CBSE

Additional Practice Questions
Subject: Chemistry Theory (043)
Class: XII 2023-24

Max. marks: 70 **Time: 3 hours**

General Instructions:

(a) There are 33 questions in this question paper with internal choice.

(b) **SECTION A** comprises **16** multiple -choice questions carrying 1 mark each.

(c) **SECTION B** comprises **5** short answer questions carrying 2 marks each.

(d) **SECTION C** comprises **7** short answer questions carrying 3 marks each.

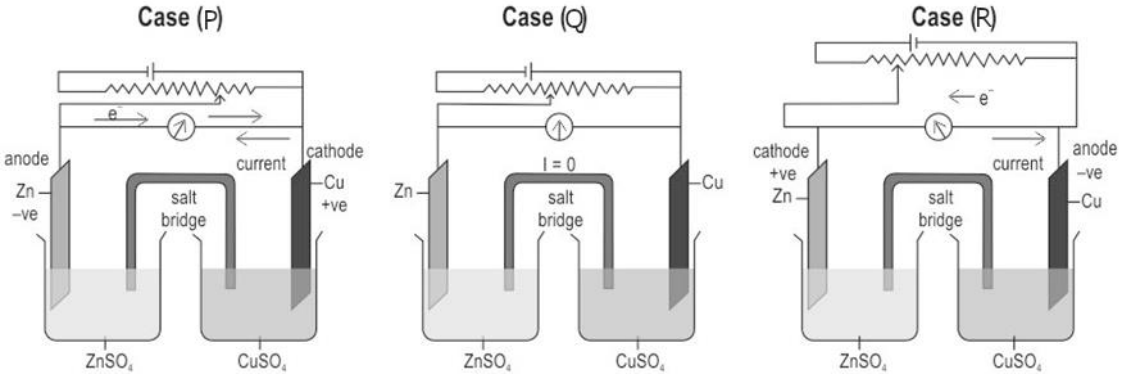
(e) **SECTION D** comprises **2** case - based questions carrying 4 marks each.

(f) **SECTION E** comprises **3** long answer questions carrying 5 marks each.

(g) All questions are compulsory.

(h) Use of log tables and calculators is not allowed.

Section A

The following questions are multiple -choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.	
1	Sunita set up three cells as shown below:  She applied external potential in all the three cells. The potential is increased slowly, till the opposing voltage reaches the value of 1.1 V.

Which of the following statements is INCORRECT?
(a) Electrons flow from Zn rod to Cu rod hence current flows from Cu to Zn in case (P).
(b) The chemical reaction takes place in case (Q) till the opposing voltage reaches 1.1 V.
(c) Zinc is deposited at the zinc electrode and copper dissolves at copper electrode in case (P).
(d) Electrons flow from Cu to Zn and current flows from Zn to Cu in case (R).

2 Two compounds M and N have the general formula $C_nH_{2n}O$ but different structural formulae.
i) Compound N belongs to that homologous series where the first member contains 3 carbon atoms.
ii) Compound M reacts with one equivalent of monohydric alcohol in the presence of dry hydrogen chloride to yield a hemiacetal.

Identify the homologous series to which compounds M and N belong to?
(a) Both the compounds are aldehydes.
(b) Compound M is an aldehyde and compound N is a ketone.
(c) Both the compounds are ketones.
(d) Compound N is an aldehyde and compound M is a ketone.

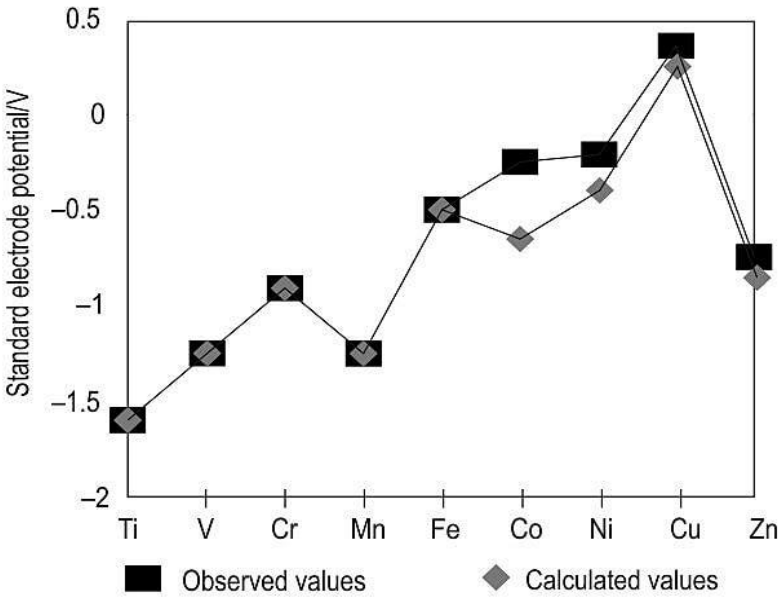
3 During a quiz competition, team A and team B have to answer a tie question on the characteristics of RNA.
Their responses are as follows:

Name	**Team**	**Response**
Adrika	**A**	Different RNA molecules of a cell are involved in the synthesis of proteins.
Shaakho	**A**	The single-stranded helix of RNA folds upon itself to form the secondary structure.
Rounak	**B**	The C-2 atom of the pentose sugar for a ribose nucleotide contains an -OH group.
Ritama	**B**	The message for the synthesis of a particular protein is present only in the RNA.

What is the expected result of the quiz and why?
(a) Team A wins the quiz as both the responses are correct.
(b) Team B wins the quiz as both the responses are correct.
(c) Team A loses the quiz as Adrika's response is incorrect.
(d) Team B loses the quiz as Rounak's response is incorrect.

4	What will be the change in the hybridisation of C when a nucleophile attacks the electrophilic centre of the carbonyl group? (a) sp^2 to sp (b) sp^3 to sp^2 (c) sp^3 to sp (d) sp^2 to sp^3
5	Four compounds, CH_3Cl, CH_3Br, C_2H_5Br and C_3H_7I are represented by the letters M, N, O and P in the table below (*in random order*). The boiling points are also given on the table. Which of the four compounds does 'N' most likely represent? (a) CH_3Cl (b) CH_3Br (c) C_2H_5Br (d) C_3H_7I
6	Study the graph given below. Based on the graph given, which element will MOST LIKELY be involved in the

Boiling points(BP)	-24.2°C	38°C	3.56° C	101.6°C
Compound	M	N	O	P



Observed and calculated values for the standard electrode potentials

($M^{2+} \rightarrow M^0$) of the elements Ti to Zn

following reaction?

Metal + conc. sulphuric acid $\rightarrow$ Metal sulphate + sulphur dioxide + water

(a) Cu
(b) Co
(c) Ti
(d) Zn

7 The table given below shows the results of three experiments on the rate of the reaction between compounds P and Q at a constant temperature.

Experiment	The initial concentration of P (mol dm^{-3})	The initial concentration of Q (mol dm^{-3})	Initial rate (mol dm^{-3} s^{-1})
1	0.1	0.2	1.10×10^{-4}
2	0.3	0.2	9.91×10^{-4}
3	0.3	0.1	4.96×10^{-4}

Based on the data, what will be the rate equation for the reaction between P and Q?

(a) $k[P]^2[Q]$
(b) $k[P][Q]^2$
(c) $k[P][Q]$
(d) $k[P]$

8 The table below shows the K_H values for some gasses at 293 K and at the same pressure.

K_H values (kbar)	144.97	69.16	76.48	34.86
Gas	Helium	Hydrogen	Nitrogen	Oxygen

In which of the following are the gases arranged in their decreasing order of solubility (from left to right)?

(a) Helium > Nitrogen > Hydrogen > Oxygen
(b) Hydrogen > Helium > Nitrogen > Oxygen

(c) Nitrogen > Hydrogen > Oxygen > Helium
(d) Oxygen > Hydrogen > Nitrogen > Helium

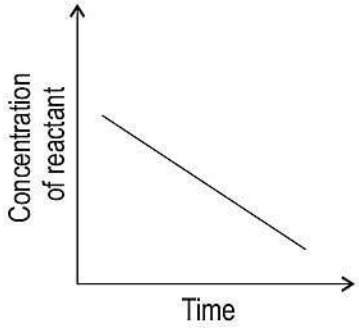
9 Sampriti took 4 acids. Help her to arrange the acids from left to right, in the increasing order of their acidity:
2, 4, 6 - Trinitrophenol, acetic acid, phenol, and benzoic acid.

	(a) 2, 4, 6 - Trinitrophenol, acetic acid, benzoic acid, phenol (b) phenol, acetic acid, benzoic acid, 2, 4, 6 - Trinitrophenol (c) 2, 4, 6 - Trinitrophenol, benzoic acid, acetic acid, phenol (d) phenol, benzoic acid, acetic acid, 2, 4, 6 – Trinitrophenol
10	An archeologist found that the percentage of carbon-14 in a wooden artifact was 20% of what carbon-14 would have been in the wood when it was cut from the tree. What would be the approximate age of this wooden artifact? *(Given the half-life of carbon-14= 5730 years)* (a) 5,790 years (b) 12,060 years (c) 13,300 years (d) 38,000 years
11	Sourima was having a severe headache. She took a medicine to relieve her pain. The medicine is industrially prepared by: (a) mononitration of phenyl methanoate (b) acetylation of salicylic acid in presence of an acid (c) hydrogenation of anisole with Br_2 in ethanoic acid (d) nitration of anisole with a mixture of concentrated sulphuric and nitric acids
12	Which of the following options give the correct arrangement of the atomic radii of the 3d, 4d, and 5d transition series of elements? (a) atomic radii of 3d < atomic radii of 4d < atomic radii of 5d (b) atomic radii of 3d < atomic radii of 4d ≈ atomic radii of 5d (c) atomic radii of 3d ≈ atomic radii of 4d > atomic radii of 5d (d) atomic radii of 3d > atomic radii of 4d > atomic radii of 5d
13	Two statements are given below - one labelled Assertion (A) and the other labelled Reason (R). Assertion (A): 2-Methoxy-2-methyl propane reacts with hydrogen iodide to form methyl alcohol and 2-Iodo-2-methylpropane. Reason (R): The reaction given in (A) follows S_N2 mechanism. Which of the following is correct? (a) Both A and R are true, and R is a 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.
14	Two statements are given below - one labeled Assertion (A) and the other labeled Reason (R). Assertion (A): In acetaldehyde, the carbonyl carbon acts as a Lewis acid and the carbonyl oxygen acts as a Lewis base.

	Reason (R): Carbonyl compounds have substantial dipole moments. Which of the following is correct? (a) Both A and R are true, and R is a 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.
15	Two statements are given below - one labelled Assertion (A) and the other labelled Reason (R). Assertion (A)**:** Denaturation of protein does not change the primary structure of proteins. Reason (R): The bonding between the carbon and hydrogen atoms during denaturation of proteins remains intact. Which of the following is correct? (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.
16	Two statements are given below - one labelled Assertion (A) and the other labelled Reason (R). Assertion (A): Copper does not form copper (II) sulphate on reaction with dil. sulphuric acid. Reason (R): The standard potential for Cu^{+2}|Cu electrode is negative. Which of the following is correct? (a) Both A and R are true, and R is a 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.

Section B

This section contains 5 questions with internal choice in one question. The following questions are very short answer type and carry 2 marks each.

<table>
<tr><td>17</td><td>Given below is a graph of concentration of reactant vs time for a reaction.
 

(a) Based on the graph above draw a rate of reaction vs concentration of reactant graph for the same reaction.
(b) What will be the order of this reaction? Justify.</td></tr>
<tr><td>18</td><td>'Colligative properties help in determining the molar masses of the solutes.'
The method based on which colligative property is preferred over others for determining molar masses of biomolecules and why?</td></tr>
<tr><td>19</td><td>In which of the two compounds $CH_3CH_2CH_2Cl$ or C_6H_5Cl will the C-Cl bond be longer? Why?</td></tr>
<tr><td>20</td><td>Correctly match the items in the 'Reactants' column with those in the 'Product' column.

<table>
<tr><th>Reactants</th><th>Products</th></tr>
<tr><td>(a) Cyclohexene heated in the presence of $KMnO_4$ and H_2SO_4</td><td>(i) Butanal</td></tr>
<tr><td>(b) Propanenitrile hydrolysed after reduction in the presence of stannous chloride and hydrochloric acid</td><td>(ii) 2-Chloro-2-phenylacetic acid</td></tr>
<tr><td></td><td>(iii) Adipic acid</td></tr>
<tr><td></td><td>(iv) Propiophenone</td></tr>
</table>

OR

Aqueous hydrogen cyanide is allowed to react separately with propanone and ethanal. In which case will the rate of reaction be faster and why?</td></tr>
<tr><td>21</td><td>Glucose does not give a positive result with the Schiff's reagent in the Schiff's test.
Based on the above information
(a) Give a reason for the observation.
(b) What type of carbonyl group is present in a glucose molecule?</td></tr>
</table>

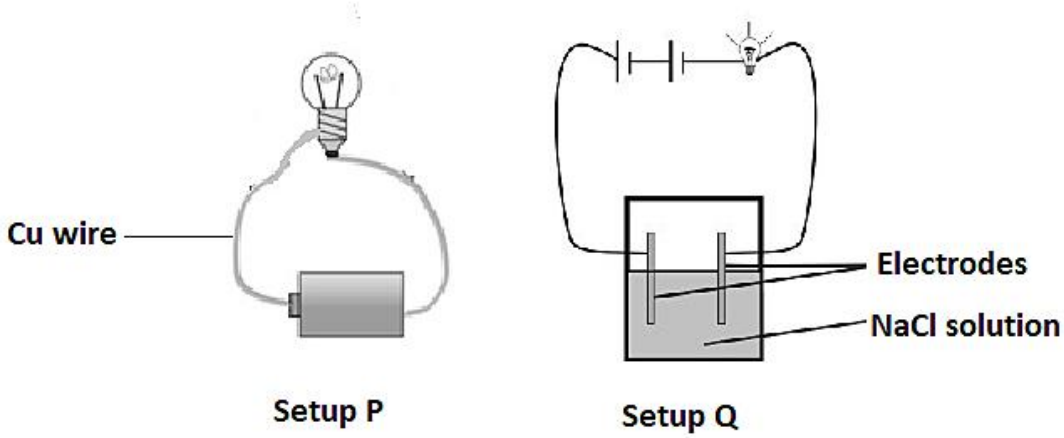
Section C

This section contains 7 questions with internal choice in one question. The following questions are short answer type and carry 3 marks each

22 A metal (M) forms two different compounds O and P with two different ligands. Ligand present in compound O is Cl^- and that in compound P is CN^-. The metal M has 4 electrons in the d orbital. Complete the table given below based on the above information:

	Compound O	Compound P
Field strength of the ligands		
Electronic configuration for metal M in the complex		
Type of complex that will be formed(High spin/low spin)		

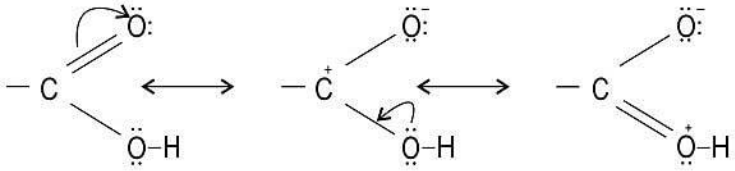
23 Abhisrija arranged two setups P and Q as shown below.



Both experiments are carried out at 25°C.

(a) Name the current carriers in setup P and Q.
(b) What is the effect of an increase in temperature on the conductivity of NaCl solution and Cu wire?
(c) What happens to the chemical composition of NaCl and Cu wire when current is passed through both setups for a prolonged period of time?

