expert)*

[illegible]

[illegible] Describe the significance of the villagers’ reaction when Raja first appears in M[illegible]d[illegible] *(A Tiger for Malgudi)*

[illegible] *(The Financial Expert)*

[illegible]

[illegible]

- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]
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[illegible]	[illegible]	[illegible]
1[illegible]	[illegible] *(1 mark for correct answer)*	1[illegible]
[illegible]	[illegible] *(1 mark for correct answer)*	1[illegible]
[illegible]	[illegible] *(1 mark for correct answer)*	1[illegible]
[illegible]	[illegible] *(1 mark for correct answer)*	1[illegible]
[illegible]	[illegible] *(1 mark for correct answer)*	1[illegible]
[illegible]	[illegible] *(1 mark for correct answer)*	1[illegible]
[illegible]	[illegible] *(1 mark for correct answer)*	1[illegible]
[illegible]	[illegible] *(1 mark for correct answer)*	1[illegible]
[illegible]	[illegible] *(1 mark for correct answer)*	1[illegible]
1[illegible]	[illegible] *(1 mark for correct answer)*	1[illegible]
11[illegible]	[illegible] *(1 mark for correct answer)*	1[illegible]
1[illegible]	[illegible] *(1 mark for correct answer)*	1[illegible]
1[illegible]	[illegible] *(1 mark for correct answer)*	1[illegible]
1[illegible]	[illegible] *(1 mark for correct answer)*	1[illegible]
1[illegible]	[illegible] *(1 mark for correct answer)*	1[illegible]
1[illegible]	[illegible] *(1 mark for correct answer)*	1[illegible]

*There is no change in the Question Paper Design and Assessment Pattern for Academic Session 2026-27.

1[illegible]	[illegible] *(1 mark for correct answer)*	1
1[illegible]	[illegible] *(1 mark for correct answer)*	1
1[illegible]	[illegible] *(1 mark for correct answer)*	1
[illegible]	[illegible] *(1 mark for correct answer)*	1
[illegible]1[illegible]	[illegible] *(1 mark for correct answer)*	1
	[illegible] 1 [illegible] M [illegible]	
[illegible]	[illegible] *(1 mark for each correct part)* [illegible] R [illegible] **0 False** **1 True** *(1 mark for each correct part)*	[illegible]
[illegible]	[illegible] information is collected automatically, often without the user’s knowledge or [illegible] *(2 mark for correct differentiation)*	[illegible]
[illegible]	[illegible] *(1 mark for each correct part)*	[illegible]
[illegible]	[illegible] *(1 mark for each correct part)* [illegible] R [illegible]	[illegible]
	[illegible]	

*There is no change in the Question Paper Design and Assessment Pattern for Academic Session 2026-27.

	[illegible] *(1 mark for each correct part)*	
[illegible]	[illegible] [illegible] *(1 mark for each correct part)*	[illegible]
[illegible]	[illegible] [illegible] [illegible] [illegible] *(1 mark for each correct guidelines)*	[illegible]
[illegible]	[illegible] *(2 mark for correct program)* [illegible] [illegible] *(1 mark for each correct part)*	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible] [illegible] [illegible] *(1 mark for each correct part)*	[illegible]
[illegible]	[illegible] *(2 marks for correct program)* *(1 mark for correct output)* [illegible] *(1 mark for each correct part)*	[illegible]
[illegible]	[illegible] [illegible] [illegible] [illegible] *(1 mark for each correct part)*	[illegible]
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(iii)

RIGHT(Name, 3)
man

(1 mark for each correct part)

R

(B) (i) 9

(ii) IN DIA

(iii) 11

(1 mark for each correct part)

Section **D** (33 to 34) 2X4 = 8 **Marks**

33

```
impo rt matplotlib.pyplot as plt
months = ['Jan', 'Feb',  Mr', 'Ap r']
sales = [12000, 15000, 11000, 18000]
plt.plot(months, sales, label=  "Sales ")
plt.title( Sales Pe rformance ")
plt.xlabel( Month")
plt.ylabel( Amount )
plt.legen d()
plt.show()
```

(! mark for correct imports)
(1 mark for correct use of plot with label)
(1/2 mark for title)
(1/2 mark for labels)
(1/2 mark for legend)
(1/2 mark for show)

4

34

(A) (i) SELECT Game, SU M(Fees) R M SPO RTS G ROUP BY Game HAVING SU M(Fees) > 1000 ;

(ii) SELECT SName, CName R M SPO RTS, COACH WHE RE SPO RTS.Game = COACH.Game ;

(2 mark for correct part(i), 2 mark for correct part(ii))

R

(B) (i)

D D	COUNT(*)	MAX(Sala ry)
D1	2	5200
D2	2	7500

(ii)

Name	DeptName
Riya	IT
Kab r	IT

(2 mark for correct part(i), 2 mark for correct part(ii))

4

Section-E (35 37) 3X5 = 15 **Marks**

35

(i) Block D. It is the most suitable because it has the maximum numbe r of compute rs (150).

(ii) LAN (Local A rea Netwo rk). The distance is within a single campus/limite d area.

(iii) Switch: Eve ry block (A, B, C, D) shou d have a switch to connect multiple compute rs within that block.

(iv) Dynamic Website. Since it involves use r logins an d real-time data up dates f om a database, a dynamic site is r r d.

5

*There is no change in the Question Paper Design and Assessment Pattern for Academic Session 2026-27.

	[illegible] *(1 mark for each correct part)*	
[illegible]	[illegible] *(3 mark for correct part(i), 1 mark for correct part(ii), 1 mark for correct part(iii))*	[illegible]
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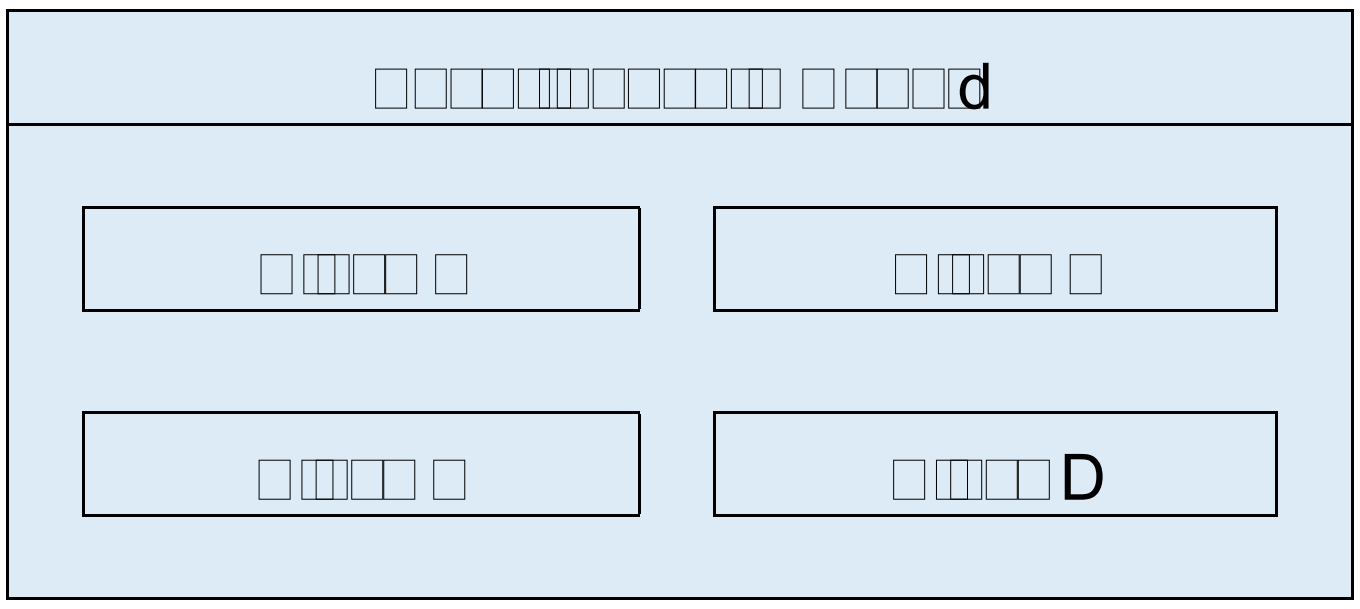

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M r d r r

1	**D**	$\pi + \cos^{-1} x$	**1**
	D	$\left[\frac{\pi}{2}, \frac{3\pi}{2}\right] - \{\pi\}$	**1**
	D	$\left(-\infty, -\frac{1}{2}\right] \cup \left[\frac{1}{2}, \infty\right)$	**1**
		$\cot^{-1}\left(2\cos\left(\frac{1}{2}\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)\right)\right) = \cot^{-1}\left(2\cos\left(\frac{1}{2}\times\frac{\pi}{3}\right)\right)$ $= \cot^{-1}\left(2\cos\left(\frac{\pi}{6}\right)\right) = \cot^{-1}\left(2\times\frac{\sqrt{3}}{2}\right) = \cot^{-1}(\sqrt{3}) = \frac{\pi}{6}$	**1**
		$3a = 1, b = -2, 2c = 4 \Rightarrow \sqrt{6a + 2b + 3c} = \sqrt{2 - 4 + 6} = \sqrt{4} = 2$	**1**
		$\lvert adj(PQ)\rvert = \lvert PQ\rvert = \lvert P\rvert\lvert Q\rvert = 2 \times 3 = 6$ ($\because$ order of P and $Q = 2 \times 2$)	**1**
	D	$\begin{bmatrix}1 & x\end{bmatrix}\begin{bmatrix}1 & 0\\ 0 & 2\end{bmatrix}\begin{bmatrix}4\\ -1\end{bmatrix} = O \Rightarrow \begin{bmatrix}1 & 2x\end{bmatrix}\begin{bmatrix}4\\ -1\end{bmatrix} = O \Rightarrow 4 - 2x = 0 \Rightarrow x = 2$	**1**
		$y = \cos^{-1}(2x^2 - 1)$ and $u = \cos^{-1}(x)$ $\Rightarrow y = \cos^{-1}(2cos^2 u - 1)$ $\cos u = x$ $\Rightarrow y = \cos^{-1}(\cos(2u)) = 2u$ $\Rightarrow \frac{dy}{du} = 2$	**1**
	D	$f(x)$ is differentiable $\Rightarrow$ $f(x)$ is continuous $\Rightarrow c = 0$ and $a = 2b$ $\Rightarrow$ (a, b, c) becomes $(2b, b, 0)$ which is satisfied by option (D) $(3, \frac{3}{2}, 0)$ only	**1**
	D	$\frac{dy}{dx} < 0 \Rightarrow a\{1 + 2\cos\left(\frac{x}{a}\right)\} < 0 \Rightarrow \cos\left(\frac{x}{a}\right) < -\frac{1}{2}$ $\Rightarrow \frac{x}{a} \in \left(\frac{2\pi}{3}, \pi\right] \Rightarrow x \in \left(\frac{2\pi a}{3}, \pi a\right]$	**1**
1		$\frac{dy}{dx} > y \Rightarrow 4x^3 > x^4 \Rightarrow x^3(4 - x) > 0 \Rightarrow x(x - 4) < 0 \Rightarrow 0 < x < 4$	**1**
11		$\frac{d^2y}{dx^2}$	**1**
1	**D**	$\int \frac{1}{1+e^{2x}}dx = \int\left(\frac{1+e^{2x}}{1+e^{2x}} - \frac{e^{2x}}{1+e^{2x}}\right)dx$ $x - \frac{1}{2}log\lvert 1 + e^{2x}\rvert + C$ $P = \frac{1}{2}$	**1**
1		$2\hat{\imath} - u\hat{\jmath} + 3\hat{k}$ $\Rightarrow \sqrt{4 + u^2 + 9} = 4$ $\Rightarrow u^2 = 16 - 13 = 3 \Rightarrow u = \pm\sqrt{3}$	**1**
1		$\hat{\imath} + \hat{\jmath} + \sqrt{2}\,\hat{k}$ $\frac{1}{2}, \frac{1}{2}, \frac{1}{\sqrt{2}}$ γ $\cos\gamma = \frac{1}{\sqrt{2}} \Rightarrow \gamma = \frac{\pi}{4}$	**1**
1		$\hat{\imath} + \hat{\jmath}$ $\hat{\imath} - \hat{\jmath}$ $3\hat{k}$	**1**

1	D	Let r be the probability that a random digit is 0 r is the probability that all three digits are 0 $\Rightarrow \frac{1}{5} \times \frac{1}{5} \times \frac{1}{5} = \frac{1}{125}$	1
1	D	Let A be the event that the sum is 8 B be the event that the first die is even $A = \{(1,4),(2,3),(3,2),(4,1),(4,6),(5,5),(6,4)\}$ $A \cap B = \{(1,4),(4,1),(4,6),(6,4)\}$ $\Rightarrow P(B\|A) = \frac{4}{7}$	1
1	C	$P(A' \cap B) + P(A \cap B') = \frac{1}{3} \Rightarrow P(A')P(B) + P(A)P(B') = \frac{1}{3}$ $\Rightarrow \left(1 - \frac{1}{6}\right)k + \frac{1}{6}(1-k) = \frac{1}{3} \Rightarrow k\left(\frac{5}{6} - \frac{1}{6}\right) = \frac{1}{3} - \frac{1}{6} \Rightarrow k = \frac{1}{6} \times \frac{6}{4} = \frac{1}{4}$	1
1	C	$\int_{-1}^{1} \|x-2\|\,dx = \int_{-1}^{1} (-x+2)\,dx = 4$	1

SECTION B

Answer any FIVE questions from this section. Each question carries 10 marks.

11	$I = \int \frac{1}{x\sqrt{x^6-1}}dx = \frac{1}{6}\int \frac{6x^5}{x^6\sqrt{x^6-1}}dx$ Let $x^6 - 1 = t^2 \quad \Rightarrow 6x^5 dx = 2tdt$ $I = \frac{1}{3}\int \frac{1}{(t^2+1)}dt = \frac{1}{3}\tan^{-1}\left(\sqrt{x^6-1}\right) + C$	1
	R	
12	$I = \int \frac{\cos x - \sin x}{\sqrt{\sin(2x)}}\,dx = \int \frac{\cos x - \sin x}{\sqrt{1+\sin(2x)-1}}\,dx = \int \frac{\cos x - \sin x}{\sqrt{(\sin x + \cos x)^2 - 1}}\,dx$ Let $\sin x + \cos x = t \quad \Rightarrow (\cos x - \sin x)dx = dt$ $I = \int \frac{1}{\sqrt{t^2-1}}\,dt = \log\left\|t + \sqrt{t^2-1}\right\| + C$ $= \log\left\|\sin x + \cos x + \sqrt{(\sin x + \cos x)^2 - 1}\right\| + C$ $= \log\left\|\sin x + \cos x + \sqrt{\sin(2x)}\right\| + C$	1
	$y = \sin(x+y) \Rightarrow \sin^{-1} y = x + y$ $\Rightarrow \frac{1}{\sqrt{1-y^2}} = \frac{dx}{dy} + 1 \Rightarrow \frac{dx}{dy} = \frac{1-\sqrt{1-y^2}}{\sqrt{1-y^2}}$ $\Rightarrow \frac{dy}{dx} = \frac{\sqrt{1-y^2}}{1-\sqrt{1-y^2}}$ Let $\frac{dy}{dx} = 0 \Rightarrow y = \pm 1$	1

