

PRE-MEDICAL : ENTHUSIAST, LEADER & ACHIEVER COURSE PHASE - ALL ENTHUSIAST, MLA, B, C, E, P, Q, R, S, T, U, V, MAZA, ZB, ZC, ZD, ZE, ZF, ZN, ZP, ZQ, ZR, ZV, ZX, ZY, ZK, MAPA, MAPB, MSP1, MSP2, LAKSHYA

Test Booklet Code

This Booklet contains 28 pages.

L8

Do not open this Test Booklet until you are asked to do so.

Important Instructions :

1. The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars on ORIGINAL Copy carefully with **blue/black** ball point pen only.
2. The test is of **3 hours 20 minutes** duration and the Test Booklet contains **200** multiple-choice questions (four options with a single correct answer) from **Physics, Chemistry and Biology (Botany and Zoology)**. **50** questions in each subject are divided into **two Sections (A and B)** as per details given below :
 - (a) **Section A** shall consist of **35 (Thirty-five)** Questions in each subject (Question Nos - 1 to 35, 51 to 85, 101 to 135 and 151 to 185). All questions are compulsory.
 - (b) **Section B** shall consist of **15 (Fifteen)** questions in each subject (Question Nos - 36 to 50, 86 to 100, 136 to 150 and 186 to 200). In Section B, a candidate needs to **attempt any 10 (Ten)** questions out of **15 (Fifteen)** in each subject.

Candidates are advised to read all 15 questions in each subject of Section B before they start attempting the question paper. In the event of a candidate attempting more than ten questions, the first ten questions answered by the candidate shall be evaluated.
3. Each question carries **4** marks. For each correct response, the candidate will get **4** marks. For each incorrect response, **one mark** will be deducted from the total scores. **The maximum marks are 720**.
4. Use **Blue/Black Ball Point Pen only** for writing particulars on this page/marking responses on Answer Sheet.
5. Rough work is to be done in the space provided for this purpose in the Test Booklet only.
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7. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Form No. anywhere else except in the specified space in the Test Booklet/Answer Sheet.
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9. Each candidate must show on-demand his/her Allen ID Card to the Invigilator.
10. No candidate, without special permission of the Invigilator, would leave his/her seat.
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12. Use of Electronic/Manual Calculator is prohibited.
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15. The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.
16. Compensatory time of one hour five minutes will be provided for the examination of three hours and 20 minutes duration, whether such candidate (having a physical limitation to write) uses the facility of scribe or not.

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: in words _____

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Candidate's Signature : _____ Invigilator's Signature : _____

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SECTION-A (CHEMISTRY)

1. For the reaction $2A + 3B \rightarrow 4C$ the rate of reaction may be represented as :-

- (1) $r = -2 \frac{d[A]}{dt} = -3 \frac{d[B]}{dt} = 4 \frac{d[C]}{dt}$
- (2) $r = -2 \frac{d[A]}{dt} = -4 \frac{d[B]}{dt} = 3 \frac{d[C]}{dt}$
- (3) $r = -\frac{1}{2} \frac{d[A]}{dt} = \frac{1}{3} \frac{d[B]}{dt} = \frac{1}{4} \frac{d[C]}{dt}$
- (4) $r = -\frac{1}{2} \frac{d[A]}{dt} = -\frac{1}{3} \frac{d[B]}{dt} = \frac{1}{4} \frac{d[C]}{dt}$

2. Mechanism of a hypothetical reaction :

$x_2 + y_2 \rightarrow 2xy$, is given below

- (I) $x_2 \rightleftharpoons x + x$ (fast)
- (II) $x + y_2 \rightarrow xy + y$ (slow)
- (III) $x + y \rightarrow xy$ (fast)

The overall order of the reaction will be :-

- (1) 2
- (2) 0
- (3) 1.5
- (4) 1

3. 90 % of a first order reaction was completed in 10 hours. When will 99.9 % of the reaction complete?

- (1) 20 hr
- (2) 30 hr
- (3) 40 hr
- (4) 35 hr

4. The following data were obtained during the first order gaseous reaction at constant volume : (starting with A only)



S.No.	Time(sec.)	Total pressure (atm)
1.	0	2
2.	100	2.5

Calculate the rate constant.

- (1) $8 \times 10^{-2} \text{ s}^{-1}$
- (2) $7.5 \times 10^{-4} \text{ s}^{-1}$
- (3) $6.93 \times 10^{-3} \text{ s}^{-1}$
- (4) $6.2 \times 10^{-2} \text{ s}^{-1}$

5. Given below are two statements :-

Statement-I :- In a mixture of potassium permanganate (KMnO_4) and oxalic acid ($\text{H}_2\text{C}_2\text{O}_4$), KMnO_4 gets decolourised faster at a higher temperature than that at a lower temperature.

Statement-II :- For a chemical reaction with rise in temperature by 10°C , the rate constant becomes four times.

- (1) Both statement I and statement II are true.
- (2) Both statement I and Statement II are false.
- (3) Statement I is true but statement II is false.
- (4) Statement I is false but statement II is true.