24 Draw the structure of:

	(a) 3-Methylphenol (b) 2,4,6-Trinitrophenol (c) Benzene-1,3-diol
25	(a) If acetaldehyde, propane, propanone, acetic acid, and ethyl alcohol are arranged in the increasing order of their boiling points, which two compounds are expected to be at the third and the fourth position? (b) The resonance structures of the carboxylic acid group are shown below, which of them is the most stable and why?  (1) (2) (3)
26	(a) Write a balanced equation for the reaction between glucose and hydrogen cyanide. What inference can we draw from it? (b) Samta reacted glucose with acetic anhydride. Will the reaction help her to determine the number of secondary alcoholic groups and the number of primary alcoholic groups that are present in a glucose molecule? Justify your answer.
27	Three sets of pairs (i) and (ii) of S_N1 reactions are given below. For each set of reactions state which reaction (i) or (ii) is expected to be slower? Justify your answer. (a) (i) $(CH_3)_3CCl + CH_3CH_2O^- \rightarrow (CH_3)_3COCH_2CH_3 + Cl^-$ [In presence of ethanol] (ii) $(CH_3)_3CCl + 2\ CH_3CH_2O^- \rightarrow (CH_3)_3COCH_2CH_3 + Cl^-$ [In presence of ethanol] (b) (i) $(CH_3)_3CCl + H_2O \rightarrow (CH_3)_3COH + HCl$ (ii) $(CH_3)_3CBr + H_2O \rightarrow (CH_3)_3COH + HBr$ (c)(i) $(CH_3)_3CCl + H_2O \rightarrow (CH_3)_3COH + HCl$ (ii) $C_6H_5Cl + H_2O \rightarrow C_6H_5OH + HCl$
28	(a) Write any four methods to increase the rate of a reversible reaction in the forward direction. (b) What is the unit for rate of reaction in SI units?

Section D

The following questions are case -based questions. Each question has an internal choice and carries 4 marks.

29 One of the most distinctive properties of transition metal complexes is their wide range of colours. This means that some of the visible spectrum is being removed from white light as it passes through the sample, so the light that emerges is no longer white. The colour of the complex is complementary to that which is absorbed. The complementary colour is the colour generated from the wavelength left over; for example, if green light is absorbed by the complex, the complex appears red.

The colour of a co-ordination compound depends on two factors:
- presence of ligands: For example, anhydrous $CuSO_4$ is white, but $CuSO_4.5H_2O$ is blue in colour.

- influence of ligands: If ligands like 'en' are added to $[Ni(H_2O)_6]^{2+}$ in the molar ratios en: Ni, 1:1, 2:1, 3:1 a series of reactions and their associated colour changes occur.

(a) Give an example of another complex that shows properties similar to those shown in the compound of Cu mentioned above.
What is the geometry of the central metal atom of this complex?

(b) What is the type of ligand added above to $[Ni(H_2O)_6]^{2+}$ to demonstrate the influence of ligand on colours of complex compounds?

(c) Complete the table given below:

en:Ni	Colour absorbed
2:1	
3:1	

OR

en:Ni	Formula of the ion formed
1:1	
3:1	

30 Conductivity measurements are used routinely in many industrial and environmental applications as a fast, inexpensive and reliable way of measuring the ionic content in a solution.

	For example, the measurement of conductivity is a typical way to monitor and continuously trend the performance of water purification systems. In many cases, conductivity is linked directly to the total dissolved solids (TDS). High quality deionized water has a conductivity of about 5×10^{-6} S/m at STP, typical drinking water is in the range of 0.02–0.08 S/m, while sea water is about 5 S/m. According to research, the TDS in a sample of fresh water can be calculated as TDS (mg/L) = $10^4 \times 0.65 \times$ conductivity (S/m). The conductivity of a sample of water taken from a borewell is given as 0.13 S/m at STP. A conductivity cell is created using the water above. The resistance of the cell is found to be 10 ohms. (a) What is the cell constant of the cell given above? (b) What is the amount of TDS in the sample of water taken? (c) According to some studies TDS of 250 mg/L represents a good source of drinking water. What would the conductivity of such a sample of water be? If such water was made by diluting the sample of water given above, what would be the resistance of a conductivity cell made using that? **OR** If the resistance of a cell made from diluting the sample of water taken above was found to be 79 ohms, calculate the TDS of the new sample.

Section E

	The following questions are long answer type and carry 5 marks each. All questions have an internal choice.
31	Answer any **five** questions with respect to the series of ions given below: Sc^{+3}, Ti^{+4}, V^{+4}, V^{+2}, Cr^{+2}, Fe^{+3}, Ni^{+2},Cu^{+2}, Zn^{+2} (a) Which of these ions are isoelectronic? (b) Why do Sc^{+3}, Ti^{+4}, and Zn^{+2} form colourless aqueous solution? (c) Which ion(s) from the list is/are not transition element(s) and why? (d) Cr forms two types of oxides - Cr^{+2} and Cr^{+3}. Which of them is expected to turn red litmus blue? (e) Arrange the following ions in the increasing order of their magnetic moments: Sc^{+3}, V^{+2}, V^{+4}, Ni^{+2}. (f) Why are alloys mostly prepared from transition metals? (g) Which ion can also has a +1 oxidation state?

[Atomic number of: Sc =21, Ti =22, V =23, Cr=24, Fe=26, Ni=28, Cu=29, Zn=30]

32 The following table contains osmotic pressure data for three compounds dissolved in various solvents.

Compound	Concentration, C (g/L)	Osmotic pressure (atm)
Cellulose	12.5	0.0021
Protein	28.5	0.0026
Haemoglobin	5	0.0018

(R = 0.083 L bar mol^{-1} K^{-1})

(a) If the concentration of protein is doubled keeping all other variables constant, what will be the osmotic pressure of the new solution?
(b) When one litre of cellulose solution was heated to 315 K, its osmotic pressure changed to 0.00248 atm. What is the molecular mass of the cellulose in the solution?
(c) A solution of 10 g of protein in a litre of solvent was found to be isotonic to the haemoglobin solution given above in the table, at the same temperature. If the molecular weight of the protein is 130,000 g/mol, what is the molecular weight of haemoglobin.

OR

The relation between the osmotic pressure of three solutions A, B, and C is:
$\pi_B < \pi_C$
$\pi_C > \pi_A$
$\pi_A > \pi_B$
The three solutions have the same molarity and are at the same temperature.
(a) For which of the solutions is the value of 'i' expected to be the greatest? Give a reason.

(b) Which of the solutions is MOST LIKELY to be glucose, potassium sulphate, and sodium chloride?

(c) Which of the solutions is expected to give a vapour pressure-mole fraction graph similar to that of an acetone-chloroform mixture? Give reason.

33 The compound $C_6H_5NHCOCH_3$ is obtained when compound A reacts with acetic anhydride in presence of pyridine. This compound A does not undergo Friedel-Crafts reaction.
(a) Write the reaction showing the formation of $C_6H_5NHCOCH_3$ from compound A.
(b) The pH of the aq. solution of A is less than 7. Is this statement true? Give reason.
(c) State what type of functional group can be introduced into compound A, that will:
(i) increase the pH of the aqueous solution

	(ii) decrease the pH of the aqueous solution (d) What do you observe when compound A reacts with bromine water at room temperature? **OR** Parul was given two test tubes. One of the test tubes contained ethyl amine and the other contained aniline. To distinguish between the two compounds, she adds a reagent X to both the test tubes. She observes that in only one of the test tubes a yellow dye is formed. (a) Identify the reagent X. (b) Describe how this reagent is prepared and give a reason why it is not readily available in a laboratory. (c) Which of the two compounds forms the yellow dye? (d) Draw the structure of the yellow dye formed.

केन्द्रीय विद्यालय क्र 4, ओ एन जी सी, वडोदरा

शरद कालीन अवकाश गृहकार्य

विषय – हिन्दी

कक्षा – बारहवीं

परियोजना कार्य –

निर्देश –

1 परियोजना कार्य मौलिक और हस्तलिखित होना है ।

2 परियोजना कार्य 12 से 15 पृष्ठ का होना चाहिए ।

क्र सं	विद्यार्थी का नाम	परियोजना कार्य का विषय –
1	रुचिता गोरू	भारतीय सिनेमा का हिन्दी में योगदान
2	छोटी	देश और समाज की उन्नति में शिक्षा का योगदान
3	नैना आनंद	वर्तमान समाज और नारी की स्थिति
4	प्राची राजपूत	सोशल मीडिया का हिन्दी में योगदान
5	दिशा	भ्रष्टाचार हमारे देश की समस्या और उसका समाधान
6	व्रज रोहित	स्वतंत्रा संग्राम में हिन्दी के कवियों का योगदान

डॉ राजेश कुमार गुप्ता

पी जी टी – हिन्दी

CBSE

Additional Practice Questions
Subject: English Core (301)
Class: XII 2023-24

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

General Instructions
1. The Question Paper contains THREE sections-READING, WRITING and LITERATURE.
2. Attempt questions based on specific instructions for each part.

Section A: READING SKILLS (22 marks)

Reading Comprehension Through Unseen Passages

1.	**Read the following text.**	**12 m**
(1)	Apollo, the Greek god of music and healing, always maintained that he was the greatest musician in the world, until Marsyas, who was part animal and part human, played the flute. Apollo's jealousy and insecurity drove him to eventually slay Marsyas so that his status as the greatest musician remained unchallenged. One's usual imagination of a god is a being who is all-knowing and pure in every intention. What makes the Greek gods interesting is that they are shown as flawed beings who do not always act like 'Gods'.
(2)	In appearance, the gods resemble mortals, whom, however, they far surpass in beauty, grandeur, and strength; they are also more commanding in stature, height being considered by the Greeks an attractive feature in men or women. They resemble human beings in their feelings and habits, marrying and having children with them. They require daily nourishment to maintain their strength, and sleep to restore their energy. Their blood, a bright magical fluid called Ichor, never causes disease, and, when shed, produces new life.
(3)	The Greeks believed that the mental qualifications of their gods were much higher than those of men, but, nevertheless, displayed human passions like revenge, deceit, and jealousy. In mythological tales, the gods always punish the evil-doer and administer dire punishments to any mortal who dares to neglect their worship. They often visit mankind and partake of their hospitality, and in many tales, both gods and goddesses become attached to mortals. Although there were so many points of resemblance between gods and men, there remained the one great characteristic distinction: immortality. Still, the gods were not invulnerable, and were often wounded and suffered so much that they'd pray for death. The gods could transport themselves to incredible distances with the speed of thought.

(4) (5)	They could be invisible at will, and could take the forms of men or animals as it suited their convenience. They could also transform human beings into trees, stones, or animals. Their robes were like those worn by mortals, but were perfect in form and much finer in texture. Their weapons also resembled those used by mankind. They often used spears, shields, helmets, bows and arrows. Most of these divinities lived on the summit of Mount Olympus, each having his or her own palace. Magnificent temples were erected to their honour, rich gifts were presented to them, and living creatures were sacrificed on their altars. In Greek mythology, the gods take every opportunity to reveal and establish their divinity but also fall prey to human impulses. Perhaps the Greeks did so to help generations of readers reflect on important life lessons to avoid tragic downfalls. - *E. M. Berens*	
	Source (edited): ***'Myths and Legends of Ancient Greece and Rome'*** *-* *https://www.gutenberg.org/cache/epub/22381/pg22381-images.html#page7* *(448 words)*	
	Answer the following questions based on the passage above.	
i	*'... they are shown as flawed beings who do not always act like 'Gods'.* (paragraph 1) Which of these are examples of the above statement? I. Gods getting attached and falling in love II. Gods punishing mortals for their wrongdoing III. Gods showing kindness and compassion to all IV. Gods deceiving everyone for their personal gain V. Gods killing a mortal out of jealousy and insecurity Select the correct option. A. Only I and III B. Only II and V C. Only I, IV, and V D. Only II, IV, and V	
ii	Which of these would Apollo most likely say about Marsyas' musical ability? A. 'Why does everyone think he plays music well? It is obvious that he doesn't have talent.' B. 'Why is he challenging me like that? I wonder what is troubling him that I can heal.'	1

	C. 'How can an animal play the flute? Such creatures must know their place.' D. 'How dare he play better than me? I am supposed to be the best in the world.'	
iii	Why does the author begin the passage with a description of Apollo? A. to show that the Greek Gods have immense power and influence over the mortals B. to emphasise the point that the Greek Gods are based in interesting stories C. to highlight the point that the Greek Gods are more human-like in nature D. to state that the Greek Gods are also allowed to make mistakes	1
iv	What is ironic about Apollo being the one who slays Marsyas? Answer in about 40 words.	2
v	Based on your reading of paragraph 3, explain what 'invulnerable' means. Answer in one sentence.	1
vi	In 40 words, state any two ways that the Greek gods are superior to human beings.	2
vii	Complete the given sentence with ONE word. *From the fact that the Greek gods punish any mortal who neglects their worship, we can infer that they are* _____.	1
viii	Imagine that someone was born from Ichor. In which of these situations would the Ichor be most useful? A. a natural disaster that causes the earth to split apart B. a pandemic that has been caused by a contagious virus C. a war that requires transforming into another form quickly D. a competitive entrance exam that is very tough to qualify for	1
ix	What does the author mean by 'tragic downfalls' in paragraph 5? Give an example of a tragic downfall in current times in about 40 words.	2
2.	**Read the following text.**	**10 m**
(1)	ChatGPT has been gaining attention for how closely it mimics human-like responses. Created by OpenAI in 2022, it is a chatbot that has been trained to have knowledge of worldly events and phenomena up till September 2021 and to interpret the context of texts to produce meaningful responses. The tool can provide answers on many topics, and often states disclaimers if it cannot answer a prompt accurately. Unlike a search engine, it cannot browse the internet for information. It also does not collect any personal information of users. A survey was administered to understand the uses of ChatGPT in the fields of education, healthcare and research. There were 420 participants in the study of which 59 respondents were from the medical field, 118 respondents were students and faculty from	

(2) the research field, 70 respondents identified as administrative staff, and 173 people marked 'other' as their occupation. Of the 420 respondents, only 40% had used ChatGPT before. More medical trainees and students as well as research students had used ChatGPT as compared to medical staff and research faculty.

The survey asked about the viability of ChatGPT for its use within the fields of education, research, and healthcare. The following table summarises the responses.

(3)

Question	Statement	Number of respondents
Should ChatGPT be used in Education?	No, it should be banned.	11
	I don't know; it is too early to make a statement.	226
	Yes, it should be actively incorporated.	183
Should ChatGPT be used in Research?	No, it should not be used at all.	6
	I don't know; it is too early to make a statement.	75
	Yes, but it should only be used to brainstorm.	68
	Yes, as long as its use is transparently disclosed.	259
	Yes, disclosure is NOT needed.	10
Should ChatGPT be used in Healthcare?	No, it should not be used at all.	15
	I don't know; it is too early to make a statement.	177
	Yes, it can be used for administrative purposes.	176
	Yes, it can be used for any purpose.	51

Based on the responses, there was a greater uncertainty around its use in healthcare and education, compared to using it in research. Regarding the use of ChatGPT in healthcare, a significant portion of respondents (42%) approved of using it for administrative purposes (for example, preparing patient profiles or reports) and a smaller population of respondents (12.2%) felt it could be used for any purpose.

(4) The current application of ChatGPT and its future potential needs to be examined. It can help students understand texts and write more effectively, simplify medical information for patients and automate administrative tasks, and prepare a summary of information which otherwise would require hours of reading through various resources. However, its negative impact must also be considered before institutions approve its use.