	□ □□□r□□□□□□□ □□□□□ $y = \sin(x+y) \Rightarrow \frac{dy}{dx} = \cos(x+y)\left(1+\frac{dy}{dx}\right)$ $\Rightarrow \frac{dy}{dx}(1-\cos(x+y)) = \cos(x+y)$ $\Rightarrow \cos(x+y) = 0 \quad \square\square \frac{dy}{dx} = 0$ $\Rightarrow \sin(x+y) = \pm 1 \Rightarrow y = \pm 1$	□ □ **1**□ □ **1**□
□□□□ □□□	□ □□□□ □□□□□□ □r□ $A(2,6,5), B(3,p,7), C(-4,3,4)$ □□d $D(-1,0,q)$ D□r□□□□□ r□□□□ □□□□ □□□ $\overleftrightarrow{AB}$ are $\langle 1,\ p-6,\ 2\rangle$ □□d D□r□□□□□ r□□□□ □□□□ □□□ $\overleftrightarrow{CD}$ are $\langle 3,-3,q-4\rangle$ □□ □□□ □□□□ □r□ □□r□□□□□□ □□ □□□□ $\frac{1}{3} = \frac{p-6}{-3} = \frac{2}{q-4}$ $\Rightarrow -1 = p-6 \ and\ q-4 = 3\times 2$ $\Rightarrow p = -1+6 = 5,\ q = 6+4 = 10$ □□□□□ $\frac{q}{p} = \frac{10}{5} = 2$	□ □ □ □ □ **1**□ □ □ □ □ □
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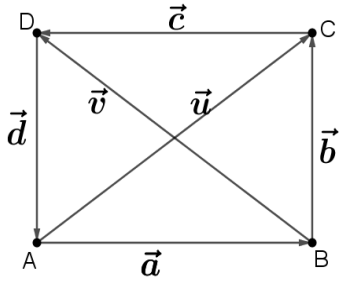
□□□□□ □□□	 □□□□□□□□r□r□□r□□□□□□□ □□□ □□□r □d□□ □□□□□ r□□□□□□□□ □r□ □□ □□□□□□ □ $\overrightarrow{AB} = \vec{a}, \overrightarrow{BC} = \vec{b}, \overrightarrow{CD} = \vec{c}, and\ \overrightarrow{DA} = \vec{d}$ □□□□ $\overrightarrow{AC} = \vec{u} = \vec{a}+\vec{b}$ …(i)and $\overrightarrow{BD} = \vec{v} = \vec{b}+\vec{c} = \vec{b}-\vec{a}$ …(ii) □□□□□□ □□□ □□d □□□□ $\vec{a} = \frac{1}{2}(\vec{u}-\vec{v})\ and\ \vec{b} = \frac{1}{2}(\vec{u}+\vec{v})$ □□□□□$\vec{c} = -\vec{a} = \frac{1}{2}(\vec{v}-\vec{u})$ □□d $\vec{d} = -\vec{b} = -\frac{1}{2}(\vec{u}+\vec{v})$	□ □ □ □ □ □ □ □ □ □ □ □ □ □ □ **1**□ □ □ □
□□□□	□ □□□□ $\|\vec{a}\| = \sqrt{6}$ □$\vec{a}\cdot\vec{b} = 1$ □□d $\vec{b}\times\vec{a} = 3\hat{\imath}+4\hat{\jmath}-2\hat{k}$ □□ $\left\|\vec{a}\times\vec{b}\right\| = \left\|\vec{b}\times\vec{a}\right\| = \sqrt{29}$ □ □ □□□□□ □$\left\|\vec{a}\times\vec{b}\right\|^2 + \left\|\vec{a}\cdot\vec{b}\right\|^2 = \|\vec{a}\|^2\left\|\vec{b}\right\|^2$ $\Rightarrow 29+1 = 6\left\|\vec{b}\right\|^2 \Rightarrow \left\|\vec{b}\right\|^2 = \frac{30}{6} = 5 \Rightarrow \left\|\vec{b}\right\| = \sqrt{5}$	□ □ □ □□□ □ □ □□□ □ **1**□ □□□
□□□□	□ □□□□r□□□□□□ □r□ $3x+2y \geq 10, x+2y \leq 6,$ $y \geq 0$□	□ **1½**□ □ □

□	□ r □ r d □ □ (p, q) □ d $\left(2p, \frac{q}{2}\right)$ □ $Z\ at\ (p,q) = Z\ at\left(2p, \frac{q}{2}\right)$ $\Rightarrow 3p + 4q = 3 \times 2p + 4 \times \frac{q}{2}$ $\Rightarrow 3p + 4q = 6p + 2q$ $\Rightarrow 6p - 3p = 4q - 2q$ $\Rightarrow 3p = 2q$	1 □ 1

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□	□ $A = PQ$ □ d $B = QP$. □ $A = PQ = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 1 & 2 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 0 & 2 \\ 1 & 0 \end{bmatrix} = \begin{bmatrix} 2 & 0 \\ 2 & 2 \end{bmatrix}$ $B = QP = \begin{bmatrix} 1 & 0 \\ 0 & 2 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} 2 & 0 & 0 \\ 0 & 1 & 2 \end{bmatrix} = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 4 \\ 2 & 0 & 0 \end{bmatrix}$ □ r □ $\|A\| = 4 \neq 0$ □ A □ r □ r □ r □ □ $A^{-1} = \frac{1}{\|A\|} adj\ A = \frac{1}{4} \begin{bmatrix} 2 & 0 \\ -2 & 2 \end{bmatrix} = \begin{bmatrix} \frac{1}{2} & 0 \\ -\frac{1}{2} & \frac{1}{2} \end{bmatrix}$ □ r □ $\|B\| = 0$ □ B □ r □ r □ r □ d □	1 □ 1 □
□	□ A □ r □ r r □ r d □ dr □ d □ r □ r d □ h □ dr □ t. □ $\frac{dA}{dh} = 44\ \ m^2\ per\ metre$ □ d $\frac{dr}{dt} = 6\ m/s$ □ d $\frac{dh}{dt}$ □ r □ $A = \pi r^2 \quad \Rightarrow \frac{dA}{dt} = 2\pi r \frac{dr}{dt} \qquad \Rightarrow \frac{dA}{dh} . \frac{dh}{dt} = 2\pi r \frac{dr}{dt}$ $44\ \frac{dh}{dt} = 2(\frac{22}{7}) 6r \quad \Rightarrow \left.\frac{dh}{dt}\right]_{r=14m} = 12$ □ □ dr □ r □ r □ 12 □	□ 1 □ 1 □
□	$\frac{dx}{dt} = 3sin^2 t\ cos\ t$ □ d $\frac{dy}{dt} = -3\ cos^2 t\ sin\ t$ $\frac{dy}{dx} = \frac{dy}{dt} \Big/ \frac{dx}{dt} = -cot\ t$ $\frac{d^2y}{dx^2} = \frac{d}{dt}\left(\frac{dy}{dx}\right) . \frac{dt}{dx} = cosec^2 t \left(\frac{1}{3sin^2 t\cos t}\right) = \frac{1}{3}(sec\ t. cosec^4 t)$ □ $\left(\frac{1}{2\sqrt{2}}, \frac{1}{2\sqrt{2}}\right)$, $sin^3 t = \frac{1}{2\sqrt{2}} \Rightarrow t = \frac{\pi}{4}$ $\left.\frac{d^2y}{dx^2}\right]_{t=\frac{\pi}{4}} = \frac{4\sqrt{2}}{3}$	1 □ 1 □ 1 □

□	□**R**□	□
□□□□ □□□	□□□ $y = x^{logx} + (logx)^x = u + v$ □□□r□ $u = x^{logx}$ □□d $v = (logx)^x$ $log\ u = (log\ x)^2$ □□d $log\ v = x.log(log\ x)$ $\frac{1}{u}\frac{du}{dx} = 2(\ log\ x).\frac{1}{x}$ □□d $\frac{1}{v}\frac{dv}{dx} = log(log\ x) + \frac{1}{log\ x}$ $\frac{du}{dx} = x^{logx}\left(2(\ log\ x).\frac{1}{x}\right)$ □□d $\frac{dv}{dx} = (logx)^x\left(log(log\ x) + \frac{1}{log\ x}\right)$ $\frac{dy}{dx} = \frac{du}{dx} + \frac{dv}{dx}$ $\Rightarrow \frac{dy}{dx} = \frac{2}{x}\ x^{logx}\ log\ x + \ (logx)^x\left(log(log\ x) + \frac{1}{log\ x}\right)$ □ □□□r□□□□□□□□ □□□□□□□ □□□□□ $x = e^{logx}$ $y = x^{logx} + (logx)^x = e^{\log(x^{logx})} + e^{\log((logx)^x)}$ $= e^{(\log x)^2} + e^{x\log(\log x)}$ $\frac{dy}{dx} = e^{(\log x)^2}\left[\frac{2\log x}{x}\right] + e^{x\log(\log x)}[\log(\log x) + x\left(\frac{1}{\log x}\right)\left(\frac{1}{x}\right)]$ $OR\ \ x^{logx}\left[\frac{2\log x}{x}\right] + (logx)^x[\log(\log x) + \left(\frac{1}{\log x}\right)]$	□ **1**□ □ **1**□ □ □ **1**□ □ □ **1**□**1**□ □ □
□□□□ □□□	$xdy + (y - x^2e^x)dx = 0$ □□□ □ □□□□□□r d□□□□r□□□□□□□□□□□□ □□□□□□ □□ $\frac{dy}{dx} + \frac{1}{x}\ y = xe^x$ □□□ □ $e^{\int\frac{1}{x}dx} = \ e^{log\ x} = x$ □□□□□□□□ □□ $y.x = \int x^2e^x\ dx$ □□□□□□ □□ □□r□□ $yx = x^2e^x - \int 2xe^x\ dx$ □□□□□□ □□ □□r□□ □□□□□□ $yx = x^2e^x - 2\{xe^x - e^x\} + C$ □ □□□□□ □ ⇒ $C = -e$ □□r□□□□□□r □□□□□□□□ □□ $yx = x^2e^x - 2\{xe^x - e^x\} - e = e^x\{x^2 - 2x + 2\} - e$	□ □ □ □ □ □□ □ □ □ □ □□ □ □ □ □□ □ □ □ □□ □
□	□**R**	
□□□□ □□□	$\frac{dy}{dx} = \frac{xy}{x^2+y^2}$ □□ □ □□□□ □□□□□□□□□□d□□□r□□□□□□□□□□□□□□	
	□□□$y = v\ x$ $\Rightarrow \frac{dy}{dx} = v + x\ \frac{dv}{dx}$ □□□□□□□□□□□ r□d□□□□ □□	

	$v + x\,\frac{dv}{dx} = \frac{v}{1+v^2} \quad \Rightarrow x\,\frac{dv}{dx} = \frac{v-v-v^3}{1+v^2}$ $\int \frac{1+v^2}{v^3}dv = -\int \frac{dx}{x}$ $\int(\frac{1}{v^3}+\frac{1}{v})\ dv = -log\ \lvert x\rvert + \log C \Rightarrow \frac{-1}{2v^2} + \log\lvert v\rvert = -\log\lvert x\rvert + \log C$ $\log\left\lvert\frac{y}{C}\right\rvert = \frac{x^2}{2y^2}$ □r $y = C\,e^{\frac{x^2}{2y^2}}$ $C = 1$ □□□□ $x = 0$ □□d $y = 1$□ □□□ □□r□□□□□r □□□□□□□ □□ $y = e^{\frac{x^2}{2y^2}}$	**1**□ □ □ □ □ □ **1**□ □ □ □ **1**
□□□□ □□□	□ □□□□□□□ □□□ □□□ $x-2 = \frac{2y+3}{4} = 2-z = k$ *is* $P\left(k+2, \frac{4k-3}{2}, 2-k\right)$ □□d d□□□□□□ r□□□□ □□□□ □□□□ □□□ □r□ $\langle 1,2,-1\rangle$□ D□□□□□□ R□□□□ □□□□ □□□ □□□□□ □□□ □□□□□ $A(2,1,4)$ □□d □□□ □□□□□ □r□ $\langle k+2-2, \frac{4k-3}{2}-1, 2-k-4\rangle = \langle k, \frac{4k-5}{2}, -k-2\rangle$ □□$\overrightarrow{AP}$ □□ □□r□□□d□□□□r □□ □□□ □□□□ □□□□□ $1\times k + 2\times\frac{4k-5}{2} + (-1)\times(-k-2) = 0$ $\Rightarrow k+4k-5+k+2 = 0 \Rightarrow 6k-3 = 0 \Rightarrow k = \frac{1}{2}$ □□□□□□□□□□□□ □□r□□□d□□□□r □□ $P\left(k+2, \frac{4k-3}{2}, 2-k\right) = \left(\frac{1}{2}+2, \frac{2-3}{2}, 2-\frac{1}{2}\right) = \left(\frac{5}{2}, \frac{-1}{2}, \frac{3}{2}\right)$ D□□□□□□ r□□□□ □□□□ □□□ $\overleftarrow{AP}$ □r□ $\langle k, \frac{4k-5}{2}, -k-2\rangle = \langle\frac{1}{2}, -\frac{3}{2}, -\frac{5}{2}\rangle$ □r $\langle 1,-3,-5\rangle$ □□d □□□□□□□ □□$\overleftarrow{AP}$ □□ $\frac{x-2}{1} = \frac{y-1}{-3} = \frac{z-4}{-5}$ □R $x-2 = \frac{1-y}{3} = \frac{4-z}{5}$	□ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □ □□ □ □ □
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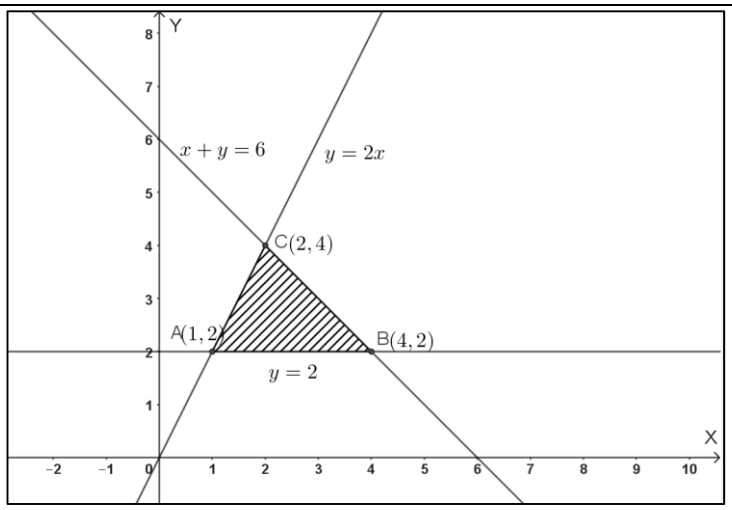
□□□□ □□□	□ □□□□ □□□□□ □r□ $\frac{x-1}{2} = \frac{y-1}{2} = \frac{z-2}{1}$ □□d $\frac{x-5}{2} = y-\frac{1}{2} = \frac{3-z}{2} \Rightarrow \frac{x-5}{2} = \frac{y-\frac{1}{2}}{1} = \frac{z-3}{-2}$ □□□□□□□ □□□□□□ □□□□□ □□□□ □□□ □□□□□□ □□ θ □□□□□□ $\cos\theta = \frac{2\times2+2\times1+1\times(-2)}{\sqrt{9}\times\sqrt{9}} = \frac{4}{9} \Rightarrow \theta = \cos^{-1}\left(\frac{4}{9}\right)$ □□□ r□□□□r□d □□□□ □ □□□□□ □□ □□□ d□r□□□□□□ □□□□□ □□□□r $\begin{vmatrix}\hat{\imath} & \hat{\jmath} & \hat{k}\\ 2 & 2 & 1\\ 2 & 1 & -2\end{vmatrix} = -5\hat{\imath} + 6\hat{\jmath} - 2\hat{k}$ □□ r□□□□r□d □□□□ □□ $\frac{x-1}{-5} = \frac{y-1}{6} = \frac{z-1}{-2}$ □R $\frac{x-1}{5} = \frac{y-1}{-6} = \frac{z-1}{2}$	□ □ □ □ **1**□ □ □ **1**□ □ □

1	 r d d r r $A(1,2), B(4,2), C(2,4)$ $Z_A = 100, Z_B = 220, Z_C = 200$ M $B(4,2)$.	1 1
	r d r r $A(20,0), B(40,0), C(30,10),\ D(0,20)$ and $E(0,10)$ $Z_A = 50 \times 20 - 20 \times 0 = 1000$ $Z_B = 50 \times 40 - 20 \times 0 = 2000$ $Z_C = 50 \times 30 - 20 \times 10 = 1300$ $Z_D = 50 \times 0 - 20 \times 20 = -400$ $Z_E = 50 \times 0 - 20 \times 10 = -200$ M Z -400 $D(0,20)$ M Z 2000 $B(40,0)$	1