(5) - *Multiple Authors*

	Source (edited): ***'An exploratory survey about using ChatGPT in education, healthcare, and research'*** - https://www.medrxiv.org/content/10.1101/2023.03.31.23287979v1.full *(330 words)*	
	Answer the following questions, based on the passage above.	
i	Complete the given sentence in ONE word. *Based on the summary table, the _____ number of respondents think that ChatGPT should not be used.*	1
ii	The following was a prompt posted by a user in ChatGPT as their first question: *'What's my name?'* Based on information from the passage, which of these is most likely to be ChatGPT's response? A. 'Error 404: page not found.' B. 'Your name is user 1000004.' C. 'Sorry, can you repeat the question?' D. 'Sorry, I don't have access to your data.'	1
iii	Imagine that you have to write a news report on a major landslide that occurred in Manipur on 30 June, 2022. Would using only ChatGPT be useful for your project? State why or why not in 40 words.	2
iv	The following are the profiles of some respondents from the survey. Based on the passage, which of these profiles is MOST LIKELY to be a part of the 40% who have used ChatGPT before? A. a manager in a hospital who has done 5 years of administrative work B. a professor of Psychology who has 30 years of teaching experience C. a college graduate who is studying in a 2-year Master's course D. a 25-year-old teacher who is working in a public school	1
v	Which of these is true about the respondents of the survey? A. It had 118 respondents who were employed in the field of education. B. It had 70 respondents who had administrative roles in educational institutions. C. It had 173 respondents who were working in the field of research including students. D. It had 59 respondents who were from the medical field including those who study medicine.	1
vi	Why do you think some respondents feel that ChatGPT should be banned in education? State a reason in 40 words.	2

vii	Locate a detail from the passage that shows that we still do not know enough about ChatGPT. Answer in one sentence.	1
viii	State TRUE or FALSE. More than half of the respondents think it is ok to use ChatGPT in research if one clearly states its contribution.	1

SECTION B : CREATIVE WRITING SKILLS (18 marks)

Note : All details presented in the questions are imaginary and created for assessment purposes		
3	Attempt **ANY ONE** of two in about 50 words.	4
A	Maruti Public School will be conducting an online course on news reading during the summer vacations for students of Class XI and XII. In this course, students will learn to understand news reports, build the habit of reading the news regularly, and will have a chance to interact with well-known journalists. As Rutwik Sen, Editor of the school magazine, draft a notice in about 50 words for the school notice board, urging students to sign up. Mention any other relevant details required for the notice.	
	OR	
B	The *Teen Well-Being Association* of your society, EcoTech World, Sector 13, Chandigarh, will be holding free yoga classes on Sunday mornings, in the common hall. As a member of the association, draft a notice in about 50 words informing the young residents. Mention any other relevant details required for the notice.	
4	Attempt **ANY ONE** of two in about 50 words.	4
A	You are a member of the Cultural Society at L.J. High School. Your school is organising a cultural programme aimed at spreading awareness about environmental conservation. The programme will have dance and song performances, poetry recitation, and art exhibitions by the students throughout the day, in the school auditorium. In about 50 words, create an invitation for parents and school teachers to attend. Mention the relevant details required for an invitation.	
	OR	
B	You and your parents have received an invitation for your elder cousin's wedding to be held in Jaipur on 6th and 7th July. All of you would be delighted to attend. Draft a reply to your cousin accepting the invite and sharing your excitement while congratulating him.	
5	Attempt **ANY ONE** of two in about 120 – 150 words.	5
A	You are Sheena Singh, a recent graduate of High Horizon School. You came across the following advertisement about an internship in editing that you would like to apply for. Write a letter to Books Galore, expressing your interest in the position along with your	

resumé.

Books Galore

We are a non-profit organisation that works with underprivileged children.
Our goal is not only to make reading possible, but also enjoyable!

SEEKING EDITORS

For the children's magazine
Internship for 3 months (May-July 2025) with a monthly pay

Your role:

- Edit children's entries (stories, poems, essays)
- Make sure content is free of grammatical errors
- Meet publishing deadlines for the magazine

Requirements:

- Senior Secondary Education Degree or above (Above 80% in Grade XII English Exam)
- Excellent command over the English language
- Positive attitude and willingness to learn

Send a sample of your writing and your resumé to: internhr@booksgalore.org
Deadline: 14th April, 2025

OR

B Lifestyle diseases such as diabetes, obesity, hypertension, and heart diseases have increased in India. 53% of deaths in India are due to lifestyle diseases. Write a letter to the editor of a national daily about the issue and your understanding of the reasons behind the same. Offer suggestions on how one can reduce their risk of having such diseases and on ways to cope with them. You may use the following cues to compose the letter. You are Shriya Rawat, a concerned citizen.

Consequences:
- leads to a poor quality of life mentally and physically
- increases the cost of health care
- can reduce life expectancy and cause early deaths

	Solutions: - follow a balanced diet - incorporate some form of exercise that is sustainable - get regular blood tests to check our health status	
6	Attempt **ANY ONE** of two in about 120-150 words.	5
A	You are Sneha Hassan of Class XII. Write an article for your school magazine on the *Importance of Active Listening*. Expand on how good listening skills help one to gain multiple perspectives, be an effective team player, and contribute to an overall atmosphere of empathy and care. Use the given cues along with your own ideas to compose this article. **Listening skills:** listening and comprehending, paraphrasing, active body language like nodding, changing facial expressions, and sitting straight. **Effect on others:** we feel heard and acknowledged, builds trust, others more likely to hear us, leads to more ideas being shared	
	OR	
B	Your school recently organised a workshop on *Active Listening* for students of Classes XI and XII on 21 January, 2024. As Simran Kaur, a member of the organising committee, draft a report covering the event for your school's newspaper. Support your ideas with the outline cues given below to craft your report. → purpose of the workshop → who attended the workshop → activities that took place → key messages or takeaways from the workshop → post-workshop resources and information given to attendees → what impact the workshop would have on the students and their environment	
	SECTION C : LITERATURE TEXTBOOK AND SUPPLEMENTARY READING TEXT (40 marks)	
7	Read the given extracts and answer the questions for **ANY ONE** of the two given	6
	What I want should not be confused with total inactivity. Life is what it is about; I want no truck with death. If we were not so single-minded about keeping our lives moving,	

	and for once could do nothing, perhaps a huge silence might interrupt this sadness of never understanding ourselves and of threatening ourselves with death. *(Keeping Quiet)*	
i	Which of these does the speaker imply through the following lines: *Life is what it is about;* *I want no truck with death.* A. Life is meant to be lived and death should not be the focus here. B. Life is meant to teach us lessons and near-death experiences are not always bad. C. Life is full of adventures and the fear of death should not stop us from exploring them all. D. Life is full of many choices and thoughts about death should not be a point of consideration.	1
ii	Complete the given sentence appropriately. Based on the extract, silence would help humanity to _____.	1
iii	What does the speaker mean when he describes people as 'single-minded'? A. People who only work towards understanding themselves. B. People who are driven by only one passion in their life. C. People who only focus on rushing through their life. D. People who can focus on only one task at a time.	1
iv	Justify the following statement as FALSE. In the given extract, the speaker is ordering readers to do certain actions.	1
v	Based on the extract, how do you think the speaker feels about humanity? Answer in one sentence.	1
vi	Observe how the lines in the poem break off at certain words. Give one reason why the poet has structured the lines in this manner.	1
	OR	
	... I saw my mother, beside me, doze, open mouthed, her face ashen like that	

	of a corpse and realised with pain that she was as old as she looked but soon put that thought away, and looked out at Young Trees sprinting, the merry children spilling out of their homes, ... *(My Mother at Sixty-Six)*	
i	Why does the poet compare her mother's face to a corpse? Answer in one sentence.	1
ii	What effect does the phrase 'open mouthed' have on the poem? A. It builds a mood of surprise and shock in the poem. B. It reveals the speaker's fear of her own death and mortality. C. It adds to the imagery of the speaker's mother appearing dead. D. It highlights the speaker's attempt at hiding her emotions from her mother.	1
iii	Complete the given sentence appropriately. The contrast present in the given extract is between _____.	1
iv	State a reason for the following. The speaker looks out of the window while travelling with her mother.	1
v	Which of these phrases uses the same poetic device as the following line from the extract? *looked out at Young Trees sprinting...* A. that restaurant is as nice as the Big Fish B. the pen became my highway to success C. that fluffy cloud crying with sadness D. the tall trees with many branches	1
vi	Why do you think the poet has placed the word 'pain' on a separate line? Give a reason.	1
8.	Read the given extracts and answer the questions for **ANY ONE** of the two, given.	4
A.	The man ceased his mutterings, and then a third bell was tapped. Every one picked up his knife and fork and began eating. I began crying instead, for by this time I was afraid to	

	venture anything more. But this eating by formula was not the hardest trial in that first day. Late in the morning, my friend Judewin gave me a terrible warning. Judewin knew a few words of English; and she had overheard the paleface woman talk about cutting our long, heavy hair. Our mothers had taught us that only unskilled warriors who were captured had their hair shingled by the enemy. Among our people, short hair was worn by mourners, and shingled hair by cowards! *(Memories of Childhood: The Cutting of my Long Hair)*	
i	Which of these can be inferred from the extract? A. The speaker did not understand or speak English. B. The speaker did not think highly of her own culture. C. The speaker did not have any living family members. D. The speaker did not know what a knife or fork were used for.	1
ii	How was the speaker feeling by the time the third bell rang? Why did she feel this way?	1
iii	Complete the given sentence appropriately. The speaker compares her experience of eating to that of a trial because _____.	1
iv	Based on the extract, what would it mean to the speaker if her long hair was cut?	1
	OR	
B.	The presidents of the New York Central and the New York, New Haven and Hartford railroads will swear on a stack of timetables that there are only two. But I say there are three, because I've been on the third level of the Grand Central Station. Yes, I've taken the obvious step: I talked to a psychiatrist friend of mine, among others. I told him about the third level at Grand Central Station, and he said it was a waking-dream wish fulfillment. He said I was unhappy. That made my wife kind of mad, but he explained that he meant the modern world is full of insecurity, fear, war, worry and all the rest of it, and that I just want to escape. Well, who doesn't? Everybody I know wants to escape, but they don't wander down into any third level at Grand Central Station. *(The Third Level)*	
i	Complete the given sentence appropriately. Unlike the two levels that have 'a stack of timetables' to prove their existence, the third level has _____.	1

ii	*Yes, I've taken the obvious step.* What is the narrator assuming that the reader is thinking when he says the above line?	1
iii	Which of these is an example of 'a waking-dream wish fulfillment' as described in the extract? A. Meenal loses her book and swears that it is her enemy who stole it. B. Milind claims that he was petting his beloved dog whom he lost a few years ago. C. Malini tells everyone that she saw a Cheetah though she herself knows it is a lie. D. Mrinal thinks that he saw a spaceship in the sky which later turned out to be a normal aircraft.	1
iv	Based on the extract, what does the narrator think about the psychiatrist's opinion?	1
9	Read the given extracts and answer the questions for **ANY ONE** of the two given.	6
A.	The old man was just as generous with his confidences as with his porridge and tobacco. The guest was informed at once that in his days of prosperity his host had been a crofter at Ramsjo Ironworks and had worked on the land. Now that he was no longer able to do day labour, it was his cow which supported him. Yes, that bossy was extraordinary. She could give milk for the creamery every day, and last month he had received all of thirty kronor in payment. The stranger must have seemed incredulous, for the old man got up and went to the window, took down a leather pouch which hung on a nail in the very window frame, and picked out three wrinkled ten-kronor bills. *(The Rattrap)*	
i	Based on the extract, which of these can we infer about the old man? A. He made more money at the creamery than as a crofter. B. His occupation changed due to the limitations of old age. C. His generosity increased as he became more prosperous in old age. D. He preferred to earn by being his own boss rather than working under someone.	1
ii	What is the author implying when she compares the old man's confidences with his porridge and tobacco?	1

iii	Complete the given sentence appropriately. *Based on the extract, we can infer that being a crofter paid the old man* _____.	1
iv	Which of these sentences uses 'supported' in the same way as the extract does? A. The pillars supported the thick ceiling that was made completely of stone. B. Raman supported his friend's decision to find a job that pays her more money. C. Lalitha supported her mother by sending some money home on a regular basis. D. Few people supported the policy while the majority of the voters were against it.	1
v	Why would the peddler have seemed 'incredulous'? State a reason.	1
vi	Justify any one trait of the old man that the extract reveals.	1
	OR	
B.	So it is hardly surprising that opinions of the interview --- of its functions, methods and merits --- vary considerably. Some might make quite extravagant claims for it as being, in its highest form, a source of truth, and, in its practice, an art. Others, usually celebrities who see themselves as its victims, might despise the interview as an unwarranted intrusion into their lives, or feel that it somehow diminishes them, just as in some primitive cultures it is believed that if one takes a photographic portrait of somebody then one is stealing that person's soul. V. S. Naipaul feels that, 'Some people are wounded by interviews and lose a part of themselves.' Lewis Carroll, the creator of Alice in Wonderland, was said to have had 'a just horror of the interviewer' and he never consented to be interviewed. *(The Interview: Part I)*	
i	Identify any one contrast in the extract and explain it in one sentence in your own words.	1
ii	Based on V. S. Naipaul's quote, we can say that interviews _____. A. are forced upon people B. are physically violent in nature C. can build hostility and hatred D. can be a traumatic experience	1
iii	What is common between how celebrities feel about interviews and how primitive cultures viewed photographic portraits?	1

iv	Which of these uses 'just' in the same way as the following expression in the extract? *'a just horror of the interviewer'* A. The just decision in the case against the criminal will empower us. B. I just need to buy one pencil so we can go shopping tomorrow. C. We will get back to you on this query in just a moment. D. The little girl looks just like her mother.	1
v	What makes an interview 'a source of truth'? State any one feature.	1
vi	Complete the given sentence appropriately. The author of the extract has a/an _____ tone while describing the interview.	
10	Answer **ANY FIVE** of the following six questions in about 40-50 words	5x2=10
i	The author of 'Poets and Pancakes' is extremely observant of people and their behaviour. Support this statement with an example of a description he gives us about any one of the characters.	
ii	Why does Sophie's father look at Sophie with disdain in the following scene from 'Going Places'? *"Sophie's met Danny Casey", Geoff said.*	
iii	In the poem 'Aunt Jennifer's Tigers', why does the poet describe the tigers as 'bright topaz denizens of a world of green'?	
iv	What were some strategies that helped the narrator to overcome his fear of water that one can apply in their own life for facing any major fear? Explain any two. *(Deep Water)*	
v	*A crisis brings out our true capacity for compassion and kindness.* Support the above statement using M. Hamel from 'The Last Lesson' as an example. State any one detail from the text.	
vi	Imagine that John Keats meets someone who is feeling sad. What advice would he give to such a person? State any one feature of beauty from 'A Thing of Beauty' and relate the advice to it.	
11	Answer **ANY TWO** of the following three question, in about 40-50 words.	2x2=4

i	In the story, 'On the Face of It', what brings Derry and Mr Lamb together as friends? What can you conclude about friendships from this?	
ii	How would a student's learning experience be enhanced in the 'Students on Ice' programme as compared to studying only in a classroom? Analyse any one point. *(Journey to the End of the Earth)*	
iii	With reference to 'The Enemy', describe any two ways in which Sadao's father influenced Sadao's life.	
12	Answer **ANY ONE** of the following two questions in about 120-150 words.	5
A	Imagine that Mahatma Gandhi from the text 'Indigo' visits Mukesh's town Firozabad as described in 'Lost Spring'. Gandhi sees how the poor bangle-makers are caught up in 'a vicious circle of the sahukars, the middlemen, the policemen, the keepers of law, the bureaucrats and the politicians.' True to his nature of being an activist and a social reformist, he decides to do something about it over a month. As Mukesh, write a diary entry on the last day of Gandhi's one-month stay, elaborating on any two things that he did that transformed the people's lives in Firozabad. You may begin this way: *Dear Diary,* *Today marks a month of Mahatma Gandhi being in our town...*	
	OR	
B	Observe the following lines from two different poems. *(Aunt Jennifer's Tigers)* *When Aunt is dead, her terrified hands will lie* *Still ringed with ordeals she was mastered by.* *(The Roadside Stand)* *I can't help owning the great relief it would be* *To put these people at one stroke out of their pain.* There are many commonalities between the two poems. Imagine that you are interviewing Adrienne Rich and Robert Frost together. Ask them any two questions that would highlight two points of similarity between their poems, and create their responses to each. You may begin this way: *Interviewer:*	

	Rich: *Frost:*	
13	Answer **ANY ONE** of the following two questions, in about 120 – 150 words.	5
A	Recall the story 'We too are Human Beings' from the text 'Memories of Childhood'. Imagine that Bama stops the elderly man who was carrying the packet of *vadais,* and strikes up a conversation with him. She asks him a couple of questions. As the man, respond to Bama's questions. You may follow the given format and include the two questions in your conversation. *Bama: Hi sir, I noticed that you were carrying that packet in a funny manner. Why were you doing so?* *Elderly man: ...* *Bama: But that's terrible. How does that make you feel?*	
	OR	
B	The king in the story 'The Tiger King' was driven by the single purpose of staying alive based on the prophecy that the hundredth tiger would kill him. He hunted tigers out of fear. Imagine that you are living in the King's times, and he has killed seventy tigers at this point. As someone who cares about animal welfare, write a letter to the king convincing him to stop hunting tigers. You may begin this way: *My sincerest greetings to his majesty,* *I am Rajan, a subject of your kingdom, and I am writing to you today because...*	

Class: XII Session: 2022-23

Computer Science (083)

Sample Question Paper (Theory)

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

General Instructions:

1. This question paper contains five sections, Section A to E.
2. All questions are compulsory.
3. Section A have 18 questions carrying 01 mark each.
4. Section B has 07 Very Short Answer type questions carrying 02 marks each.
5. Section C has 05 Short Answer type questions carrying 03 marks each.
6. Section D has 03 Long Answer type questions carrying 05 marks each.
7. Section E has 02 questions carrying 04 marks each. One internal choice is given in Q35 against part c only.
8. All programming questions are to be answered using Python Language only.

	SECTION A	
1.	State True or False "Variable declaration is implicit in Python."	1
2.	Which of the following is an invalid datatype in Python? (a) Set (b) None (c)Integer (d)Real	1

3.	Given the following dictionaries
	`dict_exam={"Exam":"AISSCE", "Year":2023}`
	`dict_result={"Total":500, "Pass_Marks":165}`
	Which statement will merge the contents of both dictionaries?
	a. `dict_exam.update(dict_result)`
	b. `dict_exam + dict_result`
	c. `dict_exam.add(dict_result)`
	d. `dict_exam.merge(dict_result)`
		1

4.	Consider the given expression: `not True and False or True` Which of the following will be correct output if the given expression is evaluated? (a) True (b) False (c) NONE (d) NULL	1
5.	Select the correct output of the code: `a = "Year 2022 at All the best"`	1

	``` a = a.split('2') b = a[0] + ". " + a[1] + ". " + a[3] print (b) ``` (a) Year . 0. at All the best (b) Year 0. at All the best (c) Year . 022. at All the best (d) Year . 0. at all the best	
6.	Which of the following mode in file opening statement results or generates an error if the file does not exist? (a) a+ (b) r+ (c) w+ (d) None of the above	1
7.	Fill in the blank: _____ command is used to remove primary key from the table in SQL. (a) `update` (b)`remove` (c) `alter` (d)`drop`	1
8.	Which of the following commands will delete the table from MYSQL database? (a) DELETE TABLE (b) DROP TABLE (c) REMOVE TABLE (d) ALTER TABLE	1

9.	Which of the following statement(s) would give an error after executing the following code?
	``
	S="Welcome to class XII" # Statement 1
	print(S) # Statement 2
	S="Thank you" # Statement 3
	S[0]= '@' # Statement 4
	S=S+"Thank you" # Statement 5
	``
	(a) Statement 3
	(b) Statement 4
	(c) Statement 5
	(d) Statement 4 and 5
		1

10.	Fill in the blank: _____ is a non-key attribute, whose values are derived from the primary key of some other table. (a) Primary Key (b) Foreign Key (c) Candidate Key	1

	(d) Alternate Key	
11.	The correct syntax of seek() is: (a) `file_object.seek(offset [, reference_point])` (b) `seek(offset [, reference_point])` (c) `seek(offset, file_object)` (d) `seek.file_object(offset)`	1
12.	Fill in the blank: The SELECT statement when combined with _____ clause, returns records without repetition. (a) DESCRIBE (b) UNIQUE (c) DISTINCT (d) NULL	1
13.	Fill in the blank: _____is a communication methodology designed to deliver both voice and multimedia communications over Internet protocol. (a) VoIP (b) SMTP (c) PPP (d)HTTP	1
14.	What will the following expression be evaluated to in Python? `print(15.0 / 4 + (8 + 3.0))` (a) 14.75 (b)14.0 (c) 15 (d) 15.5	1
15.	Which function is used to display the total number of records from table in a database? (a) sum(*) (b) total(*) (c) count(*) (d) return(*)	1
16.	To establish a connection between Python and SQL database, `connect()` is used. Which of the following arguments may not necessarily be given while calling `connect()` ? (a) host (b) database (c) user (d) password	1
Q17 and 18 are ASSERTION AND REASONING based questions. Mark the correct choice as (a) Both A and R are true and R is the correct explanation for A		

	(b) Both A and R are true and R is not the correct explanation for A (c) A is True but R is False (d) A is false but R is True	
17.	Assertion (A):- If the arguments in function call statement match the number and order of arguments as defined in the function definition, such arguments are called positional arguments. Reasoning (R):- During a function call, the argument list first contains default argument(s) followed by positional argument(s).	1
18.	Assertion (A): CSV (Comma Separated Values) is a file format for data storage which looks like a text file. Reason (R): The information is organized with one record on each line and each field is separated by comma.	1
	SECTION B	

19.	Rao has written a code to input a number and check whether it is prime or not. His code is having errors. Rewrite the correct code and underline the corrections made.
	
	`def prime():`
	`  n=int(input("Enter number to check :: ")`
	`  for i in range (2, n//2):`
	`  if n%i=0:`
	`  print("Number is not prime \n")`
	`  break`
	`  else:`
	`  print("Number is prime \n')`
		2

20.	Write two points of difference between Circuit Switching and Packet Switching. **OR** Write two points of difference between XML and HTML.	2

21.	(a) Given is a Python string declaration:
	`myexam="@@CBSE Examination 2022@@"`
	
	Write the output of: `print(myexam[::-2])`
	
	(b) Write the output of the code given below:
	`my_dict = {"name": "Aman", "age": 26}`
	`my_dict['age'] = 27`
	`my_dict['address'] = "Delhi"`
	`print(my_dict.items())`
		1
		
		1

22.	Explain the use of 'Foreign Key' in a Relational Database Management System. Give example to support your answer.	2

23.	(a) Write the full forms of the following: (i) SMTP (ii) PPP (b) What is the use of TELNET?	2

24.	Predict the output of the Python code given below:
	
	`def Diff(N1,N2):`
	`  if N1>N2:`
	`  return N1-N2`
	`  else:`
	`  return N2-N1`
	
	`NUM= [10,23,14,54,32]`
	`for CNT in range (4,0,-1):`
	`  A=NUM[CNT]`
	`  B=NUM[CNT-1]`
	`  print(Diff(A,B),'#', end=' ')`
	
	OR
	
	Predict the output of the Python code given below:
	
	`tuple1 = (11, 22, 33, 44, 55 ,66)`
	`list1 =list(tuple1)`
	`new_list = []`
	`for i in list1:`
	`  if i%2==0:`
	`  new_list.append(i)`
	`new_tuple = tuple(new_list)`
	`print(new_tuple)`
		2

25.	Differentiate between count() and count(*) functions in SQL with appropriate example. OR Categorize the following commands as DDL or DML: INSERT, UPDATE, ALTER, DROP	2
	SECTION C	
26.	(a) Consider the following tables – Bank_Account and Branch: Table: Bank_Account	1+2

ACode	Name	Type
A01	Amrita	Savings
A02	Parthodas	Current
A03	Miraben	Current

Table: Branch

ACode	City
A01	Delhi
A02	Mumbai
A01	Nagpur

What will be the output of the following statement?

```
SELECT * FROM Bank_Account NATURAL JOIN Branch;
```

(b) Write the output of the queries (i) to (iv) based on the table, TECH_COURSE given below:

Table: TECH_COURSE

CID	CNAME	FEES	STARTDATE	TID
C201	Animation and VFX	12000	2022-07-02	101
C202	CADD	15000	2021-11-15	NULL
C203	DCA	10000	2020-10-01	102
C204	DDTP	9000	2021-09-15	104
C205	Mobile Application Development	18000	2022-11-01	101
C206	Digital marketing	16000	2022-07-25	103

```
(i)     SELECT DISTINCT TID FROM TECH_COURSE;
(ii)    SELECT TID, COUNT(*), MIN(FEES) FROM
   TECH_COURSE GROUP BY TID HAVING COUNT(TID)>1;
(iii)   SELECT CNAME FROM TECH_COURSE WHERE
 FEES>15000 ORDER BY CNAME;
(iv)    SELECT AVG(FEES) FROM TECH_COURSE WHERE
 FEES BETWEEN 15000 AND 17000;
```

27. Write a method COUNTLINES() in Python to read lines from text file 'TESTFILE.TXT' and display the lines which are not starting with any vowel. 3

Example:

If the file content is as follows:

An apple a day keeps the doctor away.
We all pray for everyone's safety.
A marked difference will come in our country.

The COUNTLINES() function should display the output as:

The number of lines not starting with any vowel - 1

OR

Write a function ETCount() in Python, which should read each character of a text file "TESTFILE.TXT" and then count and display the count of occurrence of alphabets E and T individually (including small cases e and t too).

Example:

If the file content is as follows:

Today is a pleasant day.
It might rain today.
It is mentioned on weather sites

The ETCount() function should display the output as:
E or e: 6
T or t : 9

28. (a) Write the outputs of the SQL queries (i) to (iv) based on the relations Teacher and Placement given below: 3

Table : Teacher

T_ID	Name	Age	Department	Date_of_join	Salary	Gender
1	Arunan	34	Computer Sc	2019-01-10	12000	M
2	Saman	31	History	2017-03-24	20000	F
3	Randeep	32	Mathematics	2020-12-12	30000	M
4	Samira	35	History	2018-07-01	40000	F
5	Raman	42	Mathematics	2021-09-05	25000	M
6	Shyam	50	History	2019-06-27	30000	M
7	Shiv	44	Computer Sc	2019-02-25	21000	M
8	Shalakha	33	Mathematics	2018-07-31	20000	F

Table : Placement

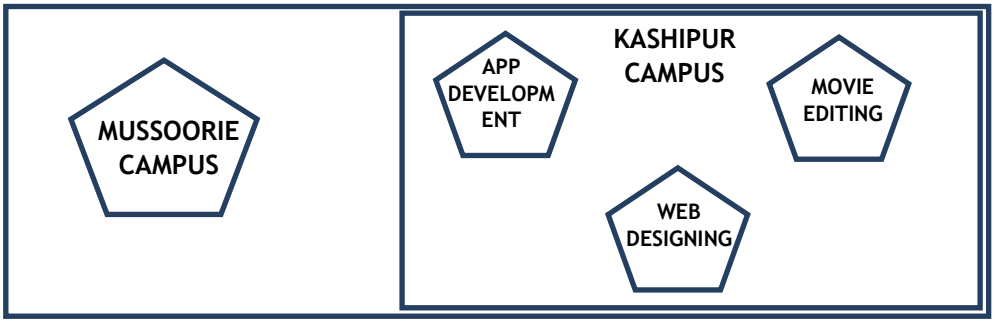
P_ID	Department	Place
1	History	Ahmedabad
2	Mathematics	Jaipur
3	Computer Sc	Nagpur

```
(i)   SELECT Department, avg(salary) FROM Teacher
      GROUP BY Department;
ii)   SELECT MAX(Date_of_Join),MIN(Date_of_Join) FROM
      Teacher;
ii)   SELECT Name, Salary,  T.Department, Place FROM
      Teacher T, Placement P WHERE T.Department =
      P.Department AND Salary>20000;

iv)   SELECT Name, Place FROM Teacher T, Placement P
```

	`WHERE Gender ='F' AND T.Department=P.Department;` (b) Write the command to view all tables in a database.	
29.	Write a function INDEX_LIST(L), where L is the list of elements passed as argument to the function. The function returns another list named 'indexList' that stores the indices of all Non-Zero Elements of L. For example: If L contains [12,4,0,11,0,56] The indexList will have - [0,1,3,5]	3
30.	A list contains following record of a customer: [Customer_name, Phone_number, City] Write the following user defined functions to perform given operations on the stack named '**status**': (i) Push_element() - To Push an object containing name and Phone number of customers who live in Goa to the stack (ii) Pop_element() - To Pop the objects from the stack and display them. Also, display "Stack Empty" when there are no elements in the stack. For example: If the lists of customer details are: ["Gurdas", "99999999999","Goa"] ["Julee", "8888888888","Mumbai"] ["Murugan","77777777777","Cochin"] ["Ashmit", "1010101010","Goa"] The stack should contain ["Ashmit","1010101010"] ["Gurdas","9999999999"] The output should be: ["Ashmit","1010101010"] ["Gurdas","9999999999"] Stack Empty **OR** Write a function in Python, Push(SItem) where , SItem is a dictionary containing the details of stationary items- {Sname:price}. The function should push the names of those items in the stack who have price greater than 75. Also display the count of elements pushed into the stack. For example: If the dictionary contains the following data:	3

	Ditem={"Pen":106,"Pencil":59,"Notebook":80,"Eraser":25} The stack should contain Notebook Pen The output should be: The count of elements in the stack is 2	
	SECTION D	
31.	MakeInIndia Corporation, an Uttarakhand based IT training company, is planning to set up training centres in various cities in next 2 years. Their first campus is coming up in Kashipur district. At Kashipur campus, they are planning to have 3 different blocks for App development, Web designing and Movie editing. Each block has number of computers, which are required to be connected in a network for communication, data and resource sharing. As a network consultant of this company, you have to suggest the best network related solutions for them for issues/problems raised in question nos. (i) to (v), keeping in mind the distances between various blocks/locations and other given parameters.	



Distance between various blocks/locations:

Block	Distance
App development to Web designing	28 m
App development to Movie editing	55 m
Web designing to Movie editing	32 m
Kashipur Campus to Mussoorie Campus	232 km

Number of computers

Block	Number of Computers
App development	75
Web designing	50
Movie editing	80

(i) Suggest the most appropriate block/location to house the SERVER in the Kashipur campus (out of the 3 blocks) to get the best and effective connectivity. Justify your answer. — 1

(ii) Suggest a device/software to be installed in the Kashipur Campus to take care of data security. — 1

(iii) Suggest the best wired medium and draw the cable layout (Block — 1

	to Block) to economically connect various blocks within the Kashipur Campus. (iv) Suggest the placement of the following devices with appropriate reasons: a. Switch / Hub b. Repeater (v) Suggest a protocol that shall be needed to provide Video Conferencing solution between Kashipur Campus and Mussoorie Campus.	1 1 1

32.	(a) Write the output of the code given below:
	
	`p=5`
	`def sum(q,r=2):`
	`  global p`
	`  p=r+q**2`
	`  print(p, end= '#')`
	
	`a=10`
	`b=5`
	`sum(a,b)`
	`sum(r=5,q=1)`
	
	(b) The code given below inserts the following record in the table Student:
	
	RollNo – integer
	Name – string
	Clas – integer
	Marks – integer
	
	Note the following to establish connectivity between Python and MYSQL:
	• Username is root
	• Password is tiger
	• The table exists in a MYSQL database named `school`.
	• The details (`RollNo, Name, Clas` and `Marks`) are to be accepted from the user.
	
	Write the following missing statements to complete the code:
	Statement 1 – to form the cursor object
	Statement 2 – to execute the command that inserts the record in the table Student.
	Statement 3- to add the record permanently in the database
	
	`import mysql.connector as mysql`
	`def sql_data():`
	`  con1=mysql.connect(host="localhost",user="root",`
		2+3

```
password="tiger", database="school")
    mycursor=_____                    #Statement 1
    rno=int(input("Enter Roll Number :: "))
    name=input("Enter name :: ")
    clas=int(input("Enter class :: "))
    marks=int(input("Enter Marks :: "))
    querry="insert into student
values({},'{}',{},{})".format(rno,name,clas,marks)
    _____                             #Statement 2
    _____                             # Statement 3
    print("Data Added successfully")
```

OR

(a) Predict the output of the code given below:

```
s="welcome2cs"

n = len(s)
m=""
for i in range(0, n):
    if (s[i] >= 'a' and s[i] <= 'm'):
        m =   m +s[i].upper()
    elif (s[i] >= 'n' and s[i] <= 'z'):
        m = m +s[i-1]
    elif (s[i].isupper()):
        m = m + s[i].lower()
    else:
        m = m +'&'
print(m)
```

(b) The code given below reads the following record from the table named `student` and displays only those records who have marks greater than 75:

RollNo - integer
Name - string
Clas - integer
Marks - integer

Note the following to establish connectivity between Python and MYSQL:

- **Username is root**
- **Password is tiger**
- **The table exists in a MYSQL database named `school`.**

Write the following missing statements to complete the code:
Statement 1 – to form the cursor object
Statement 2 – to execute the query that extracts records of those students whose marks are greater than 75.
Statement 3- to read the complete result of the query (records whose

marks are greater than 75) into the object named `data`, from the table `student` in the database.