–D

r r d R d $A = N \times N$
$(a,b)R(c,d)\ if\ and\ only\ if\ a^2 + d^2 = b^2 + c^2$
R
$(p,q) \in A = N \times N$
$p,q \in N$ $p^2 + q^2 = q^2 + p^2$
$\Rightarrow (p,q)R(p,q)\ \forall (p,q) \in N \times N$
$\Rightarrow R$ r r
r
$(p,q)\ and\ (r,s) \in A = N \times N$ $(p,q)\ R\ (r,s)$
$\Rightarrow p^2 + s^2 = q^2 + r^2$
$\Rightarrow q^2 + r^2 = p^2 + s^2$
$\Rightarrow r^2 + q^2 = s^2 + p^2$
$\Rightarrow (r,s)\ R\ (p,q)$
R r r
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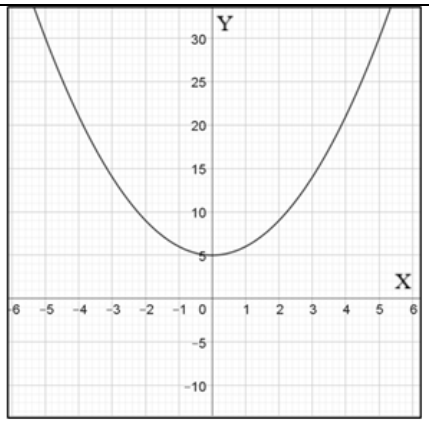
	$(p,q),(r,s),(u,v) \in A$ and $(p,q)\ R\ (r,s)\ and\ (r,s)R(u,v)$ $\Rightarrow p^2+s^2=q^2+r^2 \ \ldots(i)$ and $r^2+v^2=s^2+u^2 \ \ldots(ii)$ Add the equations, we get $p^2+s^2+r^2+v^2=q^2+r^2+s^2+u^2$ $\Rightarrow p^2+v^2=q^2+u^2$ $\Rightarrow (p,q)\ R\ (u,v)$ Thus R is a transitive relation. Hence R is an equivalence relation.	1 mark
	OR	
	 Thus R is a reflexive relation, but not symmetric, because $(1,2)\in R$ but $(2,1)\notin R$, and not transitive, because $(2,1)\in R$ and $(1,2)\in R$ but $(1,1)\notin R$. Hence R is not an equivalence relation.	1 mark 1 mark
	Let $f:(-\infty,\infty)\to[0,\infty)$ be defined by $f(x)=x^2+5$ Let $x=-1$ and $x=1$ be two elements of $(-\infty,\infty)$. Then $f(-1)=(-1)^2+5=6$ and $f(1)=1^2+5=6$ $\therefore f(-1)=f(1)=6$ Thus f is a many-one function. Range of $f=[5,\infty)\neq$ Co-domain $=[0,\infty)$ Hence f is not an onto function.	1 mark 1 mark
	Method 2 Thus R is a reflexive relation, but not symmetric, because $(1,2)\in R$ but $(2,1)\notin R$, and not transitive, because $(2,1)\in R$ and $(1,2)\in R$ but $(1,1)\notin R$. Hence R is not an equivalence relation.	1 mark
	Let $f:(-\infty,\infty)\to[0,\infty)$ be defined by $f(x)=x^2+5$ Let $a,b\in(-\infty,\infty)$, such that $f(a)=f(b)$ $\Rightarrow a^2+5=b^2+5\Rightarrow a^2=b^2\Rightarrow a=\pm b$ $\therefore f$ is not a one-one function. Thus f is a many-one function. Let $y=1\in$ Co-domain. Then $1=x^2+5\Rightarrow x^2=-4\notin$ Domain. Thus f is not an onto function.	1 mark 1 mark
	Let $a^2\in[0,\infty)$ and $a^2+7\in[7,\infty)$ Thus, every element a^2 in the co-domain $(-\infty,\infty)$ has a pre-image in the domain $[0,\infty)$.	(Continued)

	□□□$f:(-\infty,\infty)\to[0,\infty)$□$f(x)=x^2+7$ □□ □ □□□□□□□□□□	1□
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□□□□	□□□ $I=\int_{-a}^{a}\sqrt{\frac{a-x}{a+x}}\,dx$	□
	$I=\int_{-a}^{a}\sqrt{\frac{a-x}{a+x}\times\frac{a-x}{a-x}}\,dx$	□ □□
	$=\int_{-a}^{a}\frac{a-x}{\sqrt{a^2-x^2}}dx=\int_{-a}^{a}\frac{a}{\sqrt{a^2-x^2}}dx-\int_{-a}^{a}\frac{x}{\sqrt{a^2-x^2}}dx=I_1-I_2$	□ □
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	$I_1=a\int_{-a}^{a}\frac{1}{\sqrt{a^2-x^2}}dx$	□
		□
	$=2a\int_{0}^{a}\frac{1}{\sqrt{a^2-x^2}}dx$ □□□□□ $\int_{-a}^{a}f(x)\,dx=2\int_{0}^{a}f(x)\,dx$ □□$f(-x)=f(x)$	1□ □
	$I_1=2a\ \left[\sin^{-1}\left(\frac{x}{a}\right)\right]_0^a=2a\left(\frac{\pi}{2}\right)=\pi a$	1□ □
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	$I_2=\int_{-a}^{a}\frac{x}{\sqrt{a^2-x^2}}dx=0$ □□□□□ $\int_{-a}^{a}f(x)\,dx=0$ □□$f(-x)=-f(x)$	1□ □
	$I=\ I_1-I_2=\pi a$	□ □□ □ □ □
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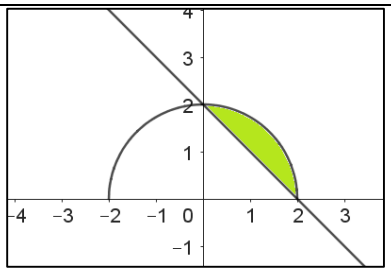
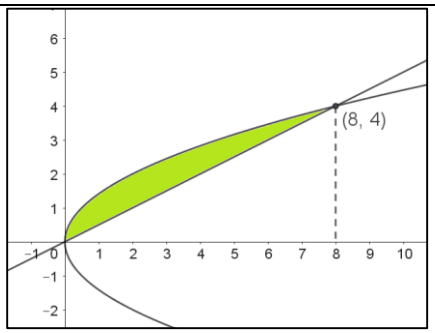
	□□□$x=a\cos 2\theta\ \ \Rightarrow dx=-2\,a\sin(2\,\theta)\,d\theta$	□
	□ □□□□ $x=-a,\theta=\frac{\pi}{2}$ □□d $x=a,\theta=0$	□ □□
	$I=\int_{-a}^{a}\sqrt{\frac{a-x}{a+x}}\,dx$ □ $-2\,a\int_{\frac{\pi}{2}}^{0}\tan\theta\sin(2\theta)\,d\theta$	□ □
	$I=\ 2\,a\int_{0}^{\frac{\pi}{2}}\tan\theta\sin(2\theta)\,d\theta$ .....(i) □□□□□ $\int_a^b f(x)dx=-\int_b^a f(x)dx$	1□ □
	$I=\ 2a\int_{0}^{\frac{\pi}{2}}\tan\left(\frac{\pi}{2}-\theta\right)\sin(\pi-2\,\theta)d\theta$ □□□□□ $\int_0^a f(x)dx=\int_0^a f(a-x)dx$	1□ □
	$I=\ 2a\int_{0}^{\frac{\pi}{2}}\cot(\theta)\sin(2\theta)\,d\theta$ .....(ii)	□
	□dd□□□ □□□□□□□□□□ □□□□□d □□□□	□
	$2I=2a\int_{0}^{\frac{\pi}{2}}(\tan\theta+\cot\theta)\sin(2\theta)\,d\theta$	1□ □
	$\Rightarrow I=\ 2a\int_{0}^{\frac{\pi}{2}}(sin^2\theta+cos^2\theta)\,d\theta$	1□
	$\Rightarrow I=2a\int_{0}^{\frac{\pi}{2}}1\,d\theta=2a\left(\frac{\pi}{2}\right)=\pi a$	

□□□□ □□□□	 1 mark for correct figure □□□□□□□□□□□□□□□□ □$y = \sqrt{4 - x^2}$ □□□ □ □□□□ □□□□r□□□ □ □□□ r□d□□□ □ □□□□□ □□d □□□□r□ □□□□□□ $x = 2 - y$ □□□□□□ □□□ □ □ □ □ □ □ □□□ □ □□□□ □ □□□ □□□□□r□□□□□□ □ □□□ □□□□□ □□□□□□ □ □r□□□□ □ □□□□□□□□□□□□□□□□d □□□□□□ □r□□ □ $\int_0^2 \left(\sqrt{4 - x^2} - (2 - x)\right) dx$ □ $[\frac{x}{2}\sqrt{4 - x^2} + 2\ \sin^{-1}\left(\frac{x}{2}\right) - 2x + \frac{x^2}{2}]_0^2$ □$\pi - 4 + 2 = (\pi - 2)$ □□□□□□□□	**1**□ □ □ □ □ □ □ **1**□ **1**□ □ **1**□ **1**□
□	□**R**□	
□□□□ □□□□	 1 mark for correct figure. □ $y^2 = 2x$ r□□r□□□□□□□ □ □□r□□□□□□□ □□□□□ □□□□□□□ □□□□□□r□□□□□□□ □ □□□ □□□□ □□□□□□ □□□□ $x = 2y$ □r□ $(0,0)$ □$(8,4)$ □r□□ □ $\int_0^8 \left(\sqrt{2x} - \frac{x}{2}\right) dx$ □ $\left[\sqrt{2}\frac{2}{3}x^{\frac{3}{2}} - \frac{x^2}{4}\right]_0^8$ □ $\frac{64}{3} - 16 = \frac{16}{3}$ □□□□□□□□ □	□ □ **1**□ □ □ □ □ □ □ **1**□ □ **1**□ **1**□ **1**
□□□□ □□□□	□□**r**□□□□□□□□□□□□ □□□**r**□**d**□□ □$25x^2 + 16y^2 = 400$ □□□ □□ □ □□□□□□□ □ □□□ □□□□ □□□□□d□rd □□□□□□□□□ □□ $\frac{x^2}{16} + \frac{y^2}{25} = 1$ □□□□ $\Rightarrow y = \frac{5}{4}\sqrt{4^2 - x^2}$ □ □r□□ □ $4\int_0^4 \left(\frac{5}{4}\sqrt{4^2 - x^2}\right) dx$ □ $5\int_0^4 \left(\sqrt{4^2 - x^2}\right) dx$ □ $5[\frac{x}{2}\sqrt{16 - x^2} + 8\ \sin^{-1}\left(\frac{x}{4}\right)]_0^4$ □$5[4(\pi)] = 20\pi$ □□□□□□□□ □	□□□□□□ □ □ □□□ □□□□**1** □□□ □□□ □□□□**1**□ □ □□□□ □□□□**1**□ □ □□□□**1**
□	□**R**	□

	$y^2 = 8x$ r r d r r $x = 2$ d $x = 5$ r $\int_2^5 \left(\sqrt{8x}\right)\, dx$ $\left[2\sqrt{2}\frac{2}{3}x^{\frac{3}{2}}\right]_2^5$ $\sqrt{2}\left(\frac{4}{3}\right)\left[5\sqrt{5} - 2\sqrt{2}\right] = \frac{4}{3}[5\sqrt{10} - 4]$	1 1
	E_1 : r E_2 : r E_3 : r E_4 : r D A : r r r r $\{E_1, E_2, E_3, E_4\}$ r $P(E_1) 0.45, P(E_2) = 0.3, P(E_3) = 0.15, P(E_4) = 0.1$ $P(A\|E_1) = 0.01,\ P(A\|E_2) = 0.02, P(A\|E_3) = 0.05, P(A\|E_4) = 0.01$ (i) By Theorem of Total Probability, r r d r r $= P(A)$ $= P(E_1)P(A\|E_1) + P(E_2)P(A\|E_2) + P(E_3)P(A\|E_3) + P(E_4)P(A\|E_4)$ $= 0.45 \times 0.01 + 0.3 \times 0.02 + 0.15 \times 0.05 + 0.1 \times 0.01$ $= 0.0045 + 0.006 + 0.0075 + 0.001 = 0.019$ (ii) By Bayes Theorem, r r r r $= P(E_2\|A)$ $= \frac{P(E_2)P(A\|E_2)}{P(E_1)P(A\|E_1)+P(E_2)P(A\|E_2)+P(E_3)P(A\|E_3)+P(E_4)P(A\|E_4)}$ $= \frac{0.3\times0.02}{0.019} = \frac{0.006}{0.019} = \frac{6}{19}$	1 1 1 1

r r

r r d d r

	(i) Given lines are $l_1: \vec{r} = \hat{\imath} + 2\hat{\jmath} + 3\hat{k} + \lambda(\hat{\imath} + 3\hat{\jmath} - \hat{k}) \equiv \vec{a} + \lambda\,\vec{b}$ and $l_2: \vec{r} = 2\hat{\imath} - \hat{\jmath} + \hat{k} + \mu(2\hat{\imath} + 3\hat{\jmath} + \hat{k}) \equiv \vec{c} + \mu\,\vec{d}$ Here $\vec{a} = \hat{\imath} + 2\hat{\jmath} + 3\hat{k},\ \vec{b} = \hat{\imath} + 3\hat{\jmath} - \hat{k},\ \vec{c} = 2\hat{\imath} - \hat{\jmath} + \hat{k},\ \vec{d} = 2\hat{\imath} + 3\hat{\jmath} + \hat{k}$ For direction vectors $\vec{b}$ and $\vec{d}$, $\vec{b} \neq \lambda\,\vec{d}$, for any $\lambda \in R$ $\Rightarrow$ $\vec{b}$ r r $\vec{d}$ r r (ii) Given lines are $l_1: \vec{r} = \hat{\imath} + 2\hat{\jmath} + 3\hat{k} + \lambda(\hat{\imath} + 3\hat{\jmath} - \hat{k}) \equiv \vec{a} + \lambda\,\vec{b}$ and $l_3: \vec{r} = 3\hat{\imath} - \hat{\jmath} + \hat{k} + \gamma(\hat{\imath} + 3\hat{\jmath} - \hat{k}) \equiv \vec{e} + \gamma\,\vec{f}$	1 1

□□□□□ $\vec{b} = \vec{f}$ □□□□ □□□□□ l_1 □□d l_3 □r□ □□r□□□□□

□□□□ □□□ $\vec{c} - \vec{a} = 2\hat{\imath} - \hat{\jmath} + \hat{k} - (\hat{\imath} + 2\hat{\jmath} + 3\hat{k}) = \hat{\imath} - 3\hat{\jmath} - 2\hat{k}$

$$\vec{b} \times \vec{d} = \begin{vmatrix} \hat{\imath} & \hat{\jmath} & \hat{k} \\ 1 & 3 & -1 \\ 2 & 3 & 1 \end{vmatrix} = 6\hat{\imath} - 3\hat{\jmath} - 3\hat{k} = 3(2\hat{\imath} - \hat{\jmath} - \hat{k})$$

$$(\vec{c} - \vec{a}).(\vec{b} \times \vec{d}) = (\hat{\imath} - 3\hat{\jmath} - 2\hat{k}).3(2\hat{\imath} - \hat{\jmath} - \hat{k}) = 3(2 + 3 + 2) = 21 \neq 0$$

□□□□□□ □□□□□ □r□ □□□□□ □□□□□□

$$|\vec{b} \times \vec{d}| = 3\sqrt{2^2 + (-1)^2 + (-1)^2} = 3\sqrt{6}$$

Thus, the shortest distance between the given lines is

$$D = \left|\frac{(\vec{c} - \vec{a}).(\vec{b} \times \vec{d})}{|\vec{b} \times \vec{d}|}\right| = \left|\frac{21}{3\sqrt{6}}\right| = \frac{7}{\sqrt{6}} = \frac{7\sqrt{6}}{6}\ units$$

□**R**□

(b) $l_1: \vec{r} = \hat{\imath} + 2\hat{\jmath} + 3\hat{k} + \lambda(\hat{\imath} + 3\hat{\jmath} - \hat{k}) \equiv \vec{a} + \lambda\,\vec{b}$

and

$l_3: \vec{r} = 3\hat{\imath} - \hat{\jmath} + \hat{k} + \gamma(\hat{\imath} + 3\hat{\jmath} - \hat{k}) \equiv \vec{e} + \gamma\,\vec{b}$

□□□□□ □□□ □□□□□ □r□ □□r□□□□□□□□ □□□r□□□d□□□□□□□ □ $\frac{|\vec{b} \times (\vec{e} - \vec{a})|}{|\vec{b}|}$

$$= \frac{1}{\sqrt{11}}\left|\begin{vmatrix} \hat{\imath} & \hat{\jmath} & \hat{k} \\ 1 & 3 & -1 \\ 2 & -3 & -2 \end{vmatrix}\right| = \frac{|-9\hat{\imath} - 9\hat{k}|}{\sqrt{11}} = \frac{9\sqrt{22}}{11} units$$

□□□□

□□□ $W(x) = 35 + 1.6x - 0.02x^2$

$W'(x) = 1.6 - 0.04x = 0 \Rightarrow x = 40$

□□□r□□□r□□□□□ □□□□□ □□x □□ □□ □r□r□□ □□□□□ □□□□□□□□r□ □□□□□□□□$W(x)$.