```
import mysql.connector as mysql
def sql_data():

     con1=mysql.connect(host="localhost",user="root",
     password="tiger", database="school")
    mycursor=_________________          #Statement 1
    print("Students with marks greater than 75 are :
")
    ___________________________         #Statement 2
    data=_____________________          #Statement 3
    for i in data:
        print(i)
    print()
```

33. What is the advantage of using a csv file for permanent storage? Write a Program in Python that defines and calls the following user defined functions: 5

(i) ADD() – To accept and add data of an employee to a CSV file 'record.csv'. Each record consists of a list with field elements as `empid, name` and `mobile` to store employee id, employee name and employee salary respectively.

(ii) COUNTR() – To count the number of records present in the CSV file named 'record.csv'.

OR

Give any one point of difference between a binary file and a csv file. Write a Program in Python that defines and calls the following user defined functions:

(i) add() – To accept and add data of an employee to a CSV file 'furdata.csv'. Each record consists of a list with field elements as `fid, fname` and `fprice` to store furniture id, furniture name and furniture price respectively.

(ii) search()- To display the records of the furniture whose price is more than 10000.

SECTION E

34. Navdeep creates a table RESULT with a set of records to maintain the marks secured by students in Sem 1, Sem2, Sem3 and their division. After creation of the table, he has entered data of 7 students in the table. 1+1+2

ROLL_NO	SNAME	SEM1	SEM2	SEM3	DIVISION
101	KARAN	366	410	402	I
102	NAMAN	300	350	325	I

103	ISHA	400	410	415	I
104	RENU	350	357	415	I
105	ARPIT	100	75	178	IV
106	SABINA	100	205	217	II
107	NEELAM	470	450	471	I

Based on the data given above answer the following questions:

(i) Identify the most appropriate column, which can be considered as Primary key.

(ii) If two columns are added and 2 rows are deleted from the table result, what will be the new degree and cardinality of the above table?

(iii) Write the statements to:

a. Insert the following record into the table
Roll No- 108, Name- Aadit, Sem1- 470, Sem2-444, Sem3-475, Div – I.

b. Increase the SEM2 marks of the students by 3% whose name begins with 'N'.

OR (Option for part iii only)

(iii) Write the statements to:

a. Delete the record of students securing IV division.

b. Add a column REMARKS in the table with datatype as `varchar` with 50 characters

35. Aman is a Python programmer. He has written a code and created a binary file `record.dat` with employeeid, ename and salary. The file contains 10 records.
He now has to update a record based on the employee id entered by the user and update the salary. The updated record is then to be written in the file `temp.dat`. The records which are not to be updated also have to be written to the file `temp.dat`. If the employee id is not found, an appropriate message should to be displayed.
As a Python expert, help him to complete the following code based on the requirement given above:

```
import _______                                  #Statement 1
def update_data():
    rec={}
    fin=open("record.dat","rb")
    fout=open("_____________")                  #Statement 2
    found=False
    eid=int(input("Enter employee id to update their
```