□□□□ $W''(x) = -0.04 < 0 \Rightarrow W(x)$ □□ □ □□□□ □□ □□$x = 40$ □□ □□□ □□□□□d d□r□□□□□□ □□□□□

□□□□□□□□ WQI is maximum when ₹ 40 crores are spent on the revival.

M□□□□ □ □□ $W(40) = 35 + 64 - 32 = 67$

(iii) (a) If the investment is ₹35 crores, then the WQI = $W(35)$

$$W(35) = 35 + (1.6)(35) - (0.02)(35)^2$$
$$= (2.6)(35) - (0.02)(1225)$$
$$= 91 - 24.5 = 66.5$$

Also, 67-66.5 = 0.5

So, the WQI is short by 0.5 units of its maximum level.

□**R**□

(b) $W(60) = 35 + 96 - 72 = 59$

□□ □□ □□□□ □□□□ □□□ □ □□□□ □□ □□□□□ □□ □□□□ □ □□□□□□□ □ □□□□ □□□□ □□□□□□□ □□□□□□□ □□□□□ □□r□□□□d r□□ □□ □r□r□□ □□ □□ □r□r□□□□□□□ □□□□□ □ □□□□□□□□ r□□□r□□ □r□ d□□ □□□□□□□□□□

	(i) Taking price of each kg of apples, oranges and pomegranate as ₹x, ₹y, ₹z respectively. M□□r□□ □□r□ □□ $AX = B$, □□□r□ $A = \begin{pmatrix} 5 & 10 & 5 \\ 10 & 10 & 5 \\ 8 & 15 & 7 \end{pmatrix}, X = \begin{pmatrix} x \\ y \\ z \end{pmatrix}, B = \begin{pmatrix} 2750 \\ 3500 \\ 4100 \end{pmatrix}$ Here $\lvert A \rvert = 25 \neq 0$ □□□□□□ □□□□□□□ □□ □□□□□□□□□□□□□d □□□ □□□□□□ □□□□□□□□ Adjoint of the matrix A = adjA = $\begin{pmatrix} -5 & 5 & 0 \\ -30 & -5 & 25 \\ 70 & 5 & -50 \end{pmatrix}$ (ii) Unique solution of the system is given by $X = A^{-1}B = \frac{1}{25}\begin{pmatrix} -5 & 5 & 0 \\ -30 & -5 & 25 \\ 70 & 5 & -50 \end{pmatrix}\begin{pmatrix} 2750 \\ 3500 \\ 4100 \end{pmatrix}$ $\Rightarrow \begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 150 \\ 100 \\ 200 \end{pmatrix} \Rightarrow x = 150, y = 100, z = 200$ □□ □□□□ □r□□□ □□□□□□□□□□□r□□□□□□ □□d □□□ □□r□□□□□□ □r□ r□□□□□□□□□□□□□□ ₹150 per kg, ₹100 per kg, ₹200 per kg.	□ □ □ □ **1** □□□□ □ □□□□ **1** □ □ □ □ **1** □ □ □ □□□□□**1** □

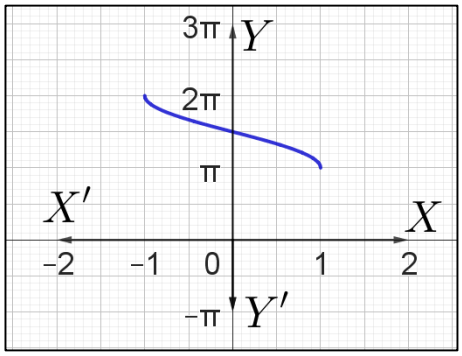
R d r r r

1. This question paper contains 38 questions. All questions are compulsory.
2. This question paper is divided into five Sections - A, B, C, D and E.
3. In Section A, Question no. 1 to 18 are multiple choice questions (MCQs) and Questions no. 19 and 20 are Assertion-Reason based questions of 1 mark each.
4. In Section B, Question no. 21 to 25 are Very Short Answer (VSA)-type questions, carrying 2 marks each.
5. In Section C, Question no. 26 to 31 are Short Answer (SA)-type questions, carrying 3 marks each.
6. In Section D, Question no. 32 to 35 are Long Answer (LA)-type questions, carrying 5 marks each.
7. In Section E, Question no. 36 to 38 are case study-based questions carrying 4 marks each.
8. There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 3 questions in Section C, 2 questions in Section D and one sub-part each in 2 questions of Section E.
9. Draw neat and clean figures wherever required. Take π = $\frac{22}{7}$ wherever required, if not stated.
10. Use of calculators is not allowed.

SECTION – A **(20 x 1 = 20)**

This section comprises of 18 multiple choice questions and two assertion and reason type questions of 1 mark each.

1	d	1



A $\cos^{-1}\left(\frac{x}{2}\right)$ B $\cos^{-1}(2x)$

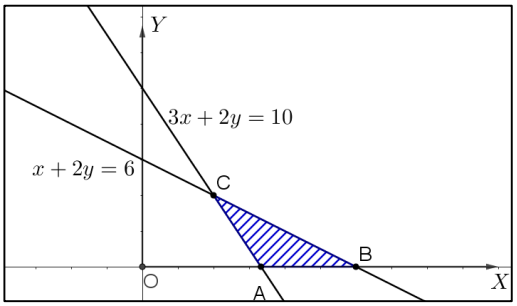
C $\pi - \cos^{-1} x$ D $\pi + \cos^{-1} x$

	[illegible] [illegible] $\frac{\pi}{2}+\sec^{-1}\left(\frac{x}{2}\right)$ (A) $[0,\pi]$ (B) $[0,\pi]-\left\{\frac{\pi}{2}\right\}$ (C) $\left[\frac{\pi}{2},\frac{3\pi}{2}\right]$ (D) $\left[\frac{\pi}{2},\frac{3\pi}{2}\right]-\{\pi\}$	
[illegible]	[illegible] $\sec^{-1}(2x)$ [illegible] (A) $(-\infty,\infty)$ (B) $\left(-\frac{1}{2},\frac{1}{2}\right)$ (C) $\left(-\infty,-\frac{1}{2}\right)\cup\left(\frac{1}{2},\infty\right)$ (D) $\left(-\infty,-\frac{1}{2}\right]\cup\left[\frac{1}{2},\infty\right)$	1
[illegible]	[illegible] $\cot^{-1}\left(2\cos\left(\frac{1}{2}\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)\right)\right)$ (A) $\frac{\pi}{6}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{2}$	1
[illegible]	[illegible] $A=\begin{bmatrix}2 & 1 & -2\\ 3a & 0 & 4\\ b & 2c & 1\end{bmatrix}$ [illegible] $\sqrt{6a+2b+3c}$ [illegible] (A) -2 (B) 2 (C) ± 2 (D) 4	1
[illegible]	[illegible] P [illegible] Q [illegible] $P=\begin{bmatrix}2 & 1\\ 0 & 1\end{bmatrix}, \lvert Q\rvert=3$ [illegible] $\lvert adj(PQ)\rvert$ (A) -3 (B) 1 (C) 6 (D) 36	1
[illegible]	[illegible] $[1 \quad x]\begin{bmatrix}1 & 0\\ 0 & 2\end{bmatrix}\begin{bmatrix}4\\ -1\end{bmatrix}=O$ [illegible] x [illegible] (A) -2 (B) -1 (C) [illegible] (D) [illegible]	1
[illegible]	[illegible] $\cos^{-1}(2x^2-1)$ [illegible] $\cos^{-1}(x)$ [illegible] (A) 2 (B) ± 1 (C) $\frac{1}{2}$ (D) -3	1
[illegible]	[illegible] a,b,c [illegible] $f(x)=\begin{cases}ax^2+b\,,\; b\neq 0\;,\; x\leq 1\\ bx^2+ax+c\,, x>1\end{cases}$ [illegible] $x=1$, [illegible] [illegible] (a,b,c) [illegible] (A) (3,2,0) (B) (0,0,3) (C) $\left(\frac{3}{2},2,0\right)$ (D) $\left(3,\frac{3}{2},0\right)$	1
[illegible]	[illegible] $y=a\left\{x+2a\,\sin\left(\frac{x}{a}\right)\right\}, a>0, x\in[0,\pi a]$; [illegible] [illegible] x [illegible] (A) $\left(\frac{5\pi}{6},\pi\right]$ (B) $\left(\frac{2\pi}{3},\pi\right]$ (C) $\left(\frac{5\pi a}{-6},\pi a\right]$ (D) $\left(\frac{2\pi a}{3},\pi a\right]$	1

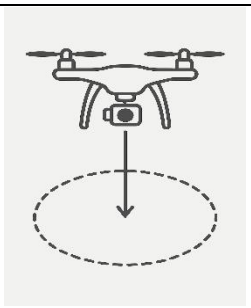
[illegible]

1	The function x is defined in the interval $y = x^4$ is increasing in the interval	1
	(A) $0 < x < 4$ (B) $0 < x \leq 4$	
	(C) $x < 0 \text{ or } x > 4$ (D) $x < 0 \text{ or } x \geq 4$	
11	The order and degree of the differential equation $y - x\left(\frac{dy}{dx}\right)^3 = a\left(y + \frac{d^2y}{dx^2}\right)^2$ are respectively	1
	(A) $3, 1$ (B) $2, 2$ (C) $3, 2$ (D) $4, 2$	
1	If $\int \frac{1}{1+e^{2x}} dx = x - P\log(1 + e^{2x}) + C$, then '$P$' is equal to	1
	(A) $-\frac{1}{2}$ (B) $-\frac{1}{3}$ (C) $\frac{1}{3}$ (D) $\frac{1}{2}$	
1	If the vector $2\hat{\imath} - u\hat{\jmath} + 3\hat{k}$ is a solution 4, then value of 'u' is	1
	(A) 1 (B) $\sqrt{2}$ (C) $\pm\sqrt{3}$ (D) ± 2	
1	The angle between the vector $\hat{\imath} + \hat{\jmath} + \sqrt{2}\,\hat{k}$ and the unit vector along the $\hat{\imath}$ is	1
	(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{2}$	
1	The vector in the direction of the vector $\hat{\imath} + \hat{\jmath}$ that has magnitude 1 is	1
	(A) $-2\,\hat{\jmath}$ (B) $3\hat{k}$ (C) $2\hat{\imath}$ (D) $2\hat{\imath} + \hat{k}$	
1	The probability that a person will live 20 more years is $\frac{1}{5}$. The probability that of 3 persons in the age group, at least 2 will live 20 more years is	1
	(A) $\frac{4}{5}$ (B) $\frac{1}{5}$ (C) $\frac{1}{25}$ (D) $\frac{1}{125}$	
1	A die is thrown 3 times. Assuming that in each throw getting an odd number is as likely as getting an even number, the probability that every throw will result in an even number is	1
	(A) $\frac{3}{5}$ (B) $\frac{4}{5}$ (C) $\frac{3}{7}$ (D) $\frac{4}{7}$	
1	A and B are two events such that $P(A) = \frac{1}{6}, P(B) = k.$ If the probability that at least one of A and B occurs is $\frac{1}{3}$, then k is	1
	(A) $\frac{1}{4}$ (B) $\frac{2}{3}$ (C) $\frac{3}{4}$ (D) $\frac{5}{6}$	

[illegible]	[illegible] r [illegible] R [illegible] d [illegible] D r [illegible] r 1 [illegible] d [illegible] r [illegible] r [illegible] d R [illegible] d [illegible] rr [illegible] 1 [illegible] r [illegible] r [illegible] d [illegible] r [illegible] d [illegible] r [illegible] d R [illegible] R [illegible] [illegible] rr [illegible] r r [illegible] d D [illegible] [illegible] [illegible] r [illegible] d R [illegible] R [illegible] r r [illegible] d R [illegible] R [illegible] rr [illegible] [illegible] r [illegible] [illegible] r [illegible] d R [illegible] R [illegible] r r [illegible] R [illegible] R [illegible] rr [illegible] [illegible] r [illegible] [illegible] r [illegible] r [illegible] R [illegible] R [illegible] D [illegible] r [illegible] R [illegible] R [illegible] r [illegible]	
[illegible] 1 [illegible]	[illegible] r [illegible] r [illegible] $\int_{-1}^{1}\lvert x-2\rvert\,dx$ [illegible] R [illegible] $f(-x) = f(x)$ [illegible] $\int_{-a}^{a} f(x)dx = 2\int_{0}^{a} f(x)dx$	1 [illegible]
[illegible]	[illegible] r [illegible] r [illegible] d [illegible] r [illegible] r [illegible] r [illegible] [illegible] r [illegible] R [illegible] d r [illegible] r r r [illegible] r [illegible]	1 [illegible]
[illegible] – [illegible] 1 [illegible] [illegible] r [illegible] r [illegible] r [illegible] r [illegible] r [illegible]		
[illegible] 1 [illegible]	[illegible] $\int \frac{1}{x\sqrt{x^6-1}}dx$	[illegible]
[illegible]	[illegible] R	
[illegible] 1 [illegible]	[illegible] $\int \frac{\cos x - \sin x}{\sqrt{\sin(2x)}}\,dx$	
[illegible]	[illegible] $y = \sin(x+y)$ [illegible] d $\frac{dy}{dx} = 0$ [illegible] r [illegible] $y = \pm 1.$	[illegible]
[illegible]	[illegible] r [illegible] $(2,6,5), and\ (3,p,7)$ [illegible] r [illegible] [illegible] $(-4,3,4)$ [illegible] d $(-1,0,q)$. [illegible] d [illegible] $\frac{q}{p}$ [illegible]	[illegible]
[illegible]	[illegible] R	
[illegible]	[illegible] r [illegible] D [illegible] $\overrightarrow{AC} = \vec{u}, and\ \overrightarrow{BD} = \vec{v}$ [illegible] d [illegible] r [illegible] r [illegible] r [illegible] r [illegible] d [illegible] r [illegible] rd r [illegible] r [illegible] r [illegible] $\overrightarrow{AB}$ [illegible]	
[illegible]	[illegible] r [illegible] r [illegible] r [illegible] $\vec{a}$ [illegible] d $\vec{b}$ [illegible] $\lvert\vec{a}\rvert = \sqrt{6}$ [illegible] $\vec{a}\cdot\vec{b} = 1$ [illegible] d $\vec{b}\times\vec{a} = 3\hat{\imath} + 4\hat{\jmath} - 2\hat{k}$ [illegible] d $\lvert\vec{b}\rvert$ [illegible]	[illegible]

SECTION – B (Attempt any **one** question from this section) **1** ×

[illegible]	[illegible] $x-2=\frac{2y+3}{4}=2-z$ [illegible]	
	OR	[illegible]
[illegible]	[illegible] $\frac{x-1}{2}=\frac{y-1}{2}=\frac{z-2}{1}$ [illegible] $\frac{x-5}{2}=y-\frac{1}{2}=\frac{3-z}{2}$ [illegible]	
[illegible]	[illegible] M[illegible] $Z=40x+30y$ [illegible] $x+y\leq 6, 2x\geq y, y\geq 2$ [illegible] [illegible] $(20,0),(40,0),(30,10),(0,20)$ and $(0,10)$. M[illegible] $Z=50x-20y$	[illegible]

[illegible] – D [illegible]

[illegible]

[illegible]	[illegible] $A=N\times N$, [illegible] N [illegible] R [illegible] d[illegible]d [illegible] A [illegible] $(a,b)R(c,d)$ *if and only if* $a^2+d^2=b^2+c^2$. [illegible] R [illegible]	
	OR	
[illegible]	[illegible] $R:(-\infty,\infty)\to[0,\infty)$ [illegible] $R=\{(x,y): y=x^2+5\}$ Dr[illegible] [illegible] [illegible] [illegible] $R:(-\infty,\infty)\to[0,\infty)$ [illegible] $R=\{(x,y): y=x^2+7\}$. [illegible]	[illegible]
[illegible]	[illegible] $\int_{-a}^{a}\sqrt{\frac{a-x}{a+x}}\,dx$	[illegible]
[illegible]	[illegible] $\{(x,y): 0\leq y\leq\sqrt{4-x^2}, x\geq 2-y\}$.	
	OR	[illegible]
[illegible]	[illegible] $y^2=2x$ [illegible] $x-2y=0$.	

[illegible]

[illegible]	[illegible]	
[illegible]	[illegible] $25x^2 + 16y^2 = 400$ [illegible]	
[illegible]	[illegible]	[illegible]
[illegible]	[illegible] $y^2 = 8x$, and the lines $x = 2, x = 5$ [illegible]	
[illegible]	[illegible] (i) Find the probability that a randomly selected user gets a false alert. (ii) If a false alert occurs, what is the probability that it came from a Beta smartwatch?	[illegible]

[illegible] 1 [illegible]

[illegible]

[illegible]	[illegible] $l_1: \vec{r} = (\lambda + 1)\hat{\imath} + (3\lambda + 2)\hat{\jmath} + (3 - \lambda)\hat{k}$ [illegible] $l_2: \vec{r} = 2(\mu + 1)\hat{\imath} + (3\mu - 1)\hat{\jmath} + (\mu + 1)\hat{k}$ $l_3: \vec{r} = (\gamma + 3)\hat{\imath} + (3\gamma - 1)\hat{\jmath} + (1 - \gamma)\hat{k}$  [illegible] (i) Show that the lines l_1 and l_2 are not parallel to each other. (ii) Show that the lines l_1 and l_3 are parallel to each other. (iii) (a) Find the shortest distance between the lines l_1 and l_2. [illegible] [illegible] l_1 [illegible] l_3 [illegible]	1 1 [illegible]

	Water is essential for life, and rivers are vital water sources across the world. The Yamuna Action Plan (YAP), one of India's largest river restoration projects, was launched to clean the Yamuna, but its effectiveness (WQI) the Water Quality Index must be measured through cost-benefit, economic and environmental analysis. Therefore, comprehensive pollutant treatment, prevention of further contamination, and community awareness are crucial for sustainable river management investment of ₹x $W(x) = 35 + 1.6x - 0.02x^2$,  (i) Find the value of x at the stationary point for the function $W(x)$. (ii) Find the maximum value of the WQI using the second derivative test? (iii) (a) If the investment is ₹ 35 crores, find by how much the WQI is short of its maximum achievable value. **Or** (b) Evaluate the WQI when the investment is ₹60 crore. Determine whether this indicates an enhancement or a diminishing return in our objective when compared with the optimum WQI.	**1** **1**
	₹2750, ₹3500, and ₹4100.  (i) Write the matrix form of the equations involved in this situation and find the adjoint of the coefficient matrix involved. (ii) Using inverse of the matrix, calculate the price of each fruit per kg.	

PHYSICAL EDUCATION (Subject Code 048)
Class XII (2026-27)
Marking Scheme

TIME ALLOWED: 3 HRS MAX MARKS: 70

Q No.	**SECTION A**	Marks
Q1.	A. Technical	1
Q2.	C. Both A and R are true and R is the correct explanation of A	1
Q3.	A. A-(iii), B-(i), C-(iv), D-(ii)	1
Q4.	B. 55 %	1
Q5.	A. Vakrasana	1
Q6.	C. Matsendraasana	1
Q7.	A. Dr. Ludwig Guttman	1
Q8.	C. Calcium	1
Q9.	D. B, C	1
Q10.	D. Harvard	1
Q11.	B. Hypertrophy of muscles	1
Q12.	B. Sprain	1
Q13.	C. Reaction	1
Q14.	B. Effect of force on different movements done by human body	1
Q15.	D. Behavior	1
Q16.	B. (A) is true, but (R) is false.	1
Q17.	B. Intensity and volume	1
Q18.	A. Strength	1
	SECTION B	
Q19.	Osteoporosis is a bone disorder in which bone density decreases, causing bones to become weak and fragile. 1.Especially after menopause, due to reduced estrogen levels that accelerate bone loss. 2.Hormonal imbalance, calcium and vitamin D deficiency, 3.lack of physical activity, aging 4.Poor nutrition, and smoking.	1+1=2
Q20.	**Roughage:** Indigestible part of food (dietary fibre) **Importance (any one):** • Roughage consists of water and improves intestinal function by adding bulk to food • It helps correct the disorder of large intestine. • It prevents constipation • Soluble roughage reduces blood sugar level • Insoluble roughage is a good stool softener	1+1=2
Q21.	1. Changes in senses with advancing age • Decline in vision and hearing • Reduced taste and smell	1+1=2

	• Slower response to stimuli With advancing age, the efficiency of sensory organs gradually decreases. Vision becomes weaker due to reduced elasticity of the eye lens. Hearing ability declines, making it difficult to hear high-frequency sounds. Sense of taste and smell also reduces, affecting appetite. Reaction time becomes slower, which may affect balance, coordination, and overall physical performance	
Q22.	What is PRICE? **P** – Protection **R** – Rest **I** – Ice **C** – Compression **E** – Elevation	2
Q23.	• Over-dependence on rewards reduces self-interest • External pressure decreases internal enjoyment • Rewards shift focus from learning to winning prizes • Loss of self-satisfaction	2
Q24.	• Plank • Wall push • Static shoulder press • Holding dumbbells without movement • Isometric push-up hold	1+1=2
	SECTION C	
Q25.	1. League tournament is considered the best method to judge the strongest team because every team gets equal opportunities to play against all other teams. 2. It eliminates the factor of luck as no team is eliminated after a single loss. 3. This format provides fair competition and accurate ranking. 4. Teams can improve performance match by match. The winner is declared using British Method that is point system. Generally, a team gets 2 points for a win, 1 point for a draw, and 0 points for a loss. The team with maximum points is declared the winner.	2+1=3
Q26.	Scoliosis is a position in which the spine is tilted to either side of the body. It is a position of lateral curvature or sideways curvature of the spine. Causes: (a) Birth defect (b) Lifting of weight towards one side in routine (c) Arthritis, Paralysis or Rickets (d) Cerebral palsy and muscular dystrophy	1+2=3
Q27.	**Meaning:** Participation of all, including CWSN **Need:** Equality, social integration **Implementation:** • Modified rules • Adapted equipment • Inclusive programs	3

Q28.	**Proteins:** Body-building nutrients **Functions (any two):** • Growth and repair • Muscle development • Enzyme formation **Daily requirement:** ~1 g/kg body weight	1+2=3
Q29.	Advantages of Friction e.g. Gymnastics- To increase the frictional force between rod and hands. Weightlifting- The lifter needs more friction between their feet and the floor to prevent slipping while lifting heavy weights. Badminton- Badminton racket had a knot of clothing that increases the frictional force of the player's hand due to which the racket does not slip	3
Q30.	**Self-esteem:** Feeling of self-worth **Enhancement:** • Success in sports • Social interaction • Confidence building • Peer recognition	3
Q31.	1. Fixture Based Questions (i) (A) Single Knockout (ii) (B) N-1 (iii) (A) 42 (iv) (C) Elimination OR (C) 12 **(VISUALLY IMPAIRED)** (i) (C) Seeding (ii) (A) 6 (iii) (A) (NB+1)/2 (iv) (A) Knockout OR (C) Round Robin Tournament	1x4=4
Q32.	IPC: **International Paralympic Committee** Name reason: Started for paraplegic athletes Governing body: **IPC** Formed: **1989**	1x4=4
Q33.	1. (b) Sprain – It involves overstretching or tearing of ligaments around a joint. 2. R.I.C.E. Method**:** **R** – Rest: Stop playing to prevent further damage. **I** – Ice: Apply ice packs to reduce swelling and pain.	1x4=4

	C – Compression: Use elastic bandage to limit swelling. **E** – Elevation: Keep the injured area above heart level to minimize swelling. 3. **Difference:** **Sprain** – Ligament injury (e.g., twisted ankle). **Strain** – Muscle or tendon injury (e.g., pulled hamstring). 4. **Preventive Measures:** Proper warm-up and stretching before play. Wearing appropriate footwear and protective gear. OR **Possible Effects:** Chronic pain, joint instability, ligament tear, or repeated injuries	
Q34.	**Diabetes Mellitus** is a **chronic metabolic disorder** in which the body is **unable to regulate blood glucose (sugar) levels** due to: • insufficient production of **insulin**, or • improper utilization of insulin by body. As a result, the level of glucose in the blood becomes **abnormally high (hyperglycaemia)**. Type 1 Diabetes Type 2 Diabetes **Diagram – 1 mark** **Benefits – any four** • Controls diabetes • Improves digestion • Improves posture • Strengthens muscles • Reduces stress	2+1+2-=5
Q35.	• Forward Roll • Backward Roll • Jumping Half Turn • Jumping Full Turn **(a) Jumping Half Turn** • In **Jumping Half Turn**, the subject jumps vertically upward from both feet. • While in the air, the performer turns the body **180 degrees** (half rotation). • The performer lands on **both feet**, maintaining balance and control. • Arms may be used freely to assist rotation and balance. **Purpose / importance:** • Tests **coordination**, **balance**, and **motor control** • Indicates ability to learn and perform new motor skills	1+2+2=5

	(b) Jumping Full Turn • In **Jumping Full Turn**, the subject jumps upward from a standing position. • During the jump, the performer rotates the body **360 degrees** (full turn) in the air. • The performer lands safely on both feet without losing balance. • Proper coordination of arms, legs, and trunk is required. **Purpose / importance:** • Measures **advanced coordination**, **agility**, and **motor educability** • Reflects the learner's capacity to acquire complex motor skills	
Q36.	The **sports training cycle** is a **systematic and planned process of training**, divided into different time phases, which aims at **achieving peak performance** of an athlete at the right time of competition. **1. Micro Cycle** • The **shortest unit** of the training cycle. • Usually lasts for **one week (5–7 days)**. • Includes **daily training sessions**, rest, and recovery. • Focuses on **specific training objectives** like strength, speed, or skill improvement. **2. Meso Cycle** • The **medium-term training phase**. • Generally, lasts for **3 to 6 weeks**. • Consists of **several micro cycles combined together**. • Aims at **development of a particular fitness component**, such as endurance or strength. **3. Macro Cycle** • The **longest phase** of the training cycle. • Usually covers **one full season or one year**. • Includes **pre-season, competitive season, and transition period**. • Main aim is to achieve **peak performance during major competitions**.	1+4=5
Q37.	A **projectile** is an **object which is thrown or projected into the air** and, after leaving the hand or an implement, **moves under the influence of gravity alone**. Once released, **no further force acts on it except gravity**. **Factors – Explain any three** • Angle of projection • Velocity • Height of release • Gravity • Air resistance	2+3=5

PHYSICAL EDUCATION (Subject Code 048)
Class XII (2026-27)
Sample Question Paper

TIME ALLOWED: 3 HRS **MAX MARKS: 70**

GENERAL INSTRUCTIONS:

1. The question paper consists of 5 sections and 37 Questions.
2. Section A consists of question 1-18 carrying 1 mark each and is multiple choice questions. All questions are compulsory
3. Sections B consist of questions 19-24 carrying 2 marks each and are very short answer types and should not exceed 60-90 words. Attempt any 5.
4. Sections C consist of Question 25-30 carrying 3 marks each and are short answer types and should not exceed 100-150 words. Attempt any 5.
5. Sections D consist of Question 31-33 carrying 4 marks each and are case studies. There is an internal choice available.
6. Section E consists of Question 34-37 carrying 5 marks each and are long answer types and should not exceed 200-300 words. Attempt any 3.

	Section -A	
Q-1.	Rules and regulations of a sports tournament are the responsibility of _____ committee? (a) Technical (b) Logistics (c) Marketing (d) Finance	1
Q-2.	Given below are the two statements labelled Assertion (A) and Reason (R). **Assertion (A):** In this type of tournament, a team once defeated gets eliminated only the winners continue in the competition. **Reason (R):** Good team once lost cannot make a comeback. In context of the above two statements, which one of the following is correct? (a) A is true, but R is false (b) A is false, but R is true (c) Both A and R are true and R is the correct explanation of A (d) Both A and R are true, but R is not the correct explanation of A	1
Q-3.	Match the following (a) Knock knee — (i) Increase exaggeration of backward curve (b) Kyphosis — (ii) Wide gap between the knees when standing with feet together (c) Lordosis — (iii) Knees touch each other in normal standing position; (d) Bow legs — (iv) Inward curvature of the spine	1

Note: There is no change in the Question Paper Design and Assessment Pattern for Academic Session 2026-27.

	(a) A-(iii), B-(i), C-(iv), D-(ii) (b) A-(i), B-(iii), C-(iv), D-(ii) (c) A-(iv), B-(ii), C-(i), D-(iii) (d) A(iii), B-(i), C-(iv), D-(ii)	
Q 4.	How much carbohydrates are required for strength dominant sports? (a) 40% (b) 55% (c) 70% (d) 80%	1
Q 5.	Identify the yoga asana below.  (a) Vakrasana (b) Tadasana (c) Vajrasana (d) Ardha Matsyendrasna	1
Q 6.	Which asana is preparatory asana for pawanmuktasana? (a) Vajra asana (b) Bhujang asana (c) Matsendra asana (d) Nauka asana	1
Q 7.	Who is known as the father of Paralympic games? (a) Dr. Ludwig Guttman (b) George Iser (c) Pierre de Coubertin (d) Jacques Rogge	1
Q 8.	Deficiency of which of the following nutrients leads osteoporosis? (a) Iron (b) Iodine (c) Calcium (d) Sulphur	1
Q 9.	From the following find water soluble vitamins. (a) A, D (b) E, K (c) C, A (d) B, C	1

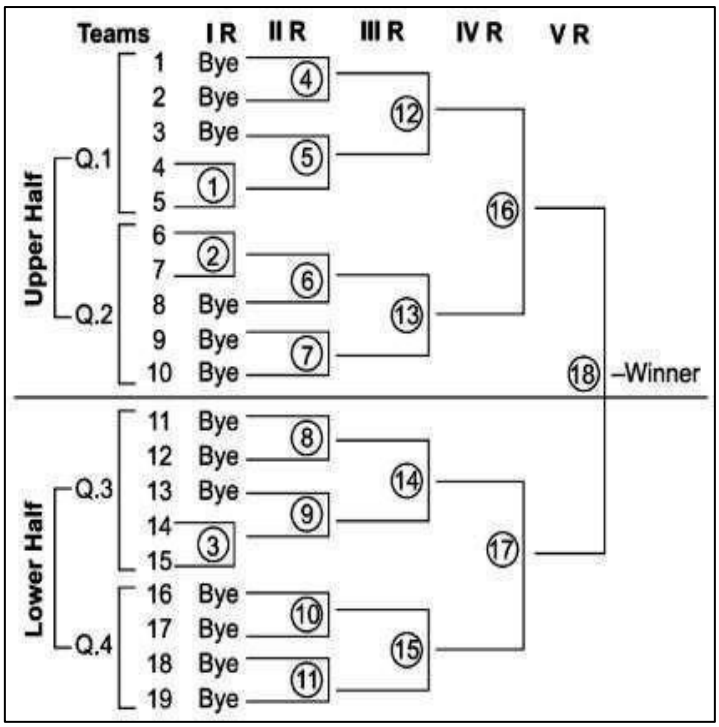
Note: There is no change in the Question Paper Design and Assessment Pattern for Academic Session 2026-27.

Q10.	Which of the following is an aerobic endurance test. (a) Rockport (b) Harvard (c) 6 min walk (d) 100 m run	1
Q11.	Which of the following is an effect of exercise on muscular system? (a) Cardiac output (b) Hypertrophy of muscles (c) Tidal volume (d) I.R.V	1
Q12.	Overstretching of the ligaments near the joints is known as _____. (a) Contusion (b) Sprain (c) Laceration (d) Fracture	1
Q13.	_____ refers to the resistance to the motion at the contact of two surfaces. (a) Attraction (b) Friction (c) Reaction (d) Acceleration	1
Q14.	Biomechanics deals with which of the following? (a) Muscles involved in movement (b) Effect of force on different movements done by human body (c) To understand the physiology of the body (d) To understand time and distance concept of various biomechanics	1
Q15.	Psychology deals with -. (a) Function of body (b) Activity of air (c) Anatomy (d) Behavior	1
Q16.	Given below are the two statements labelled Assertion (A) and Reason (R). **Assertion (A):** Introverts are more comfortable living alone and being by themselves. **Reason (R):** They are actively involved in the world of people and things. In context of the above two statements, which one of the following is correct? (a) (A) is false, but (R) is true. (b) A) is true, but (R) is false	1

Note: There is no change in the Question Paper Design and Assessment Pattern for Academic Session 2026-27.