```
salary :: "))
while True:
  try:
    rec=_____________                    #Statement 3
    if rec["Employee id"]==eid:
         found=True
         rec["Salary"]=int(input("Enter new salary
    :: "))
         pickle._____________          #Statement 4
    else:
         pickle.dump(rec,fout)
  except:
    break
if found==True:
  print("The salary of employee id  ",eid,"  has
  been updated.")
else:
  print("No employee with such id is not found")
fin.close()
fout.close()
```

1

(i) Which module should be imported in the program? (Statement 1) 1

(ii) Write the correct statement required to open a temporary file named `temp.dat`. (Statement 2)

(iii) Which statement should Aman fill in Statement 3 to read the data from the binary file, `record.dat` and in Statement 4 to write the updated data in the file, `temp.dat`? 2

KENDRIYA VIDYALAYA NO 4 ONGC VADODARA

HOLIDAY HOMEWORK

(Autumn Break)

CLASS – XII

1. Difference between hardware and software
2. Difference between system software & Application Software
3. Difference between RAM and ROM
4. Difference between compiler and interpreter.
5. Difference between list and tuple.
6. Mutable and immutable type
7. Practice Basic Python programs.
8. Write Python Program in practical notebook.
9. Complete Project Work as assigned.

KENDRIYA VIDYALAYA NO. 4, ONGC,VADODARA

HOLIDAYS(AUTUMN BREAK) HOMEWORK

Class – 12

Subject: Mathematics

Session: 2023-24

Q1.If A =$\{1, 3, 5, 7\}$ and B= $\{1, 2, 3, 4, 5, 6, 7, 8\}$ then the number of one to one function from A into B is:

(a)1340 b) 1860 c) 1430 d) 1680

Q2.The relation R on the set A =$\{1, 2, 3\}$ given by R = $\{(1, 1), (1, 2), (2, 2), (2, 3), (3, 3)\}$ is:

(a) Reflexive b) Symmetric c) Transitive d) Equivalence

Q3. Given set A = $\{1, 2, 3\}$ and a relation R = $\{(1, 2), (2, 1)\}$ will be :
a) reflexive if (1,1) is added b) symmetric if (2,3) is added
c) transitive if (1,1) is added d) symmetric if (3,2) is added

Q4. If R is an equivalence relation on A = $\{x\epsilon\, Z : 0 \leq x \leq 15\}$ given by:
R = $\{(a, b): |a - b| \text{ is a multiple of } 5\}$ then the set of elements related to 6 are

a) $\{0, 11\}$ b) $\{6, 15\}$ c) $\{6, 11\}$ d) $\{0, 6\}$

Q5..The number of bijective functions from set A to itself when A contains 6 elements is:

(a) 6^2
(b) $6!$
(c) 2^6
(d) 6

Q6.The maximum number of equivalence relations on the set

$A = \{1, 2, 3\}$ **are:**

(a) 1
(b) 2
(c) 3
(d) 5

Q7.Let $A = \{1, 2, 3\}$ **and consider the relation** $R = \{(1, 1), (2, 2), (3, 3), (1, 2), (2, 3), (1, 3)\}$. **Then R is:**

(a) reflexive but not symmetric

(b) reflexive but not transitive

(c) symmetric and transitive

(d) neither symmetric, nor transitive

Q8 .Let $A = \{1, 2, 3, \ldots, n\}$ **and** $B = \{a, b\}$. **Then the number of surjections from A into B is:**

(a) 2^n

(b) $2^n - 2$

(c) $2^n - 1$

(d) none of these

Q9. A relation R define as

$R = \{(x, y): x, y \in R \ \ and\ x - y + \sqrt{3}\ \ is\ an\ irrational\ number\}$. **Then the relation R is**

(a) reflexive only

(b) symmetric only

(c) transitive only

(d) None of these

Q10. Let R be a relation on the set L of lines defined by $R = \{(l_1, l_2): l_1 \text{ is perpendicular to } l_2\}$ **. The relation R is:**

a) Reflexive **b) Symmetric** **c)Transitive** **d)Equivalence**

Q11. et R be the equivalence relation in the set $A = \{0, 1, 2, 3, 4, 5\}$ **given by** $R = \{(a, b): 2 \text{ divides } (a - b)\}$. **Then the equivalence class** $[0]$ **is:**

a) $\{0, 1, 3\}$ **b)** $\{0, 2, 4\}$ **c)** $\{1, 3, 5\}$ **d)** $\{0\}$

Q12. he number of onto functions from set {1, 2, 3, 4} to {3, 4, 7} is:

(a) 18 **(b) 36** **(c) 64** **(d) None of these**

Q13. f f : R → R, f(x) = 5x + 7 then the function f is:

(a) One one and onto **(b) One one and not onto**

(c) Onto but not one one **(d) Neither one one nor onto**

Q14 If a relation R on the set {1, 2, 3} be defined by R = {(1, 2)}. Then, R is:

(a) Reflexive **(b) Transitive** **(c) Symmetric** **(d) None of these**

Q15.Which of the following functions from Z into Z are bijections ?

(a) $f(x) = x^3$ **(b)** $f(x) = x + 2$ **(c)** $f(x) = 2x + 1$ **(d)** $f(x) = x^2 + 1$

Q16. If .R = {(x, y) : x is wife of y}, then R is:

(a) reflexive **(b) symmetric**
(c) transitive **(d) an equivalence relation**

Q17. Let us define a relation R in R as *a R b* if a ≥ b. Then R is:

(a) An equivalence relation
(b) Reflexive, transitive but not symmetric
(c) Symmetric, transitive but not reflexive
(d) Neither transitive nor reflexive but symmetric

Q18.Let f:R→R be defined as f(x) = 3x then f is:

(a)one-one onto **(b) many one onto**
(c) one-one but not onto **(d) neither one-one nor onto**

Q19. Let A = {x : -1 ≤ x ≤ 1} and f : A → A is a function defined by f(x) = x |x| then f is
(a) A bijection **(b) Injection but not surjection**
(c) Surjection but not injection **(d) Neither injection nor surjection**

Q20.The number of surjective functions from A to B where A = {1, 2, 3, 4} and B = {a, b} is
(a) 14 **(b) 12** **(c) 2** **(d) 15**

ASSERTION AND REASON TYPE QUESTIONS(Q21 TO Q30)

Directions: Each of these questions contains two statements, Assertion and Reason. Each of these questions also has four alternative choices, only one of which is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below.

(a) Assertion is correct, reason is correct; reason is a correct explanation for assertion.
(b) Assertion is correct, reason is correct; reason is not a correct explanation for assertion
(c) Assertion is correct, reason is incorrect
(d) Assertion is incorrect, reason is correct.

21.Assertion : f : R →R defined by f (x) = sin x is a bijection.

Reason : If f is both one-one and onto it is bijection.

22. Assertion: The relation R in the set {1, 2, 3} given by R = {(1, 1), (2, 2),(3, 3), (1, 2), (2, 3)} is reflexive but neither symmetric nor transitive.

Reason: R is not symmetric, as (1, 2) ∈R but (2, 1) ∉R. Similarly, R is not transitive, as (1, 2) ∈R and (2, 3) ∈R but (1, 3) ∉R.

23. Assertion : The function f : R → R given by $f(x) = x^3$ is injective.

Reason : The function f : X → Y is injective, if f(x) = f(y) x = y for all x, y ∈ X.

24. Assertion: If n (A) = p and n(B) = q The number of relation from set A to B is pq

Reason: The number of subsets of A X B is 2^{pq}

25. Assertion: The relation R in R defined as R = {(a, b): a ≤ b} is not equivalence relation.

Reason: Since R is not reflexive but it is symmetric and transitive.

26. Assertion (A): Domain of the function$\sin^{-1}(2x-1)$ is [0,1]

Reason (R): Domain of the function $\text{Sin}^{-1}\,x$ is [-1,1]

27. Assertion (A): The value of $cos\left\{\frac{\pi}{2}-(-\frac{1}{2})\right\}=\frac{1}{2}$

Reason (R): $\text{Sin}^{-1}\,(-x) = Sin\ -1$ (x)

28. Assertion (A):$\text{Sin}-1\left(\ sin\ \left(\frac{2\pi}{3}\right)\right)=\ \frac{2\pi}{3}$

Reason (R): $\sin^{-1}(-x) = -\sin^{-1}x\ \ if\ \ x\epsilon[-1,1]$

29. Assertion (A): $\sin^{-1}(-1/2) = -\frac{\pi}{6}$

Reason (R): Principal value branch of $\sin^{-1}x$ is $[-\frac{\pi}{2},\frac{\pi}{2}]$ and $sin\ sin\ (-\theta) =\ -sin\theta$

30. Assertion (A): Range of $\tan^{-1}x$ is $\left([-\frac{\pi}{2},\frac{\pi}{2}\right)$

Reason (R): Domain of $\tan^{-1} x$ is R.

SMALL ANSWER QUESTIONS, LONG ANSWERS QUESTIONS AND VERY LONG ANSWERS QUESTIONS(Q 31 TO Q 50)

31.Show that the relation S in the set of integers Z given by

$S = \{(a, b) : a, b \in Z, |a - b| \text{ is divisible by } n\}$ **is transitive**

32.Let $f: N \to N$ **is defined by** $f(x) = x^2 + x + 1$, **prove that** f **is not onto.**

33.Let $f: R - \left\{\frac{2}{3}\right\} \to R - \left\{\frac{2}{3}\right\}$ **be a function defined by** $f(x) = \frac{2x + 3}{3x - 2}$, $x \neq \frac{2}{3}$ **. Show that it is a bijection.**

34.Show that $f: N \to N$, **given by** $f(x) = \begin{cases} x + 1 & , \text{ if } x \text{ is odd} \\ x - 1 & , \text{ if } x \text{ is even} \end{cases}$, **is a bijection.**

35.Show that the function f: R → R is given by f(x) = x^3 is injective.

36 Show that the relation R in the set {1, 2, 3} given by R = {(1, 2), (2, 1)} is symmetric but neither reflexive nor transitive.

37. Check the injectivity of f : R → R , f(x) = x^3 .

38.Let A = R {3} and B = R – {1}. Consider the function f: A →B defined by f (x) = (x- 2)/(x - 3). Is f one-one and onto? Justify your answer.

39.Show that the relation R on A , A = { x ; x ∈ Z , 0 ≤ x ≤ 12 } defined as R = {(a ,b): |a - b| is multiple of 3.}, is an equivalence relation.

40.Show that the modulus function f R -> R, given by f(x) = [x] is neither one-one nor on-to.

41 .Prove that R is an equivalence relation,where R:N ×N→N defined as (a,b) R (c,d) if and only if ad(b+c) = bc(a+d).

42.Let N be the set of natural numbers and R be the relation in NX N defined by (a,b) R (c,d) if and only if a+d=b+c. Show that R is an equivalence relation.

INVERSE TRIGONOMETRIC FUNCTIONS

42.Find the principal value of the following:

a) $sin^{-1}(\frac{1}{\sqrt{2}})$ **b)** $cos^{-1}(\frac{-1}{\sqrt{2}})$ **c)** $tan^{-1}(\frac{-1}{\sqrt{3}})$ **d)** $cosec^{-1}(-2)$ **e)** $sec^{-1}(-\frac{2}{\sqrt{3}})$

43.Find the value of the following:

a) $sin^{-1}(sin\frac{3\pi}{5})$ **b)** $cos^{-1}(cos\frac{13\pi}{6})$ **c)** $tan^{-1}(tan\frac{7\pi}{6})$ **d)** $cosec^{-1}(cosec\frac{\pi}{8})$

MATRICES

44. Construct 2×3 matrix A = [a_{ij}] whose elements a_{ij} is given by $a_{ij} = \frac{(2i+j)^2}{3}$

45. Find X and Y if 2 X + Y = $\begin{bmatrix}4 & 4 & 7\\ 7 & 3 & 4\end{bmatrix}$, X - 2Y= $\begin{bmatrix}-3 & 2 & 1\\ 1 & -1 & 2\end{bmatrix}$

46. Find x and y if A = $\begin{bmatrix}2 & 3\\ 1 & 2\end{bmatrix}$ so that $A^2 - x\,A + y\,I = 0$.

47. If $A=\begin{bmatrix}1 & 0\\ -1 & 7\end{bmatrix}$, find k such that $A^2 - 8A + kI = 0$.

48. Solve for x : $\begin{bmatrix}1 & x & 1\end{bmatrix}\begin{bmatrix}1 & 3 & 2\\ 2 & 5 & 1\\ 15 & 3 & 2\end{bmatrix}\begin{bmatrix}1\\ 2\\ x\end{bmatrix}$=0

49. Let A =$\begin{bmatrix}2 & 3\\ -1 & 2\end{bmatrix}$ *then* show that $A^2-4A+7I=O$ ..

50. Find the matrix X such that $\begin{bmatrix}2 & -1\\ 0 & 1\\ -2 & 4\end{bmatrix}X=\begin{bmatrix}-1 & -8 & -10\\ 3 & 4 & 0\\ 10 & 20 & 10\end{bmatrix}$

51.**If x= a(1-cosθ), y =a(θ+ sin θ), prove that y" = - $\frac{1}{a}$ at θ = 90^0**

52. Find the absolute maximum and the absolute minimum values of the function $f(x) =2x^3-15x^2+36x+1$ on the interval [1 , 5]

53.Show that the volume of the largest cone that can be inscribed in a sphere of radius R is $8/27$ of The volume of the sphere.

54. $\int(4x+1)/(x^2+3x+2)\,.dx$

55.Find the area of the region enclosed by $y = x^2$ and the line y = 16 .

56. Find the general solution of the differential equation $y.dx - (x + 2y^2)dx = 0$

KENDRIYA VIDYALAYA SABARMATI, AHMEDABAD
MINIMUM LEARNING PROGRAMME FOR CBSE BOARD EXAM, 2023
CLASS: XII (PHYSICS)

Chapter 1: Electric charge & field

1. State Coulomb's law of electrostatics.
2. What is electric field intensity? Write its S.I. unit. Draw the electric field lines for (i) $q>0$ (ii) $q<0$ (iii) two equal positive charges (iv) Electric diploe (v) Uniform electric field.
3. What is an electric dipole? Define dipole moment. Write its S.I. unit. Derive an expression for electric field due to dipole (i) At axial point (ii) At equatorial point.
4. Derive an expression for torque acting on dipole in an external electric field.
5. Define electric flux. Either electric flux is a scalar or vector quantity? Write its S.I. unit.
6. State gauss's theorem & use it to derive an expression for electric field due to infinitely long charged straight wire of linear charge density λ. Draw the graph showing the variation of electric field with distance.
7. Derive an experience for electric field due to a uniformly charged spherical shell of radius 'R' at (i) outside the sphere ($r>R$) and inside the sphere ($r<R$). Draw the graph showing the variation of electric field with distance.
8. State gauss's theorem & use it to derive an expression for electric field due to infinitely charged plane sheet of surface charge density σ. Draw the graph showing the variation of electric field with distance.

Chapter 2: Electric potential & capacitance

1. Define electric potential & electric potential difference. Write its S.I. unit. Derive expression for electric potential due to (i) a point charge (ii) electric dipole
2. Derive an expression for potential energy of a system of (i) two point charges and (iii) three point charges.
3. Derive and expression for potential energy of a two charges system q_1 and q_2 placed in a uniform electric field.
4. Derive an expression for work done in a rotating a dipole in a uniform electric field and hence find the expression for potential energy in this case.
5. Draw equipotential surface for (i) positive point charge ($q>0$) (ii) negative point charge ($q<0$) (ii) two equal positive charges (iii) Electric diploe and (v) uniform electric field.
6. Define electrical capacitance. Write its S.I. unit. State the principle of parallel plate capacitor. Derive an expression for its capacitance.

Chapter 3: Current electricity

1. Define drift velocity and relaxation time and derive an expression for drift velocity in terms of relaxation time.
2. Using the concept of free electron of free electrons in the conductor, derive the expression for resistivity/conductivity of a wire in terms of number density and relaxation time. Hence obtain the relation between current density and the applied electric field.
3. Define internal resistance of cell. On which factors internal resistance of a cell depends. Derive relation between emf and terminal potential of cell.
4. Two cells of emfs E_1 & E_2 and internal resistance r_1 & r_2 are connect in parallel. Find the expression for equivalent e.m.f. and internal resistance.
5. Two cells of emfs E_1 & E_2 and internal resistance r_1 & r_2 are connect in series. Find the expression for equivalent e.m.f. and internal resistance.

6. Draw the graph between resistivity and temperature for (i) copper (ii) nichrome and (iii) semiconductor.
7. State Kirchhoff's laws for an electrical circuit. Which physical quantities are conserved in Kirchhoff's laws?
8. What is Wheatstone bridge? Find the condition of balance Wheatstone bridge using Kirchhoff's laws.

Chapter 4: Moving Charges & Magnetism

1. State Bio-Savart's law. Write its vector form. Derive an expression for magnetic field at axial point of a current carrying circular coil.
2. State Ampere's law. Apply it to find magnetic field due to (i) infinitely long straight current carrying wire (ii) Straight Solenoid
3. Derive expression for force between two infinitely long straight current carrying wires. Hence define ampere.
4. Derive an expression for the torque acting on a loop of N turns area **A**, carrying current I, when held in a uniform magnetic field **B** at an angle θ.