	(c) Both (A) and (R) are true and (R) is the correct explanation of (A). (d) Both (A) and (R) are true, but (R) is not the correct explanation of (A).	
Q17.	Two major components of load are _____. (a) Specificity and volume (b) Intensity and volume (c) Intensity and Progression (d) Continuity and recovery	1
Q18.	Ability to your muscle overcome resistance is called _____. (a) Strength (b) Speed (c) Balance (d) Explosive strength	1
	Section-B (Attempt any 5)	
Q19.	What is Osteoporosis. Mention the factors responsible for it in women**.**	1+1=2
Q20.	What do you mean by roughage? Mention its importance also.	1+1=2
Q21.	What changes come in our senses with advancing age?	2
Q22.	What is PRICE?	2
Q23.	How extrinsic motivation sometime may kill intrinsic motivation?	2
Q24.	Suggest any two Isometric exercises for shoulder region.	1+1=2
	Section-C (Attempt any 5)	
Q25.	Discuss how League tournament is a better way to judge the best team of any tournament. Also explain one of its methods to declare the winner	2+1=3
Q26.	What is Scoliosis? What are the causes of Scoliosis?	1+2=3

Note: There is no change in the Question Paper Design and Assessment Pattern for Academic Session 2026-27.

Q27.	What do you understand by the term inclusion? Explain its need and implementation.	1+2=3
Q28.	What are proteins? Write their functions along with their daily requirement.	1+2=3
Q29.	List down any three advantages of friction.	1+1+1=3
Q30.	What is self-esteem? How participation in physical activities enhances self-esteem among children?	1+2=3
	Section-D (There is an internal choice available)	
Q31.	 Based on above given fixture answer the following questions: (i) Which method is followed in drawing the fixture given above - (A) Single knockout (B) Double knockout (C) Consolation (D) Ladder	1 1

Note: There is no change in the Question Paper Design and Assessment Pattern for Academic Session 2026-27.

(ii) The formula for number of matches played in the above tournament is- 1

(A) N(N-1) (B) N-1
(C) N+1 (D) Nx2

(iii) If 7 teams participate in a double league tournament such as in IPL, how many matches will be conducted in the first phase of the league? 1

(A) 42 (B) 45
(C) 54 (D) 58

(iv) In this type of tournament, a team once defeated get

(A) Rematch (B) Consolationaward
(C) Elimination (D) Bye

OR

Which no. of team in the above given fixture will be given the 7th bye?

(A) 2 (B) 5
(C) 12 (D) 18

(For Visually Impaired Candidates Only)

The sports captain of XYZ school organized a basketball tournament on knockout basis. He found spectators were losing interest in the tournament because the best 2 teams got knocked out in the beginning. Answer the following questions-

(i) Which provision could have avoided this kind of situation?

(A) Bye (B) Pool
(C) Seeding (D) Halves

(ii) If the number of teams is 58, How many byes will be given? 1

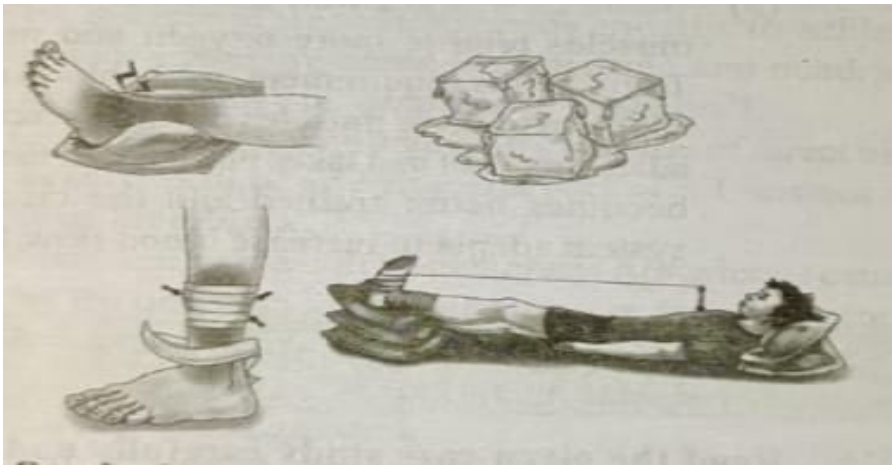
(A) 6 (B) 12
(C) 7 (D) 9

(iii) In a knockout tournament if byes are in odd number, then number of byes in lower half are calculated by- 1

(A) (NB+1)/2 (B) (NB-1)/2
(C) NB/2 (D) NB-1

(iv) Which of the following tournaments is the most economical- 1

(A) Knockout Tournament (B) League Tournament

	(C) Combination Tournament (D) Challenge Tournament OR League tournament is also known as – (A) Combination Tournament (B) League cum League tournament (C) Round Robin Tournament (D) Consolation Tournament	1
Q32.	**Read the given case study carefully and answer the questions that follow:** The International Paralympic Committee is the global governing body of the Paralympic Movement. Its purpose is to organize the summer and winter Paralympic Games and act as the International Federation for ten sports, supervising and coordinating World Championships and other competitions. (a) IPC in sports stands for _____. (b) What was the reason Paralympic Games got their name? (c) Which body governs the Paralympic Movement? (d) When was the IPC formed?	4
Q33	**In relation to the pictures, answer the following questions:**  (a) While playing in school ground Aman got injured. The injury is stretching in ligaments. What should be the first step to provide him the first aid? (b) What is the importance of Elevation? (c) What is the duration of application of ice? (d) First aid is focused on what are called 3 'P's, **P**reserve life, **P**revent deterioration and_____.	4

Note: There is no change in the Question Paper Design and Assessment Pattern for Academic Session 2026-27.

	(Question for candidates with visual impairment) Ramesh is an athlete of a school. He is use to do 100m event for his school. He used to do hard work throughout the year to get his best performance. One day he got injured in winter season due to improper warming-up. He has been given first -aid before sent to hospital. **1**. Sprain is an injury of _____. a) Ligament b) Bone c) Muscle d) Joint **2**. In PRICE treatment I stands for _____. a) Icing b) Incision c) Incline d) Irritation **3**. Abrasion is a _____. a) Type of fracture b) Soft tissue injury c) Joint dislocation d) Internal injury **4**. Why warming up is necessary? a) To avoid injuries b) To increase body temperature c) To increase pulse rate d) All of these	
	Section-E (Attempt any 3)	
Q34.	What is Diabetes and its types. Draw stick diagram of Gomukhasana and mention its benefits.	2+1+2=5
Q35.	Make a list of all the test items in Jhonson – Metheny Test of Motor Educability. Explain the procedure of jumping Half turns and jumping full turns Johnson-Metheny educability test battery.	1+2+2=5
Q36.	What is Sports training cycle? Explain micro cycle, meso cycle and macro cycle.	1+4=5
Q37.	What is a Projectile? Discuss the factors affecting projectile's trajectory.	2+3=5

Subject: PHYSICS (042)
Marking Scheme
Class – XII
Academic Session 2026–27

Maximum Marks: 70 **Time Allowed: 3 hours**

Q. No	SECTION A	Marks
1.	C. remain the same According to Gauss's Law, electric flux, $\Phi = \frac{Q}{\varepsilon_0}$ Flux depends only on the enclosed charge, not on the shape or size of the Gaussian surface. Therefore, doubling the radius does not change the flux**.**	1
2.	C. 2000 W For a parallel combination , $P= P_1+P_2$ =1000+1000=2000 W	1
3.	C. No current will be induced As the cylinder is kept stationary and also the magnetic field is uniform. The flux linked with the cylinder is not changing, so no current is induced in the cylinder.	1
4.	A. $\hat{\imath}$ The direction of propagation of electromagnetic waves is given by –ω/k and is along x axis as equation of wave is a function of x	1
5.	D. Origin of spectra All three can be explained by Huygens' construction of wave front but Origin of spectra cannot.	1
6.	C. Plane As star will act as distance point source hence wavefront detected will be plane.	1
7.	B. They are the most tightly bound nuclei. A maximum in binding energy per nucleon means these nuclei are the most stable and most tightly bound. • They do not undergo spontaneous fission (that's typical for very heavy nuclei like uranium). • They are certainly not the least stable — in fact, they are the most stable. • They can still participate in nuclear reactions, but they are at the "energy valley," so both fusion (lighter nuclei) and fission (heavier nuclei) tend to release energy by moving toward iron.	1

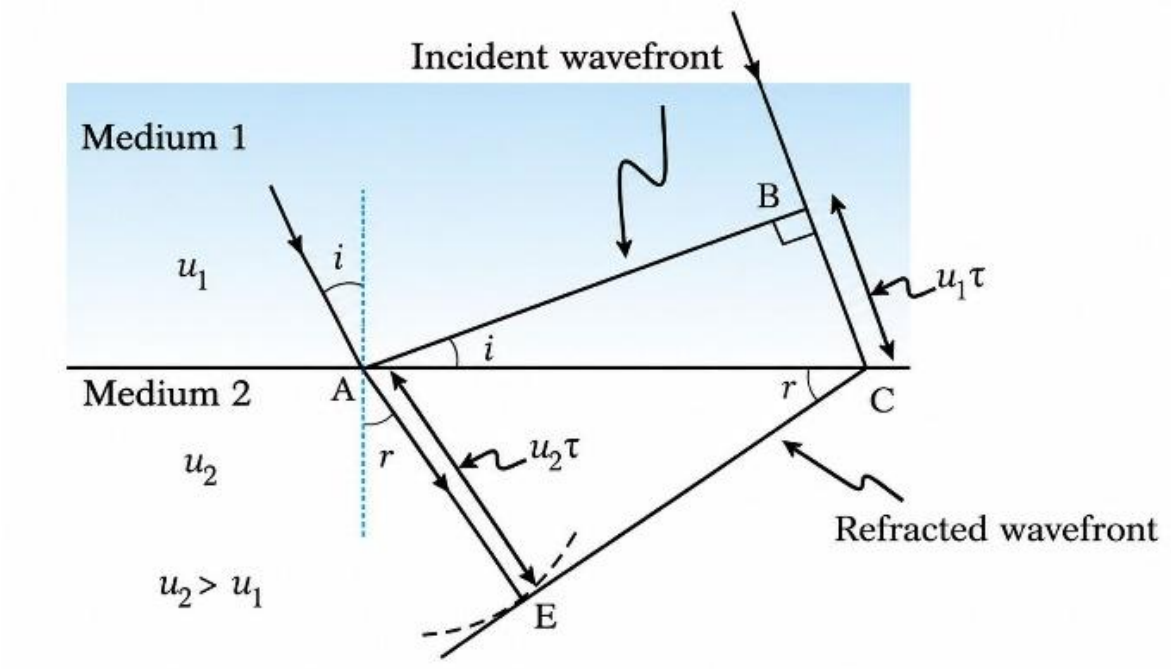
8.	D. Away from the bar magnet and opposite to that of bar magnet As the ball is dipped in liquid nitrogen, its temperature becomes less than the critical temperature and it becomes a superconductor. In this state, the ball becomes diamagnetic.	1
9.	B. 5 A The Wheatstone bridge is balanced, because $\frac{2\Omega}{4\Omega} = \frac{3\Omega}{6\Omega}$. The 5 Ω resistance is ineffective, we now have- (2 Ω + 4 Ω) and (3 Ω + 6 Ω) resistances in parallel. $R_{AB} = \frac{6\ X\ 9}{6+9} = \frac{18}{5}\ \Omega$ Now, I= V/R Or, I= $\frac{18}{18/5}$A =5A **<u>For Visually Impaired Students only</u>** B. R In the balanced condition, the resistance R of the galvanometer is ineffective. We have (R+R) and (R+R) resistances in parallel. $R_{eq} = \frac{2R\ X\ 2R}{2R+2R} = R$	1
10.	A. 5:3 Here P_1=60 W , P_2=100 W $R_1 = \frac{V^2}{P_1}$ and $R_2 = \frac{V^2}{P_2}$ $\therefore \frac{R_1}{R_2} = \frac{P_2}{P_1} = \frac{100}{60}$ = 5: 3	1
11.	C. 22 km Typical **nuclear radius** ≈ 10^{-15}m (1 femtometer). Atom radius (electron orbit, roughly Bohr radius) ~ 10^{-10} m Ratio of atom size to nucleus size ~ 10^5. Football (nucleus) radius ~ 22 cm = 0.22 m. Multiply by 10^5 0.22m×10^5=22,000m=22km.	1
12.	C. 5 π μ T **B** = $\frac{\mu_0 I}{4R} = \frac{4\pi \text{ x } 10^{-7} \text{x } 5}{4\ x\ 0.10} T$ =5π x10^{-6} T =5 π μ T	1

	For Questions 13 to 16, two statements are given –one labelled Assertion (A) and other labelled Reason (R). Select the correct answer to these questions from the options as given below. A. both Assertion and Reason are true and Reason is the correct explanation of Assertion. B. both Assertion and Reason are true but Reason is not the correct explanation of Assertion. C. Assertion is true but Reason is false. D. both Assertion and Reason are false.	
13.	B. both Assertion and Reason are true but Reason is not the correct explanation of Assertion. Explanation: Both are true; most of the space is empty (nucleus tiny), so alpha particles pass undeflected; electron mass has negligible deflecting effect on energetic alpha particles, as reason for statement is "most of the space is empty (nucleus tiny)"	1
14.	A. both Assertion and Reason are true and Reason is the correct explanation of Assertion. Explanation: Both true and R explains A; lens maker's formula uses relative index ($\frac{\mu_{lens}}{\mu_{medium}}$ - 1), so in water the relative refractive index decreases and f increases.	1
15.	C. Assertion is true but Reason is false Fringe width in YDSE is inversely proportional to the slit separation and directly proportional to the wavelength of light.	1
16.	D. both Assertion and Reason are false. Electrons in a conductor move freely. When an external field is applied, charges rearrange until the internal field they create exactly cancels the external field. This is the reason the net internal field becomes zero.	1
	SECTION B	
17.	I. Refractive index of medium (μ) = $\frac{c}{v_{medium}}$ C= 3 × 10^8m/s $V_{medium}=\frac{2\pi \times 10^{18}}{\pi \times 10^{10}}$ = 2 × 10^8 m/s μ =$\frac{3 \times 10^8}{2 \times 10^8}$ = 1.5 II. Angular frequency (ω)= 2π × 10^{18} rad s^{-1}	½ ½ ½

	Or, $2\pi\nu = 2\pi \times 10^{18}$ rad s^{-1} Or, $\nu = 10^{18}\ s^{-1}$ - This frequency correspond to X Ray	½
18.	The nature of the path of free electrons in a conductor differs depending on whether an electric field is present or not: a. In the presence of an electric field • Free electrons experience a net force opposite to the direction of the electric field. • This causes them to drift slowly in the direction opposite to the field (since electrons are negatively charged). • Despite this drift, electrons still undergo frequent collisions with atoms in the conductor, resulting in a zigzag or random motion superimposed with a net drift. • This net movement of electrons constitutes an electric current. b. In the absence of an electric field • Electrons move randomly due to thermal energy. • There is no net movement of electrons in any particular direction. • The motion is random and chaotic, similar to the movement of gas molecules. • As a result, no electric current flows in the conductor.	1 1
19.	At the midpoint, distance from both charges is d/2 Potential due to one charge +q at the midpoint of the line: $V_1 = \frac{kq}{\frac{d}{2}} = \frac{2kq}{d}$ Potential due to both charges; V = 2 x $\frac{2kq}{d} = \frac{4kq}{d}$ Work done by external gent : W = qV = q ($\frac{4kq}{d}$) = $4kq^2/d$	½ ½ ½ ½
20(A)	Given: Relative magnetic permeability, μ_r=800 Since the relative permeability is much greater than 1, the material is a ferromagnetic material. Properties: 1. Ferromagnetic materials are strongly attracted by a magnetic field because they have a very high value of magnetic permeability. 2. They can retain magnetism even after the external magnetic field is removed, meaning they show hysteresis and can be made into permanent magnets.	1 ½ x2

20(B)	Gauss's law for magnetism states that the net magnetic flux through any closed surface is always zero: $\Phi_B = \oint \vec{B}.\ d\vec{S} = 0$ This means that the magnetic field lines neither begin nor end at any point. Significance: • Magnetic monopoles do not exist • Magnetic field lines always form continuous loops	1 ½ x 2
21(A)	I. Hydrogen spectral lines are considered to be a fingerprint of the element because they represent the unique set of colored lines emitted when hydrogen atoms transit between energy levels. This phenomenon, known as the line spectrum, is a result of the quantized energy levels of electrons in the hydrogen atom. Each spectral line corresponds to a specific energy transition, and the distinct pattern of these lines allows for the identification of hydrogen in various environments. II. The minimum energy of a photon that can ionize an electron in a hydrogen atom is 13.6 eV. This is the ionization energy required to remove the electron from its ground considering all the energy is transferred to electron.	1
21(B)	Postulate: Bohr postulated that electrons revolve around the nucleus in certain discrete circular orbits without radiating energy. His quantization condition is: mvr = $\frac{nh}{2\pi}$ Where: • m = mass of the electron • v = velocity of the electron • r = radius of the orbit • n = principal quantum number Explanation of stationary orbits using de Broglie hypothesis: According to de Broglie, a moving electron behaves like a matter wave with wavelength: $\lambda = h/mv$ For an orbit to be stable (stationary), the electron wave must form a standing wave around the nucleus. This is possible only when the circumference of the orbit is an integral multiple of the wavelength: $2\pi r = n\lambda$ Substituting $\lambda = h/mv$	1 1

	$2\pi r = nh/mv$ Or, $mvr = nh/2\pi$ This is exactly Bohr's quantization condition. Hence, de Broglie hypothesis explains Bohr's stationary orbits as those orbits in which the electron's matter wave forms a standing wave, leading to stable, non-radiating orbits.	
	SECTION C	
22.	Metals: Overlapping bands or partially filled conduction band; free electrons yield high conductivity. Insulators: Large band gap; negligible thermal excitation at room temperature; poor conductivity. Semiconductors: Moderate band gap; thermally/optically excited carriers; conductivity can be varied with doping. Diamond vs tin: Diamond (C): Strong network, large gap (~ 5.4 eV); insulator at room temperature. Tin (Sn): Metallic bonding with overlapping bands; conductor due to available states at Fermi level. Conclusion: Band gap magnitude controls room-temperature carrier availability and hence conductivity.	1 1 1
23.	I. The internal resistance of a car battery decreases with increase in temperature. Therefore, on a warm day a car battery gives large current which helps in starting the car engine. II. It is because our body is sensitive to minute currents even as low as a few mA. III. When the temperature of the heater becomes greater than the temperature of its surroundings, it begins to lose heat to surroundings. A stage is reached when the rate of production of heat becomes equal to the rate of loss of heat and the temperature becomes constant.	1 1 1
24.	Z= 8 protons, N= 8 neutrons. Sum of nucleon masses: $m_pZ + m_nN = 8(1.00727) + 8(1.00866)$ =8.05816 + 8.06928 = 16.12744 u Mass defect $\Delta m = 16.12744 - 15.99493 = 0.132514$ Binding energy $B = \Delta m \times 931.5 = 0.13251 \times 931.5 \approx 123.4$ MeV Binding energy per nucleon $\frac{B}{A} = \frac{123.4}{16} \approx 7.71$ MeV	1 1 1

25.	For diamond, refractive index μ=2.42 Critical angle Θ_c= $\sin^{-1}\frac{1}{2.42}$ Or, $\Theta_c < 30^0$ I. Given incidence angle: 30^0. Since $30^0 > \Theta_c$, the ray exceeds the critical angle Hence, the ray will undergo Total Internal Reflection (TIR) inside the diamond. II. A well-cut diamond has facets (the flat faces) angled just right so that light hitting them reflects back inward (TIR) instead of leaking out the sides or bottom. So the light gets trapped inside the piece of diamond.	1 1
26.	Huygens' principle: Every point on a wavefront acts as a source of secondary wavelets, and the new wavefront at a later time is the common tangent (envelope) to these wavelets.  Consider a plane wavefront AB incident on the boundary between two media at an angle of incidence i. • Velocity of light in medium 1 = v_1 • Velocity of light in medium 2 = v_2 • Angle of refraction = r Let point A of the wavefront strike the boundary first. After time t: • Point B(still in medium 1) advances to C, where $BC = v_1 t$ • From point A, a secondary wavelet grows into medium 2 with radius $AE = v_2 t$ The refracted wavefront is the tangent CE drawn to the wavelet from A. From the geometry of the figure: Sin i $=\frac{BC}{AC}$; Sin r = $\frac{AE}{AC}$ Or, $\frac{Sin\ i}{Sin\ r} = \frac{BC}{AE} = \frac{v_1 t}{v_2 t} = \frac{v_1}{v_2}$ But the refractive index n of a medium is defined as	 1 1

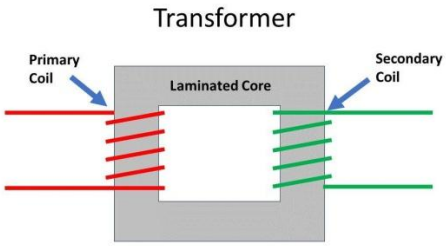
	n = $\frac{c}{v}$ hence, $\frac{v_1}{v_2} = \frac{n_1}{n_2}$ Therefore, $$n_1 \sin i = n_2 \sin r$$ This is Snell's law of refraction. Prediction of wave theory later experimentally verified The wave theory of light (from Huygens' construction) predicted that light travels more slowly in an optically denser medium than in a rarer medium: $$v \propto \frac{1}{n}$$ This prediction was experimentally verified by Foucault (and later Fizeau), who showed that the speed of light in water is less than its speed in air—contradicting the earlier corpuscular (Newtonian) theory.	1
27(A)	I. The original ammeter can be treated as the galvanometer. S = $\frac{I_g\, G}{I - I_g}$ =$\frac{100\ X\ 13}{750-100}$ = $\frac{1300}{650}$ = 2 Ω II. To provide electromagnetic damping. The induced currents set up in the metal frame help to damp the oscillation of the coil in the magnetic field.	1 ½ ½ 1
	OR	
27(B)	I. Magnetic dipole moment SI unit: ampere metre^2 (Am^2) or joule per tesla (JT^{-1}) II. Pole strength, $q_m = \frac{m}{l}$ When the wire is bent into a semicircular arc, the separation between the poles changes from l to 2r, where r is the radius of the semicircular arc. l = π r r = $\frac{l}{\pi}$ New magnetic moment = q_m x 2r = $\frac{m}{l}$ x $\frac{2l}{\pi}$ = $\frac{2m}{\pi}$	½ ½ ½ ½ ½ ½
28.	I. As the magnet falls, the magnetic flux linked with the copper ring increases. The current induced in the ring opposes the downward motion of the magnet. II. Self Inductance, L α $\frac{N^2 A}{l}$ Here N→5N Area as square of linear dimension, A→5^2A = 25 A	1 ½

		Magnetic path Length, l →5l $\frac{L'}{L} = \frac{(5N)^2.25A/5l}{N^2A/l}$ $=\frac{25\ X\ 25}{5}$ =125 L' = 125 L	½ ½ ½
		SECTION D	
29.	I.	**C. Low power consumption and reliability** Wearable devices need to operate continuously with minimal energy usage and dependable performance, which semiconductors provide.	1
	II.	**B. Diamond's band gap is too large for thermal excitation at room temperature.** Because of its large band gap, diamond does not allow sufficient charge carriers to be generated at room temperature, making it unsuitable as a semiconductor	1
	III.	**C. Number of electrons equals number of holes.** In intrinsic semiconductors, electrons and holes are generated in pairs, so their numbers are equal.	1
	IV.	In polymer semiconductors, electrical conduction mainly occurs due to **majority carriers** (electrons in n-type or holes in p-type materials). By controlling the concentration and mobility of these carriers, polymer semiconductors can conduct electricity efficiently even when bent or stretched. Minority carriers play a role in recombination processes and stability. This balance allows polymer semiconductors to function reliably at low power, making them well-suited for flexible, lightweight, and wearable technologies such as smart clothing and medical patches.	1
30.	I.	The **work function (ϕ_0)** of a metal is the **minimum energy required to remove an electron from the surface of the metal** so that it just escapes with zero kinetic energy.	1
	II.	Increasing light intensity increases the **number of photons**, not the energy of each photon. Since the energy of a photon depends only on its **frequency**($E = h\nu$), the **maximum kinetic energy** of emitted electrons depends only on frequency, not intensity. Higher intensity only increases the number of emitted electrons (photoelectric current).	1
	III.	C. Electrons are emitted with maximum kinetic energy greater than 0 eV. Photon energy: $E = h\nu \approx 4.14 \times 10^{-15} \times 1.2 \times 10^{15} \approx 5$ eV Maximum kinetic energy: $K_{\max} = E - \phi_0 = 5 - 2 = 3$ Ev	1

	IV. D. **(**Both B and C) • B: Maximum kinetic energy depends only on frequency, not intensity • C: Electrons are emitted instantaneously Both observations cannot be explained by classical wave theory and support the particle nature of light	1
	SECTION E	
31(A)	I. An isolated conductor cannot have a large capacitance because its capacitance depends directly on its size (radius). For an isolated sphere: $C=4\pi\varepsilon_0 R$ Since ε_0 is a constant, the only way to increase capacitance is by increasing R (the radius). A very large capacitance would require an extremely large-sized conductor**,** which is not practically possible. Therefore, an isolated conductor always has a small capacitance**.** II. i. For minimum capacitance, the three capacitors must be connected in series, $\frac{1}{C_{min}} = \frac{1}{6} + \frac{1}{9} + \frac{1}{18} = \frac{6}{18} = \frac{1}{3}$ C_{min} = 3 μF ii. For maximum capacitance, the three capacitors must be connected in parallel, C_{max} = 6+ 9 + 18 = 33 μF III. The other two factors on which capacitance of a parallel plate capacitor depends, are- i. Distance between the plates (C α 1/d) ii. Permittivity of the medium between the plates (C α ε)	½ ½ ½ ½ ½ ½ ½ ½ x 2
	OR	

31(B)	I. Consider a small positive charge +q placed in an electric field $\overrightarrow{E}$. Suppose it is displaced through a very small distance *dx* in the direction of the field. Force on the charge, $\overrightarrow{F}$ =q$\vec{E}$ Work done by the electric field in moving the charge through distance *dr,* $dW = \vec{F} \cdot d\vec{r} = qE.dr$ ……(1) Here,the change in electric potential , $dV = \frac{dW}{q}$ From (1)- $dV = -\frac{qE.dr}{q}$ $dV = -E.dr$ ⇨ $E = -\frac{dV}{dr}$ i.e. The electric field at any point is equal to the negative gradient of electric potential at that point. II. Potential gradient, $\frac{dV}{dr} = 2.5 \times 10^6\ Vm^{-1}$ $dV = 2.5 \times 10^6\, dr$ $V = 2.5 \times 10^6\, r$ $r = \frac{V}{2.5 \times 10^6}$ $= \frac{5\ X\ 10^5}{2.5 \times 10^6}$ $r = 2 \times 10^{-1} = 0.2$ m	½ ½ ½ ½ ½ ½ ½ ½ ½
32(A)	I. Position of the image formed by the objective lens Using the lens formula: $\frac{1}{f_o} = \frac{1}{v_o} - \frac{1}{u_o}$ $\frac{1}{2} = \frac{1}{v_o} - \left(\frac{1}{-2.2}\right)$ $\frac{1}{v_o} = \frac{1}{2} - \frac{1}{2.2}$ $\frac{1}{v_o} = \frac{2.2 - 2}{4.4} = \frac{0.2}{4.4}$ $v_o = 22$ cm Image formed by the objective lens is at 22 cm from it. II. Magnifying power of the microscope (final image at infinity)	2+2+1

	Magnifying power of a compound microscope: $$M = \left(\frac{v_o}{u_o}\right)\left(\frac{D}{f_e}\right)$$ where $D = 25$ cm(least distance of distinct vision) $$M = \left(\frac{22}{2.2}\right)\left(\frac{25}{5}\right)$$ $$M = 10 \times 5 = 50$$ Magnifying power of the microscope = 50 III. A compound microscope provides much higher magnification than a simple magnifier because: A compound microscope uses two lenses: • The objective lens produces a highly magnified real image of a very small object. • The eyepiece lens further magnifies this image. Thus, the total magnification is the product of the magnifications of the objective and the eyepiece, making it much greater than that of a simple magnifier, which uses only a single lens.	
	OR	
32(B)	Given: Focal length of objective lens, $f_o = 100$ cm Focal length of eyepiece lens, $f_e = 5$ cm Least distance of distinct vision, $D = 25$ cm I. Magnifying power when final image is formed at infinity For an astronomical telescope (normal adjustment): $$M = \frac{f_o}{f_e}$$ $$M = \frac{100}{5} = 20$$ Magnifying power = 20 II. Magnifying power when final image is formed at the least distance of distinct vision $$M = \frac{f_o}{f_e}\left(1+\frac{f_e}{D}\right)$$ $$M = \frac{100}{5}\left(1+\frac{5}{25}\right)$$ $$M = 20(1+0.2) = 20 \times 1.2 = 24$$ Magnifying power = 24 III. Reason for design of objective and eyepiece in an astronomical telescope	2+2+1

	• The objective lens is made with a large focal length to produce a highly magnified real image of distant celestial objects and with a large aperture to collect more light, increasing brightness and resolution. • The eyepiece lens has a small focal length so that it can further magnify the image formed by the objective. This combination results in high magnifying power and a brighter, clearer image of distant astronomical objects.	
33(A)	I. Device: Step–up transformer  Principle – Mutual induction: When an alternating current flows in the primary coil, it produces a time-varying magnetic flux in the soft iron core. This changing flux links with the secondary coil and, by Faraday's law of electromagnetic induction**,** an emf is induced in the secondary. For an ideal transformer : $\frac{V_S}{V_P} = \frac{N_S}{N_P}$ If $N_s > N_p$, then $V_s > V_p$: the transformer steps up the voltage. Because in an ideal transformer- $P_{in} = P_{out} \Rightarrow V_p I_p = V_s I_s$, The law of conservation of energy is not violated: when voltage increases, current decreases correspondingly. II. Working mechanism: • The primary coil is supplied with an alternating voltage. • This produces an alternating magnetic field in the core. • The changing magnetic flux linked with the secondary coil induces an alternating emf in it. • Thus energy is transferred from primary to secondary coil through the changing magnetic field in the core, without any electrical contact between the two windings.	1 ½ ½ 1 1

	Condition for proper functioning: The input must be alternating current (a.c.), not direct current (d.c.) With d.c. there is no change of flux, hence no induced emf in the secondary coil. III. Any one of the following : • Copper losses • Eddy current losses. • Hysteresis loss • Flux leakage Because of these losses, output power is less than input power, so efficiency is less than 100%.	1
	OR	
33(B)	I. Resonance condition in a series LCR circuit & resonant frequency A series LCR circuit has a resistor (R), inductor (L) and capacitor (C) all in series with an AC source. Resonance condition: The circuit is said to be in resonance when its inductive reactance equals its capacitive reactance: $X_L = X_C$ $\omega L = \frac{1}{\omega C}$ Where ω is the angular frequency of the a.c. supply. At resonance: • The net reactance $X=X_L-X_C = 0$ • The impedance Z=R (minimum) • The current in the circuit is maximum for the given applied voltage Hence the circuit behaves as a purely resistive circuit at resonance. The resonant frequency, $f_0 = \frac{\omega_0}{2\pi} = \frac{1}{2\pi\sqrt{LC}}$ II. Use of a series resonant circuit in tuning a radio receiver A radio station transmits electromagnetic waves of a definite frequency**.** In a radio receiver, the input stage contains a tuneable series LCR circuit (or LC tank) whose resonance frequency can be changed. • The inductor (L) is usually fixed. • The capacitor (C) is made variable (variable capacitor).	1 ½ ½ 1 1

	By adjusting the variable capacitor **C**, the resonant frequency, $f_0 = \frac{1}{2\pi\sqrt{LC}}$ is changed until it becomes equal to the frequency of the desired radio station. At this condition: • The LCR circuit is at resonance with that station's frequency. • Its impedance is minimum, so the current (and hence signal voltage**)** is maximum for that particular station. • Signals of other frequencies (other stations) are not at resonance, so their currents are much smaller and get largely rejected. Thus, by using a series resonant circuit, the radio receiver can select (tune to) one particular station and reject others.	1

Subject: PHYSICS (042)
Sample Question Paper
Class – XII
Academic Session 2026–27

Maximum Marks: 70 **Time Allowed: 3 hours**

General Instructions

(1) There are 33 questions in all. All questions are compulsory.