5. On which principle moving coil galvanometer works. Explain construction, theory and working of moving coil galvanometer (with labeled diagram). How galvanometer is converted into (i) Ammeter (ii) Voltmeter. Explain with circuit diagram in each case.

Chapter 5 : Magnetism & Matter

1. Explain the properties of para, dia and ferro-magnetic substances. Write the examples of each.
2. Draw the magnetic field lines pattern when (i) diamagnetic material and (ii) para magnetic material placed in a magnetic field.
3. Name the magnetic material whose magnetic susceptibility is (i) small and negative (ii) small and positive and (iii) very large and positive.
4. How will the magnetic susceptibility of (i) diamagnetic material and (ii) paramagnetic material vary with temperature.
5. Derive an expression for magnetic moment of revolving electron.

Chapter 6: Electromagnetic Induction

1. State Faraday's law of electromagnetic induction and Lentz' law.
2. Define magnetic flux. Either this quantity is scalar or vector? Write its S.I. unit.
3. Define self-inductance. Derive an expression for self inductance of a long straight solenoid. On which factors self-inductance of solenoid depends?
4. Define mutual inductance. Derive an expression for mutual inductance of two long straight solenoids. On which factors mutual inductance of two solenoids depends?

Chapter 7: Alternating Current

1. (a) Define(i) inductive reactance (ii) capacitive reactance and (iii) impedance.
   (b) Draw the graph between (i) X_L and frequency (ii) X_C and frequency.
2. Find the expression for impedance in the circuit when resistor, inductor and capacitor are connected in series with AC source. Explain resonance condition.
3. Describe the principle, construction and working of AC generator with a neat labeled diagram.
4. Explain the construction, principle and theory of transformer. Write about different losses of transformer.

Chapter 8: Electromagnetic waves

1. Draw diagram of electromagnetic wave propagating in x-direction.
2. What is the relation between E and B for an electromagnetic wave propagating in vacuum?

3. What is displacement current? Write its expression.
4. Electromagnetic Spectrum: (Radio, micro, infrared, visible, uv, x-ray and gamma rays) Frequency, wavelength and uses(applications).

Chapter 9: Ray Optics

1. A ray of light when moves from denser to rarer medium undergo total internal reflection. Drive the expression for critical angle in terms of speed of light in the respective media. Write the conditions for T.I.R.
2. What is optical fiber? Draw its diagram. Write its uses.
3. Draw the ray diagram for a right angled isosceles prism when incident ray (i) deviates through 90^0 and (ii) deviate through 180^0
4. Derive mirror formula. Define linear magnification.
5. Draw the ray diagram for a prism. Derive and expression for refractive index of prism in terms of angle of minimum deviation.
6. Trace the rays of light showing the formation of an image due to a point object placed on the axis of a spherical surface separating the two media of refractive indices n_1 and n_2. Establish the relation between the distances of the object, the image and the radius of curvature from the central point of the spherical surfaces. Derive the lens-maker's formula in case of a double convex lens. State the assumptions made and convention of signs used.
7. Draw a labeled ray diagram to show the formation of an image by a compound microscope (i) When final image formed at the least distance of distinct vision and (ii) when final image is formed at infinity (normal adjustment). Write the expressions for its magnifying power in each case.
8. Draw a labeled ray diagram to show the formation of an image by a refracting telescope (Astronomical telescope) (i) When final image formed at the least distance of distinct vision and (ii) when final image is formed at infinity (normal adjustment). Write the expressions for its magnifying power in each case.
9. Draw a labelled diagram of a reflecting type telescope (Cassegrain telescope). Write four advantages of a reflecting type telescope over a refracting type telescope.

Chapter 10: Wave Optics

1. What is wave front. State Huygens's principle and use it to prove laws of reflection and laws of refraction (Snell's law).
2. What are coherent sources of light? Two slits in Young's double slit exp. are illuminated by two different sodium lamps emitting light of the same Wavelength. Why is no interference pattern observed?
3. Draw the graph showing intensity distribution in young's double experiment.
4. What is the effect on the interference pattern observed in a Young's double slit experiment in the following cases:
   i) Screen is moved away from the plane of the slits,
   ii) Separation between the slits is increased, and
   iii) Widths of the slits are doubled, Give reasons for your answer.
5. What is diffraction of light? Discuss single slit experiment for diffraction. Draw the graph to show the relative intensity distribution for a single slit diffraction pattern. Obtain the expression for the width of central maxima.

Chapter 11: Dual nature of Radiation & Matter

1. Define (i) work Function (ii) Threshold frequency (iii) stopping potential
2. Write the name the phenomena which explains the quantum/particle nature of radiation.
3. Show on a plot the nature of variation of photoelectric current with the intensity of radiation incident on a photosensitive surface.

4. Plot a graph showing the variation of photoelectric current as a function of anode potential for two light beams having the same frequency but different intensities I_1 and I_2 ($I_1 < I_2$).
5. Draw a plot showing the variation of photoelectric current with collector plate potential for two different frequencies, $v_1 < v_2$, of incident radiation having the same intensity. In which case will the stopping potential be higher? Justify your answer.
6. Draw a graph showing the variation of stopping potential with frequency of incident radiation for two photosensitive materials having work functions W_1 and W_2 ($W_1 < W_2$).
7. State laws of photoelectric emission.
8. Write the Einstein's photelectric equation. Write Einstein's theory which explain the photoelectric effect.
9. (i) What is the effect on photoelectric current if we increase (a) Intensity of light (b) Frequency of incident radiation? Justify your answer.
   (ii) What is the effect on kinetic energy of electrons if we increase (a) Intensity of light (b) Frequency of incident radiation? Justify your answer.
10. Derive the Bohr's quantization condition for angular momentum of the orbiting of electron in hydrogen atom, using de Broglie's hypothesis. Draw diagram.
11. Why photoelectric effect cannot be explained on the basis of wave nature of light? Give two reasons.
12. Plot a graph showing variation of de-Broglie wavelength λ versus $1/\sqrt{V}$, where V is accelerating potential for two particles A and B carrying same charge but of masses m_1, m_2 ($m_1 > m_2$). Which one of the two represents a particle of smaller mass and why?

Chapter 12: Atoms

1. Draw the diagram of Geiger-Marsden experiment (alfa scattering experiment). Derive an expression of distance of closeted approach(r_0) in this experiment.
2. State bohr's postulates of atomic theory or Hydrogen atom. Drive an expression for (i) The radius of orbit. (ii) Total energy of electron in nth orbit.
3. THE total energy of and electron in the first excited state of hydrogen atom is -3.4 eV. Calculate
   (1) K.E. of the electron in this state.
   (2) P.E. of the electron in this state and
   (3) Which of the answer would change of the choice. Justify your answer?
4. Draw a neat labeled energy level diagram and explain the different series of spectral lines for the hydrogen atom.

Chapter 13: Nuclei

1. Write an expression for radius of nucleus (size of nucleus). If ratio of mass number of two nuclei is 8: 125, then find the ratio of their radii.
2. What is the ratio densities of two nuclei if ratio of their radii is 27:125?
3. What is the amount of energy in 1 atomic unit mass in eV?
4. Define (i) mass defect (ii) nuclear binding energy (iii) nuclear binding energy per nucleon.
5. Draw a graph showing the variation of binding energy per nucleon with mass number for different nuclei. Explain, with the help of this graph, the release of energy by the process of nuclear fission and fusion.
6. What is nuclear force? Write four properties of nuclear force. Draw the graph showing the variation in potential energy of any two nucleon and distance between them.

Chapter 14: Semiconductor Electronics: Material, Devices and Simple Circuits

1. What are energy bands? Distinguish between a conductor, an insulator and a semiconductor on the basis of energy band diagram.
2. What is the ratio of hole and electron concentration (**number density**) in intrinsic semiconductor?
3. At what temperature intrinsic semiconductor behaves like insulator?
4. Name the extrinsic semiconductor in which (i) hole concentration is greater than electron concentration and (ii) electron concentration is greater than hole concentration.
5. Name the extrinsic semiconductor formed by adding the impurities from (i) 13 group (B or In or A/) of periodic table and (ii) 15 group (As or P or Sb) of periodic table.
6. Draw energy Band diagram for n and p type semiconductors.
7. Explain formation of depletion region p-n junction. Define (i) potential barrier and (ii) depletion region. Write two important terms involved in the process of formation of depletion region.
8. How does its width change when the junction is at
   (i) Forward biased, and (ii) reverse biased Explain with diagram?
9. Explain (i) forward biasing, (ii) reverse biasing of a P-N junction diode with the help of a circuit diagram, also draw its characteristic curve for (i) forward biasing, (ii) reverse biasing of a P-N junction diode
10. Explain the use of a p-n junction diode as a rectifier. Draw the circuit diagram of a full wave rectifier/half wave and explain its working. Draw the input and output wave form.

CBSE

ADDITIONAL PRACTICE QUESTIONS

Physics-Theory

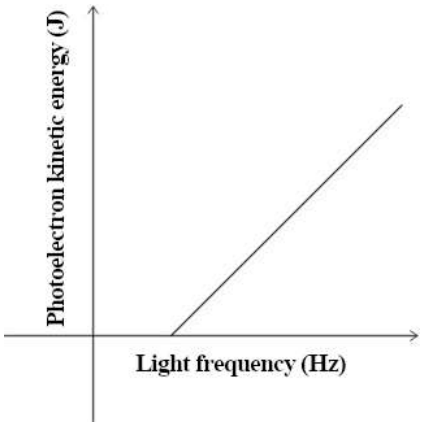
Class XII | 2023–24

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 1 mark 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 one question in Section B, one question in Section C, one question in each CBQ in Section D 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.

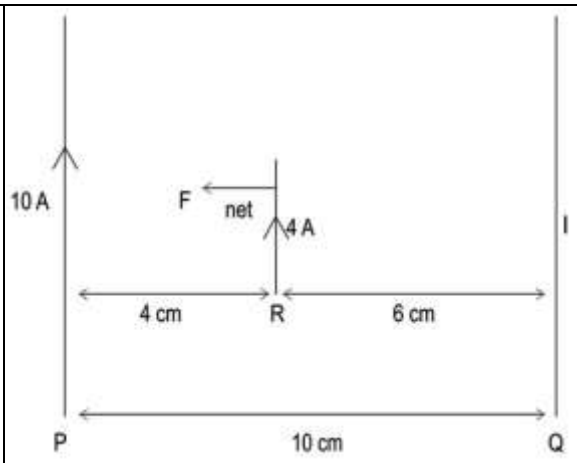
Q.No	Questions	Marks
	SECTION A	
1	An electric dipole having a dipole moment of 4×10^{-9} C m is placed in a uniform electric field such that the dipole is in stable equilibrium. If the magnitude of the electric field is 3×10^{3} N/C, what is the work done in rotating the dipole to a position of unstable equilibrium? A. zero B. 1.2×10^{-5} J C. 2.4×10^{-5} J D. $- 1.2 \times 10^{-5}$ J	1
2	An infinite line of charge has a linear charge density of 10^{-7} C/m. What will be the magnitude of the force acting on an alpha particle placed at a distance of 4 cm from the line of charge? A. 14.4×10^{-15} N B. 7.2×10^{-15} N C. 4.5×10^{4} N D. 9×10^{4} N	1

<table>
<tr><td>3</td><td>The graph below shows the variation of the maximum kinetic energy of the emitted photoelectron with the frequency of the incident radiation for a given metal.
 

Which of the following gives the work function of the metal?

A. x-intercept
B. y-intercept
C. the slope of the graph
D. the area under the graph</td><td>1</td></tr>
<tr><td>4</td><td>When an electron in an atom moves from the ground state to a higher energy level what happens to its kinetic and potential energies?

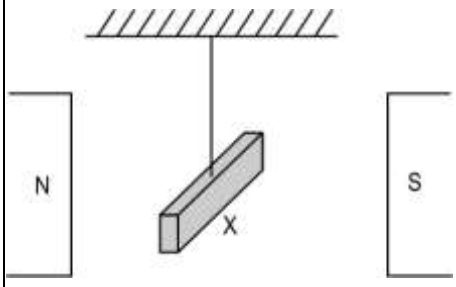
<table><tr><td></td><td>kinetic energy</td><td>potential energy</td></tr><tr><td>A</td><td>increases</td><td>Increases</td></tr><tr><td>B</td><td>increases</td><td>Decreases</td></tr><tr><td>C</td><td>decreases</td><td>Increases</td></tr><tr><td>D</td><td>decreases</td><td>Decreases</td></tr></table></td><td>1</td></tr>
<tr><td>5</td><td>Two long and straight current-carrying wires, P and Q are placed parallel to each other separated by a distance of 10 cm. A wire 'R' of length 8 cm and carrying a current of 4 A is placed between the two wires P and Q as shown below.</td><td>1</td></tr>
</table>



If the wire R, experiences a net force towards wire P, then which of the following is definitely TRUE about the current 'I' in wire Q?

A. Current I cannot be in the upward direction.
B. Current I can have any magnitude greater than 0 A in the upward direction.
C. Current I cannot have a magnitude of more than 15 A in the upward direction.
D. Current I cannot have a magnitude of more than 10 A in the upward direction.

6	A rod when suspended in a uniform magnetic field aligns itself perpendicular to the magnetic field as shown below.	1

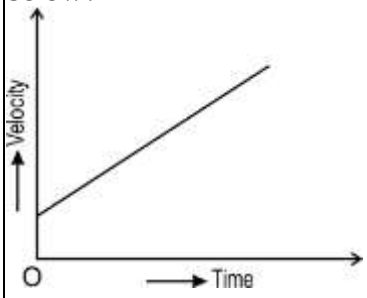
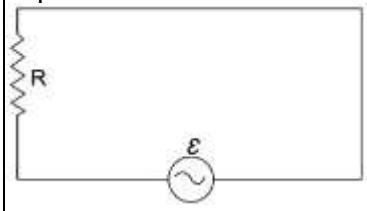


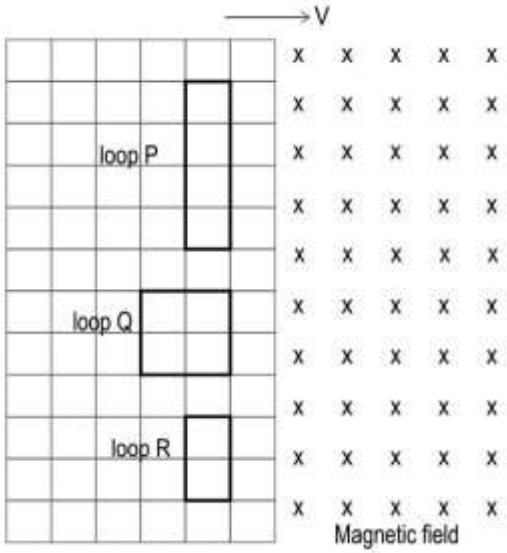
Which of the following statements is/are true for the rod?
P) Every atom in the rod, has a zero magnetic moment.
Q) The rod is attracted when taken near the poles of a strong magnet.
R) The relative permeability of the material of the rod is slightly less than 1.
S) The susceptibility of the material of the rod is directly proportional to temperature.

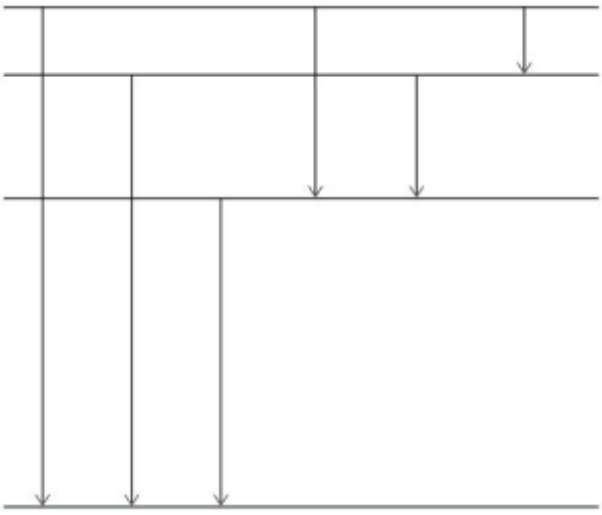
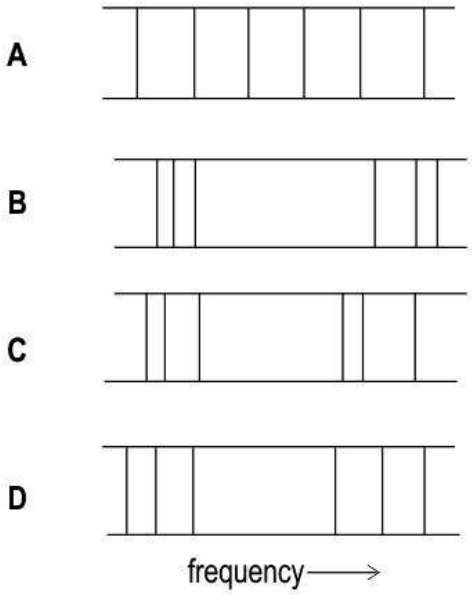
A. only Q
B. only P and R
C. only Q and S
D. only R and S

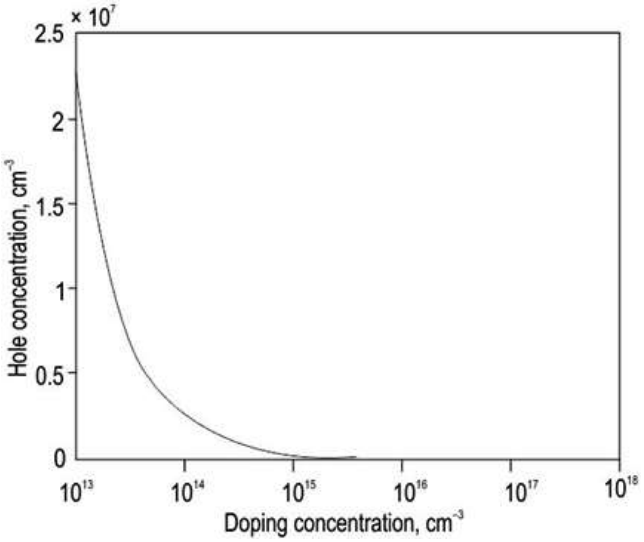
7	Three students construct a solenoid of length 35 cm. They are each given insulated copper wire of the same length. The table below lists some details about the solenoids made by them. Compare the magnetic field produced by the solenoids made by the three students. A. $B_1=B_3<B_2$ B. $B_3<B_1<B_2$ C. $B_1<B_2<B_3$ D. $B_1=B_2>B_3$	1

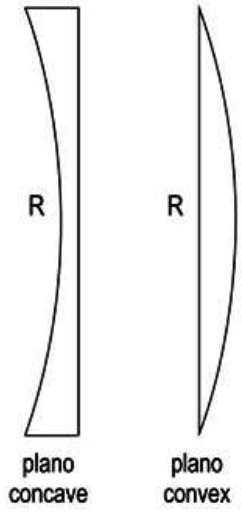
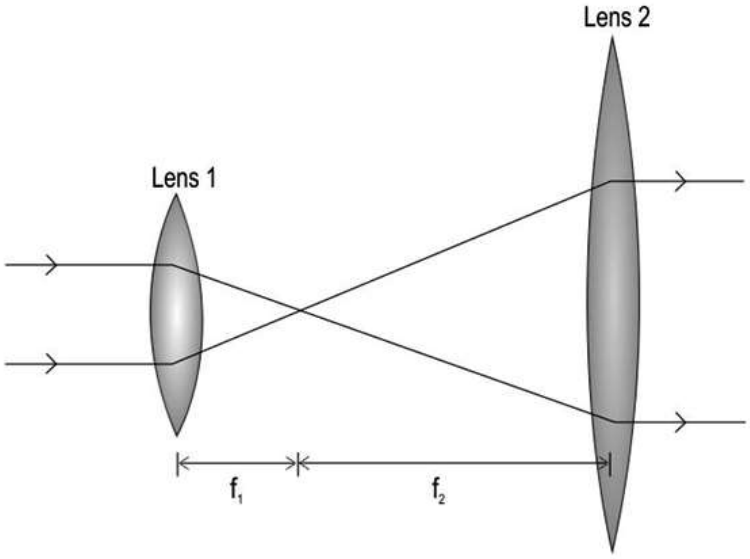
	Magnetic field produced	Radius of solenoid	Core of solenoid
Student 1	B_1	3 cm	air
Student 2	B_2	3 cm	iron
Student 3	B_3	6 cm	air

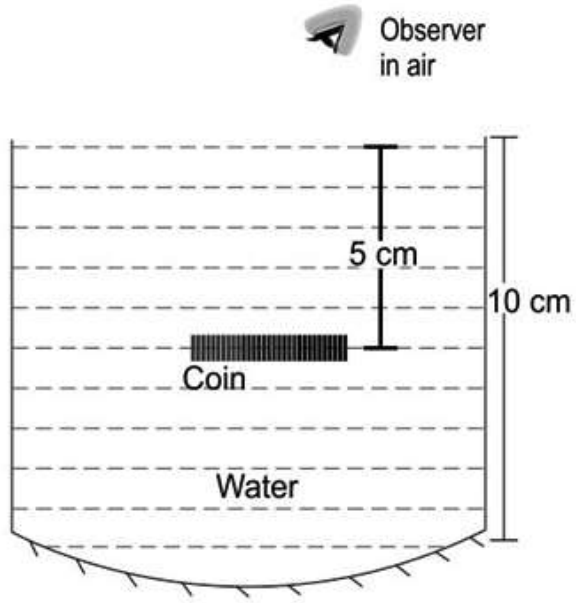
8	A charged particle '+q' having a mass 'm' moves in a uniform electric and magnetic field. In which of the following scenarios will the path of the charged particle be linear and described by the velocity time graph shown below?  A. E ⊥ B ⊥ velocity of the particle B. E || B and the particle is initially at rest C. E || B and the particle has an initial velocity along the electric field D. E ⊥ B and the particle has an initial velocity along the electric field	1
9	A pure resistor is connected to an AC power source as shown below.  Which of the following statement(s) is/are TRUE? I: The average current flowing through the circuit during one full cycle is zero.	1

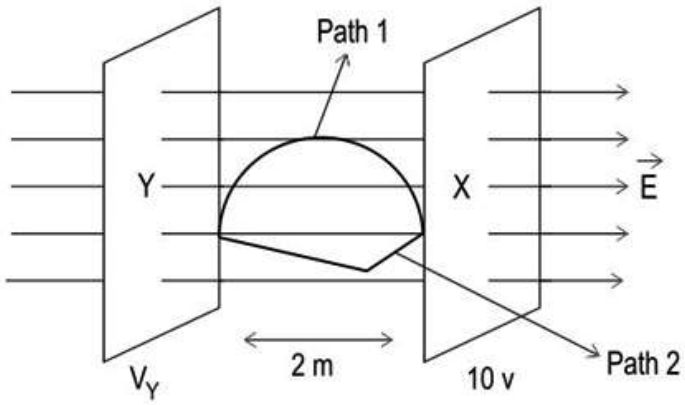
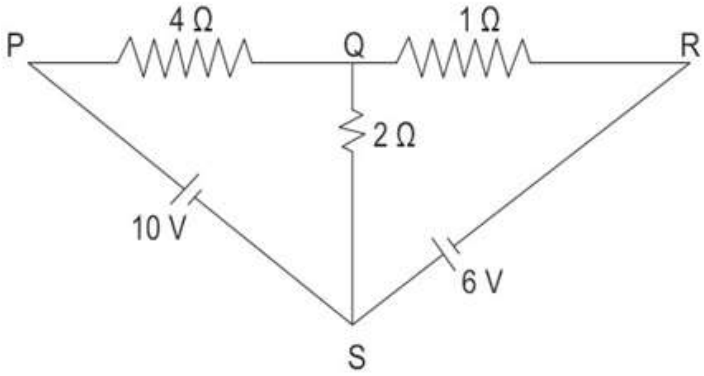
	II: The current in the resistor leads the voltage by $\pi/2$. III: The average power dissipated by the resistor is zero. A. only I B. only I and II C. only II and III D. all - I, II and III	
10	At what rate does the electric field change between the plates of a square capacitor of side 5 cm, if the plates are spaced 1.2 mm apart and the voltage across them is changing at a rate of 60 V/s? A. 7.2×10^{-2} $Vm^{-1}s^{-1}$ B. 30×10^{-1} $Vm^{-1}s^{-1}$ C. 12×10^{2} $Vm^{-1}s^{-1}$ D. 5×10^{4} $Vm^{-1}s^{-1}$	1
11	Three loops as shown below move into the magnetic field with a velocity v.  In which loop(s) will the induced emf be the **largest** at the instant when the loops enter the magnetic field? A. only P B. only Q C. only P and Q D. only Q and R	1
12	The emission spectrum of an element is the spectrum of frequencies of em radiations emitted due to electrons making a transition from a higher energy state to a lower energy state. The diagram below shows electrons transitioning from higher energy states to lower energy states.	1

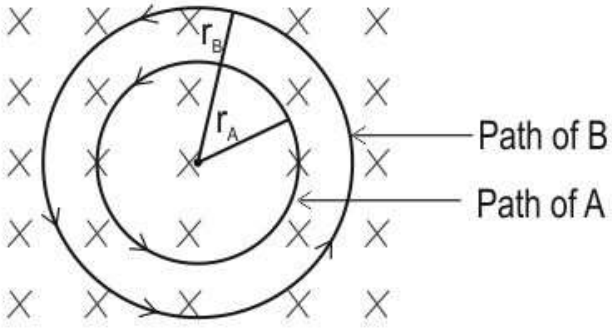
	 Which of the following spectrums most closely corresponds to the above transitions?  	
	For Questions 13 to 16, two statements are given –one labelled Assertion (A) and other labelled Reason (R). Select the correct answer to these questions from the options as given below. **A. Assertion and Reason are true and Reason is the correct explanation of Assertion.** **B. 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): The work function of a given material increases with an increase in the frequency of the incident radiation.	1

	Reason (R): As per Einstein's photoelectric equation $h\nu = \varphi + KE$, work function φ is directly proportional to the frequency ν of the incident radiation.	
14	Assertion (A): The conductivity of intrinsic semiconductors increases with an increase in temperature. Reason (R): Increase in temperature decreases the average time between collisions of electrons.	1
15	Assertion (A): The direction of the electric field is always perpendicular to the equipotential surface. Reason (R): Work is done by the electric force in moving a charge between any two points on an equipotential surface is zero.	1
16	Assertion (A): If the focal length of two convex lenses is the same, the lens with the larger diameter will produce brighter images. Reason (R): Convex lenses with larger diameters are able to focus light better.	1
	SECTION B	
17	The graph shows the variation in hole concentration with doping concentration in an extrinsic semiconductor doped with pentavalent impurities.  Why does the hole concentration reduce when pentavalent doping is increased?	2
18	λ_α and λ_p are the wavelengths associated with a moving alpha particle and a proton respectively. Obtain the relation between velocities of the two particles for which, (a) $\lambda_\alpha > \lambda_p$ (b) $\lambda_\alpha = \lambda_p$	2

19	Compare the focal lengths of the two lenses shown below if the radius of curvature of the curved surface is the same in both lenses.  	2
20	(a) Two copper wires, P and Q of the same area of cross-section are joined in parallel. The combination of wires is connected across a battery of potential difference V. If the length of the wires, P and Q are in the ratio 1:2, find the ratio of drift velocities of electrons in wires P and Q.	2
21	The image below shows a setup of a device that is used to increase the diameter of a light beam from a laser.  Show how a combination of a convex and a concave lens can also be arranged to increase the diameter of a light beam. Your answer should include how the two lenses should be arranged and the distance between the two lenses. *(Note that the rays in both the incident and emergent beam are parallel.)* **OR** A glass beaker of height 10 cm, completely filled with water (refractive index = 4/3), has a curved bottom which is silvered as shown below.	2

	 A plastic coin remains submerged in water at a depth of 5 cm from the top of the beaker. An observer sees the coin in the water and its image in the mirror. If the image formed by the curved mirror is seen by the observer at a distance of 15 cm from the surface of the water, what is the focal length of the curved surface? *(Assume the silvered curved surface acts as a spherical mirror.)*	
	SECTION C	
22	Identify if the two nuclear reactions mentioned below are endothermic or exothermic. Show your calculations. $^{1}_{1}p + ^{7}_{3}Li \rightarrow 2(^{4}_{2}He)$ $^{7}_{3}Li + ^{4}_{2}He \rightarrow ^{1}_{0}n + ^{10}_{5}B$ Use the information below to answer the question: $^{1}_{1}p = 1.00728\ amu$ $^{7}_{3}Li = 7.0160\ amu$ $^{4}_{2}He = 4.0026\ amu$ $^{1}_{0}n = 1.0087\ amu$ $^{10}_{5}B = 10.01294\ amu$	3
23	X and Y are two equipotential surfaces separated by a distance of 2 m in a uniform electric field of 10 V/m. Surface X has a potential of 10 V (a) Calculate the potential of surface Y. (b) What is the work done in moving a +2 C charge from surface Y to surface X along path 1? How will this work change when the charge is moved along Path 2? Give a reason for your answer.	3

		
24	(a) Compare the de Broglie wavelength associated with the electron in the third orbit to the circumference of the orbit. (b) In which of the following will the electrons have the same de Broglie wavelength? (i) Third orbit of He atom (ii) Fourth orbit of He atom (iii) Third orbit of Li atom (iv) Sixth orbit of Be atom Show your calculations.	3
25	Using Kirchhoff's laws, calculate the current flowing through 4 Ω, 1 Ω, and 2 Ω resistors in the circuit shown below. 	3
26	Two charges A and B, each having a velocity of v, traverse circular paths in a uniform magnetic field as shown below.	3



(a) Compare the charge-to-mass ratio of the two particles A and B. Show the necessary mathematical calculations.
(b) Which of the two particles is likely to be a proton if the other is an alpha particle? Give reason.

27 (a) A radio wave and an infrasonic wave have the same wavelength when travelling through air. Are their frequencies the same or different? Give a reason for your answer. — 3

(b) An electromagnetic wave traveling east has a magnetic field that oscillates vertically and has a frequency of 60 kHz and an rms strength of 8×10^{-9}T. Determine the frequency and the rms strength of the electric field. What is the direction of the electric field?

28 A circular ring of diameter 0.2 m is placed in a uniform magnetic field of 0.4 T. The ring is rotated about its diameter at a frequency of 60 Hz. — 3
(a) If the ring has 50 turns, then what is the maximum induced emf in the ring?
(b) State one condition under which the induced emf in the circular ring will be zero?

OR

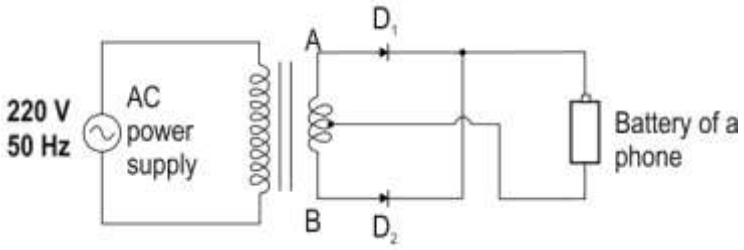
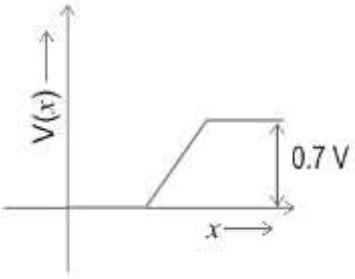
Given below are a few characteristics of solenoids p and q.

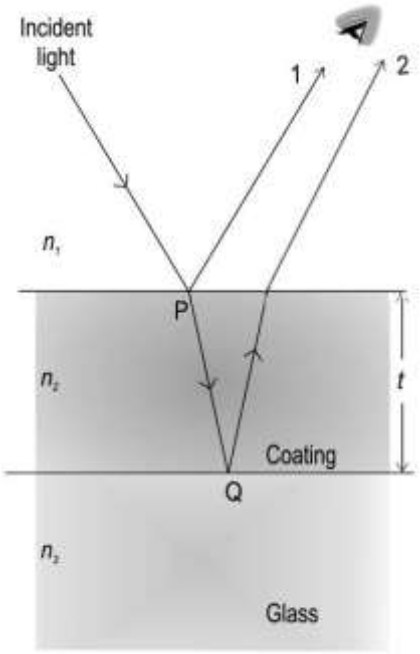
	solenoid p	**solenoid q**
length of the solenoid	l (m)	l (m)
number of turns (N)	200	50
cross-sectional area of the wire	A (m^2)	A (m^2)
relative permeability of the core material	1	500
self-inductance	2 (mH)	?

What is the self-inductance of the solenoid q?

SECTION D

29 **Read the following paragraph and answer the questions that follow.** — 4

	For most mobile devices, the voltage to recharge the battery is typically 5 volts of direct current. In India, the current supplied to our homes is alternating current at 220V and at a frequency of 50 Hz. Fatima designed a simplified version of a mobile phone charger. She made a circuit using a centre tap transformer and two similar silicon diodes D_1 and D_2 as shown below. Study the diagram below and answer the questions that follow.  (a) Can Fatima also charge the battery of a phone by connecting the battery directly to the ac power supply? Give reason. (b) The graph of the potential barrier (V) vs width of the depletion region (x), when D_1 is unbiased at room temperature, is shown below.  Plot a comparative graph of the potential barrier (V) vs width of the depletion region (x) of D_1 at room temperature when the voltage at A is negative with respect to voltage at centre tap. Give reason. **OR** If the battery of the phone is directly connected to the output terminals of the secondary coil of the transformer, will it get charged? Justify your answer. (c) What will be the output frequency across the phone's battery when the orientation of D_2 is reversed in fig. 1 and the centre-tapped three-output transformer is replaced by a two-output step-down transformer? Justify your answer.	
30	**Read the following paragraph and answer the questions that follow.** When light rays fall on glass, about 4% of the light gets reflected. To eliminate this reflection, the glass display cases in museums usually have an anti-reflective coating. This works on the principle of interference. When light falls on the coated glass, the light gets reflected from the top and bottom surfaces of the coating and these two reflected light rays can interfere. To reduce reflection, the thickness and refractive index of the coating are adjusted such that the light rays undergo destructive interference.	4



Reflected light undergoes a 180° phase shift when it falls on a denser medium from a rarer medium and no phase shift when it falls on a rarer medium from a denser medium. (Note: The thickness of coating is much less than the glass.) To answer the questions below, consider a monochromatic light of wavelength λ incident on the coating of thickness t at a small angle of incidence and n1<n2<n3. Also Consider PQ ≈ t.

(i) Which of the following occurs, if there is no coating on the glass?

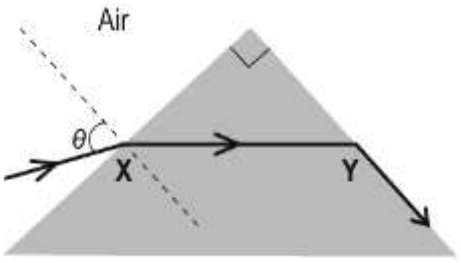
A. The object behind the case looks distorted.
B. The colours of the object behind the glass case appear dull.
C. A reflection of the objects in front of the glass case is seen on the case.
D. Multiple reflections of the object behind the glass case are seen on the case

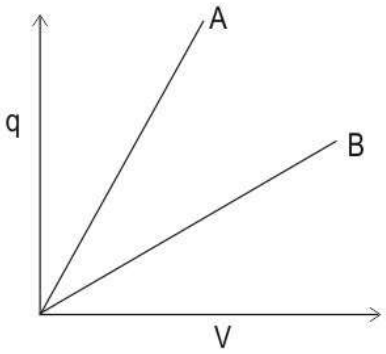
(ii) What is the path difference between rays 1 and 2? (Consider PQ ≈ t.)

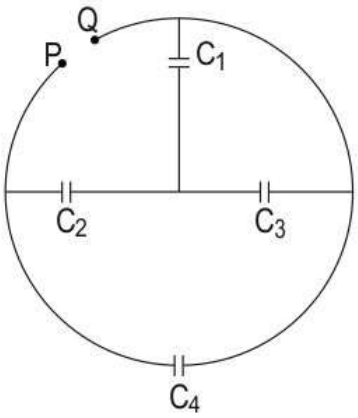
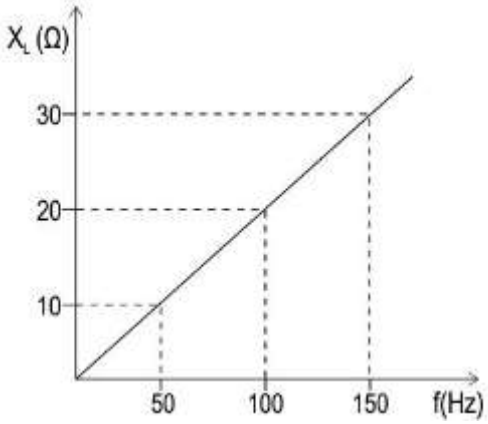
A. t
B. 2t
C. λ
D. 2 λ

(iii) For what minimum thickness of the coating, do the two rays 1 and 2 undergo destructive interference? *(Remember the wavelength of the light ray changes as it moves from one media to another.)*

A. $n_2 \lambda/2$
B. $n_2 \lambda/4$
C. $\lambda/(2n_2)$
D. $\lambda/(4n_2)$

	OR For what minimum thickness of the coating, do the two rays 1 and 2 undergo constructive interference? *(Remember the wavelength of the light ray changes as it moves from one media to another.)* A. $n_2 \lambda$ B. $n_2 \lambda/2$ C. $\lambda/(n_2)$ D. $\lambda/(2n_2)$ (iv) If the material of the coating is changed such that $n_2 > n_3$, what will be the additional path difference compared to the path difference identified in question (b)? A. t B. π C. $\lambda/2$ D. (There will be NO additional path difference.)	
	SECTION E	
31	(a) A ray of light is incident at angle θ on a right-angled prism at point X. At point Y, it emerges along the prism surface. Calculate the refractive index of the prism in terms of the incident angle.  (b) Show that for an equilateral prism kept in air, minimum deviation occurs when the angle of incidence $i = \sin^{-1}(n/2)$, where n is the refractive index of the material of the prism. **OR** (a) A Young's double slit setup is illuminated with monochromatic light. If the intensity of light passing through one of the slits is reduced, explain the changes that can be seen in the appearance of the bright and dark fringes? (b) (i) A single slit diffraction setup is illuminated with green light of wavelength 500 nm. If the width of the slit is 1 mm and the screen is 2 m away from the slits, calculate the width of the central maximum. (ii) What will happen to the width of the central maximum, if the green light is replaced with the red light? Give a reason for your answer.	5

	(c) A student wishes to study the diffraction of sound using the single slit setup. He replaces the light source with a sound source. What other change should he do to study the diffraction pattern?	
32	(a) A camera usually operates at 1.5 V and this potential difference is not sufficient to emit light energy using flash. For this purpose, the flash circuit of the camera has a capacitor that is charged to 300 V-330 V using various electrical components. If the voltage generated across the plates of the capacitor is 300 V and the capacitance of the parallel plate capacitor used is 100 µF, then find the energy released when the trigger button on the camera is pressed. (a) How much charge does the 100 µF capacitor charged to 300 V hold? (b) If the distance between the parallel plate capacitor of capacitance 100 µF is increased two times, then calculate the capacitance of the capacitor. (c) The graph below shows the variation of charge 'q' with potential difference 'V' for a parallel plate capacitor 'C' for scenarios P and Q. Scenario P - the space between the capacitor 'C' is filled with air. Scenario Q - the space between the capacitor 'C' is filled with a substance of dielectric constant K. Which of the two lines A or B corresponds to scenario Q? Give a reason for your answer.  **OR** (a) Find the effective capacitance between points P and Q, if each capacitor has a capacitance of 6µF.	5

	 (b) Find the ratio of charges on capacitors C_1 and C_4, if the potential difference between points P and Q is 10 V.	
33	An inductor of inductance 'L' is connected to an AC source, V = 100 sin ωt. The graph below represents the variation of inductive reactance (X_L) of the inductor with the frequency of an alternating source.  (a) What is the self-inductance of the inductor? (b) If the ac source is replaced by a battery such that V = 100 V, then what is the inductive reactance of the inductor? Give reason. (c) When the frequency is 50 Hz, what is the average power dissipated by the inductor over a complete cycle in the circuit? Justify your answer. (d) This inductor is connected in series with a resistance of 15 Ω and a capacitor of 5 μF. The frequency of the alternating source is varied such that the power dissipated in the circuit becomes maximum. Calculate the frequency and the phase difference between alternating voltage and current when the power dissipated is the maximum. **OR** An ideal transformer having a ferromagnetic core consists of two coils having 500 turns (primary) and 50 turns (secondary) respectively. (a) What is the voltage across the secondary coil, if the rms voltage across the primary coil is 240 V? (b) What will be the individual currents in the two coils (primary and secondary), if the secondary has a resistive load of 20 ohms?	5