(2) This question paper has five sections: Section A, Section B, Section C, Section D and Section E.

(3) All the sections are compulsory.

(4) Section A contains sixteen questions, twelve MCQ and four Assertion-Reasoning based of 1mark each, Section B contains five questions of two marks each, Section C contains seven questions of three marks each, Section D contains two case study-based questions of four marks each and Section E contains three long answer questions of five marks each.

(5) There is no overall choice. However, an internal choice has been provided in two questions in Section B, one question in Section C, and all three questions in Section E. You have to attempt only one of the choices in such questions.

(6) Use of calculators is not allowed.

(7) You may use the following values of physical constants where ever necessary.

i. $c = 3 \times 10^8$ m/s

ii. $m_e = 9.1 \times 10^{-31}$ kg

iii. $m_p = 1.7 \times 10^{-27}$ kg

iv. $e = 1.6 \times 10^{-19}$ C

v. $\mu_0 = 4\pi \times 10^{-7}$ T m A^{-1}

vi. $h = 6.63 \times 10^{-34}$ J s

vii. $\varepsilon_0 = 8.854 \times 10^{-12} C^2 N^{-1} m^{-2}$

viii. Avogadro's number = 6.023×10^{23} per gram mole

ix. radius of nucleus $\approx 10^{-15}$ m

SECTION A (16 x 1 = 16)		
Q.No.	**Question**	**Marks**
1.	A point charge **+Q** is placed at the centre of a spherical Gaussian surface of radius **R**. If the radius of the sphere is doubled, the electric flux through the surface will A. become half B. become double C. remain the same D. become four times	1

*There is no change in the Question Paper Design and Assessment Pattern for Academic Session 2026-27.

2.	If two identical heaters each rated as (1000 W, 220 V) are connected in parallel to 220 V, then the total power consumed is- A. 200 W B. 250 W C. 2000 W D. 2500 W	1
3.	An infinitely long cylinder is kept parallel to a uniform magnetic field B directed along negative y –axis. What will be the direction of induced current as seen from the y axis? A. clockwise of the negative y-axis B. anticlockwise of the negative y-axis C. no current will be induced D. along the direction of the magnetic field	1
4.	If electric field associated with an electromagnetic wave is given by **E**= 30 sin ($0.2\pi \times 10^{-4}$ $m^{-1}x - 0.6\ \pi \times 10^{4}$ Hz t)$\hat{j}$ then the direction of propagation of the wave is along, A. $\hat{\imath}$ B. $-\hat{\imath}$ C. $\hat{k}$ D. $-\hat{k}$	1
5.	Which one of the following phenomenon is **not** explained by Huygens' construction of wave front? A. Diffraction B. Refraction C. Reflection D. Origin of spectra	1
6.	If wave front from star in nearby galaxy is detected by a telescope at the top of some mountain in India then the shape of the wavefront detected will be A. diverging spherical B. converging spherical C. plane D. cylindrical	1

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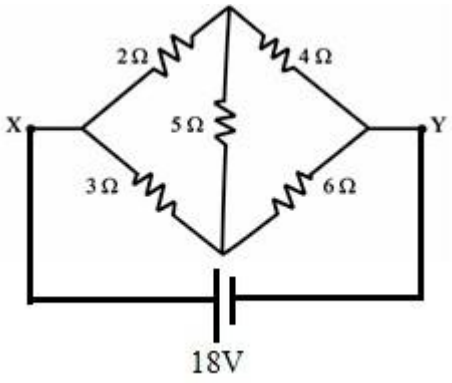
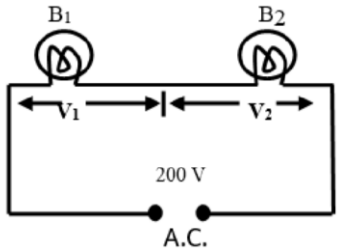
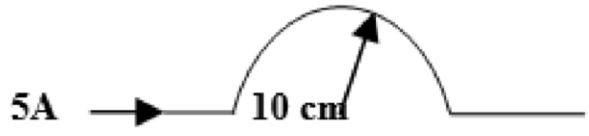
7.	The binding energy per nucleon curve shows a maximum around mass number A=56. What does this imply about nuclei near iron (Fe)? A. They are the least stable nuclei. B. They are the most tightly bound nuclei. C. They undergo spontaneous fission releasing maximum energy. D. They cannot participate in nuclear reactions.	1
8.	A ball of superconducting material is dipped in liquid nitrogen and placed near a bar magnet. The direction of the movement of the ball and the magnetic moment would be-	1

	Direction of the movement of ball	Direction of the magnetic moment
A.	Towards the bar magnet	Opposite to that of the bar magnet
B.	Towards the bar magnet	Same direction as that of the bar magnet
C.	Away from the bar magnet	Same direction as that of the bar magnet
D.	Away from the bar magnet	Opposite to that of the bar magnet

9.	A bridge circuit is shown in the following figure. The total current flowing in the circuit is-  A. 18 A B. 5 A C. 5/18 A D. 18/5A **For Visually Impaired Students only** In a Wheat-stone bridge, all the four arms have equal resistance R. If the resistance of the galvanometer arm is 2R, the equivalent resistance of the combination as seen by the battery is- A. 2R B. R C. R/2 D. R/4	1

*There is no change in the Question Paper Design and Assessment Pattern for Academic Session 2026-27.

10.	Two electric bulbs, B_1 and B_2, are connected in series to an A.C. supply of 200 V. The power ratings printed on the bulbs are:  • B_1: 200 V, 60 W • B_2: 200 V, 100 W Using their rated voltage–power information, the ratio of their resistances R_1/R_2 is- A. 5:3 B. 3:5 C. 3:4 D. 4:3	1
11.	If nucleus scaled to football size is approximately 22cm, then the radius of the orbit of electron will be approximately: A. 22 cm B. 22 m C. 22 km D. 22000 km	1
12.	A current of 5A is passing through a long wire which has semicircular loop of radius 10 cm as shown in the figure-  The magnetic field produced at the center of the loop is- A. 2 π μ T B. 4 π μ T C. 5 π μ T D. 8 π μ T	1

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	For Questions 13 to 16, two statements are given –one labelled Assertion (A) and other labelled Reason (R). Select the correct answer to these questions from the options as given below.	
	A. both Assertion and Reason are true and Reason is the correct explanation of Assertion. B. both Assertion and Reason are true but Reason is not the correct explanation of Assertion. C. Assertion is true but Reason is false. D. both Assertion and Reason are false.	
13.	**Assertion** (A): In Rutherford's scattering experiment, most of the alpha particles passed through the gold foil undeflected. **Reason** (R): The electrons in the atom are very light and do not affect the path of the alpha particles significantly.	1
14.	A convex lens of focal length 20 cm is used to form a real image of a point object placed 30 cm from the lens. The lens is then immersed in water of refractive index 1.33 (the lens material has refractive index 1.5). **Assertion** (A): The focal length of the lens increases when it is immersed in water. **Reason** (R): The focal length of a lens depends on the relative refractive index of the lens material with respect to the surrounding medium, as given by the lens maker's formula.	1
15.	In Young's double slit experiment, the distance between the slits is 0.25mm and the screen is placed 1.0m away. A student uses monochromatic light of wavelength 500nm. **Assertion** (A): The fringe width observed on the screen will be 2.0mm. **Reason** (R): The fringe width in YDSE is directly proportional to the slit separation and inversely proportional to the wavelength of light.	1
16.	**Assertion** (A): If a conductor is placed in an external electric field, the electric field inside the conductor becomes infinity in electrostatic equilibrium. **Reason** (R): Free electrons inside the conductor rearrange themselves in such a way that the internal electric field is in the same direction as that of the external field.	1

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	SECTION B	
17.	The electric and magnetic fields associated with an electromagnetic radiation in a medium are given as follows: $E = 30 \sin (2\pi \times 10^{18} \text{rads}^{-1} t + \pi \times 10^{10} \text{m}^{-1} x)$ Vm^{-1} $B = 10^{-7} \sin (2\pi \times 10^{18} \text{rad}^{-1} t + \pi \times 10^{10} \text{m}^{-1} x)$ T I. What is the refractive index of the medium through which the wave is propagating? II. Find the frequency of the wave and identify the electromagnetic wave.	2
18.	Write the nature of path of free electrons in a conductor in the a) presence of electric field, b) absence of electric field.	2
19.	Two like charges +q and +q are placed at a distance d. What work must be done by an external agent to bring another charge +q from infinity to the midpoint of the line joining the two given charges?	2
20(A)	A certain magnetic substance is found to have a relative permeability of 800. What type of magnetic material is it? Write any two characteristics that such a material exhibits. **OR**	2
20(B)	State Gauss's law of magnetism. Also discuss its significance.	
21(A)	I. Why hydrogen spectral lines are considered to be a fingerprint of the element? II. If energy of an electron of the hydrogen atom in ground state is -13.6 eV, what should be the minimum energy of photon which can ionize the atom? **OR**	2
21(B)	State Bohr's quantization condition for defining stationary orbit. How does de Broglie hypothesis explain the stationary orbit?	
	SECTION C	
22.	Compare the energy band diagrams of metals, insulators, and semiconductors. I. Explain how the band gap determines conductivity. II. Apply this reasoning to justify why diamond (C) is an insulator while tin (Sn) is a conductor, though both are the elements of group IV.	3

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23.	Explain- I. It is easier to start a car engine on a warm day than on a chilly day. II. The resistance of our body is so large, even then one experiences a strong shock (sometimes even fatal)) when one accidentally touches the live wire of, say 240 V supply. III. Heat is generated continuously in an electric heater but its temperature becomes constant after some time.	3
24.	The atomic mass of $^{16}_{8}O$ is 15.99493 u. Calculate the binding energy per nucleon of the oxygen nucleus. *(Given: mass of proton = 1.00727 u, mass of neutron = 1.00866 u, 1 u = 931.5 MeV/c^2)*	3
25.	A diamond has a refractive index of 2.42. I. A ray of light inside the diamond strikes the surface at an angle of incidence of 30^0 .State whether it will undergo refraction or total internal reflection. II. Explain why diamonds sparkle when cut properly.	2+1
26.	Derive Snell's law of refraction using Huygens' wave theory. What prediction of the wave theory was later experimentally verified?	3
27(A)	I. An ammeter has an internal resistance of 13 Ω and is originally designed to measure currents only up to 100 A**.** To extend its range for high-current measurements, a shunt resistor is connected in parallel with it. After adding the shunt, the same meter can now read currents as high as 750 A without damage. Using the principle of current division in parallel circuits, determine the value of the shunt resistance required to increase the measuring range of the ammeter. II. The coil of a moving coil galvanometer is wound over a metal frame. Why?	3
	OR	
27(B)	I. A small current loop behaves like a tiny magnet when placed in a magnetic field. Using this idea, explain what physical quantity determines the strength and orientation of such a magnetic dipole. Also state the SI unit of this quantity. II. A steel wire of length l has a magnetic moment m. It is bent into a semicircular arc. What is its new magnetic moment?	

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28.	I. A bar magnet falls from a height through a metal ring. Its acceleration will be less than 'g'. Explain. II. A coil of copper wire is wound uniformly on a wooden equilateral triangular frame. If each side of the triangle is increased to 5 times its original length, while keeping the number of turns per unit length unchanged, how does the self-inductance of the coil change?	3
	SECTION D	
29.	In 2023, researchers developed flexible semiconductor films using organic polymers that could be printed like newspaper sheets. These films can bend, fold, and still conduct electricity efficiently. Unlike traditional silicon chips, polymer semiconductors are lightweight, biodegradable, and can be integrated into clothing or medical patches. Imagine a shirt that monitors your heartbeat or a bandage that tracks wound healing in real time. Such innovations extend the idea of semiconductors beyond rigid circuits, showing how manipulating band gaps and carrier mobility in new materials can revolutionize electronics for healthcare, sustainability, and wearable technology.	
	I. Which advantage of semiconductors makes them ideal for wearable devices like smart shirts? A. High voltage operation (~100 V) B. Bulky design and short life C. Low power consumption and reliability D. Requirement of external heating	1
	II. Carbon (diamond) has a band gap of 5.4 eV, while silicon has 1.1 eV. Why is silicon used in electronic devices but not the diamond? A. Diamond has too many free electrons. B. Diamond's band gap is too large for thermal excitation at room temperature. C. Silicon has weaker covalent bonds than diamond. D. Diamond cannot form covalent bonds.	1
	III. In an intrinsic semiconductor at room temperature A. only electrons contribute to conduction. B. only holes contribute to conduction. C. number of electrons equals number of holes. D. no conduction occurs at all.	1
	IV. How will you use the concept of majority and minority carriers to explain the efficiency of polymer semiconductors in wearable technology?	1

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30.	In 1905, Albert Einstein explained the photoelectric effect by proposing that light consists of discrete packets of energy called photons. Each photon carries an energy $E=h\nu$. When a photon strikes a metal surface, it can transfer its energy to an electron. If the photon's energy exceeds the work function of the metal, the electron can be emitted with maximum kinetic energy $K_{max}=h\nu-\phi_0$. This discovery challenged the classical wave theory, which predicted that electron emission should depend only on the intensity of light. Instead, experiments showed that emission of electrons depends on frequency too, proving the particle nature of light.	
	I. Define the term *work function*.	1
	II. Why the increase in the intensity of light does not increase the maximum kinetic energy of photoelectrons?	1
	III. A metal surface has a work function of 2 eV. The light of frequency 1.2×10^{15}Hz falls on it. Which statement is correct? A. No electron is emitted because the intensity is low. B. Electrons are emitted with maximum kinetic energy less than 2 eV. C. Electrons are emitted with maximum kinetic energy greater than 0 eV. D. Electron emission depends only on the intensity of light and not on the frequency.	1
	IV. Which observation/s directly contradicts the classical wave theory of light? A. Photoelectric current increases with intensity B. The maximum kinetic energy depends only on the frequency and not on the intensity. C. The electrons are emitted instantaneously. D. Both B and C.	1
	SECTION E	
31(A)	I. An isolated conductor cannot have a large capacitance. Why? II. How would you connect 6 μF, 9 μF and 18 μF capacitors to obtain- i. the minimum capacitance ii. the maximum capacitance III. The capacitance of a parallel plate capacitor is increased as the area of the plates increases. What are the other two factors on which the capacitance depends?	2+2+1
	OR	

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31(B)	I. Show that the electric field at any point is equal to the negative of the potential gradient at that point. II. A small metallic sphere is gradually charged in open air. It is observed that electrical breakdown of air occurs when the electric field at its surface reaches 2.5×10^6 V m^{-1} .If the sphere is allowed to attain a maximum potential of 5×10^5 V without causing any discharge, determine the minimum radius the insulated sphere must have.	3+2
32(A)	A compound microscope consists of an objective lens of focal length 2 cm and an eyepiece lens of focal length 5 cm. The object is placed 2.2 cm from the objective lens. I. Calculate the position of the image formed by the objective lens. II. The eyepiece is so placed that the final image is formed at infinity. Find the magnifying power of the microscope. III. Explain briefly why the compound microscope provides much higher magnification compared to a simple magnifier.	2+2+1
	OR	
32(B)	An astronomical telescope uses an objective lens of focal length 100 cm and an eyepiece of focal length 5 cm. I. Calculate the magnifying power of the telescope when the final image is formed at infinity. II. If the least distance of distinct vision of the observer is 25 cm, calculate the magnifying power when the final image is formed at this distance. III. Explain why the objective lens of an astronomical telescope is made with a large focal length and aperture, while the eyepiece has a small focal length.	
33(A)	A certain electrical device is used to convert an alternating voltage of smaller magnitude into a much larger alternating voltage without violating the law of conservation of energy. I. With the help of a neat labelled diagram, describe the principle on which this device operates and explain how it increases the voltage. II. State the basic working mechanism of the device and mention the condition required in its input signal for proper functioning. III. Give one reason why this device does not operate with 100% efficiency in practical situations.	2+2+1
	OR	
33(B)	I. What do you mean by the resonance condition of a series LCR–circuit? II. Write an expression for the resonant frequency. Describe the use of a series resonant circuit in the tuning of a radio receiver.	3+2

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