6. Resistance of 0.01 N CaCl_2 solution is 210 ohm at 298 K with cell constant 0.84 cm^{-1} . Match the column.

Column-I		Column-II	
(P)	Conductance (ohm^{-1})	(a)	4×10^{-3}
(Q)	Specific conductance ($\text{ohm}^{-1}\text{cm}^{-1}$)	(b)	400
(R)	Molar conductance ($\text{ohm}^{-1}\text{cm}^2\text{mol}^{-1}$)	(c)	800
(S)	Equivalent conductance ($\text{ohm}^{-1}\text{cm}^2 \text{eq}^{-1}$)	(d)	$\frac{1}{210}$

- (1) (P) \rightarrow a, (Q) \rightarrow b, (R) \rightarrow c, (S) \rightarrow d
- (2) (P) \rightarrow d, (Q) \rightarrow a, (R) \rightarrow c, (S) \rightarrow b
- (3) (P) \rightarrow d, (Q) \rightarrow a, (R) \rightarrow b, (S) \rightarrow c
- (4) (P) \rightarrow d, (Q) \rightarrow c, (R) \rightarrow a, (S) \rightarrow b

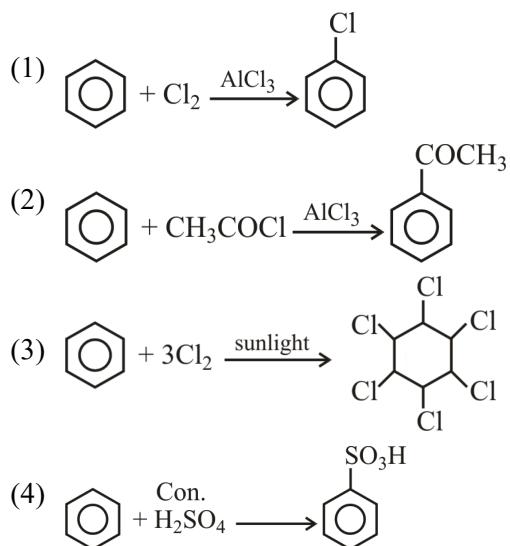
7. Equivalent conductances at infinite dilution of aqueous solution of BaCl_2 , H_2SO_4 and HCl are x_1 , x_2 and x_3 respectively. Equivalent conductance of BaSO_4 solution at infinite dilution is :

- (1) $x_1 + x_2 - x_3$
- (2) $x_1 - x_2 - x_3$
- (3) $x_1 + x_2 - 2x_3$
- (4) $x_1 - 2x_2 + x_3$

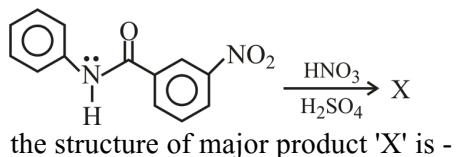
8. Standard oxidation potentials of four metals P, Q, R and S are +2.87, +3.05, -0.80 and +0.25 volt respectively. The reducing power of these metals are :-
- P > Q > R > S
 - S > R > Q > P
 - Q > P > S > R
 - None of these
9. If the E_{cell}° for a given reaction has a negative value, then which of the following gives the correct relationship for the values of ΔG° and K_{eq} ?
- $\Delta G^{\circ} > 0$; $K_{\text{eq}} > 1$
 - $\Delta G^{\circ} < 0$; $K_{\text{eq}} > 1$
 - $\Delta G^{\circ} < 0$; $K_{\text{eq}} < 1$
 - $\Delta G^{\circ} > 0$; $K_{\text{eq}} < 1$
10. What is the emf of the cell ?
 $\text{Cr}|\text{Cr}^{3+}(0.01\text{M}) \parallel \text{Co}^{2+}(0.01\text{M})|\text{Co}$
 $[\text{E}^{\circ} \text{ for } \text{Cr}^{3+}/\text{Cr} = -0.74\text{V} \text{ and } \text{Co}^{2+}/\text{Co} = -0.28\text{V}]$
- 0.46V
 - +0.44V
 - 0.46 V
 - +1.66 V
11. Two different electrolytic cells filled with molten $\text{Cu}(\text{NO}_3)_2$ and molten $\text{Al}(\text{NO}_3)_3$ respectively are connected in series. When electricity is passed, 6.35 g Cu is deposited on electrode. Calculate the weight of Al deposited on cathode.
 $(\text{Cu} = 63.5 \text{ g/mol}, \text{Al} = 27 \text{ g/mol})$:-
- 180 g
 - 9.525 g
 - 1.8 g
 - 31.75 g
12. What will be freezing point of a 0.5 m KCl solution? The molal freezing point constant of water is $1.86^{\circ}\text{C m}^{-1}$:-
- 1.86 °C
 - 0.372 °C
 - 3.2 °C
 - 0 °C
13. If 25 mL of 0.25 M NaCl solution is diluted with water to a volume of 500 mL. The new concentration of the solution is :-
- 0.0125 M
 - 0.167 M
 - 0.833 M
 - 0.0167 M

14. At 27° C vapour pressure of pure liquid A is 70 torr. This liquid makes ideal solution with liquid B. The mole fraction of B in solution is 0.2 and the total vapour pressure of the solution at 27°C has been found to be 84 torr. What is the vapour pressure of pure liquid B at 27°C :-
- 14 torr
 - 140 torr
 - 56 torr
 - 70 torr
15. Which of the following shows positive deviation from Raoult's Law :-
- Acetone – chloroform
 - Ethanol – acetone
 - Water – nitric acid
 - Water – HCl
16. The van't Hoff factor for 0.1M $\text{Ba}(\text{NO}_3)_2$ solution is 2.74. The degree of dissociation is :-
- 91.3%
 - 87%
 - 100%
 - 74%
17. Which of the following indicator is used in the titration between oxalic acid and sodium hydroxide ?
- Hph (Phenolphthalein)
 - MeOH (Methyl orange)
 - Both (1) and (2)
 - Phenol red
18. NH_2 -group in aniline is :
- m-directing and deactivating
 - o, p-directing and deactivating
 - o, p-directing and activating
 - m-directing and activating

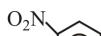
19. Which of the following reactions is not an example of electrophilic substitution in benzene ring?

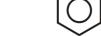


- 20.** In the following reaction



- (1) 

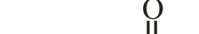
(2) 

(3) 

(4) 

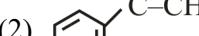
21. 

- Product 'A' is ?

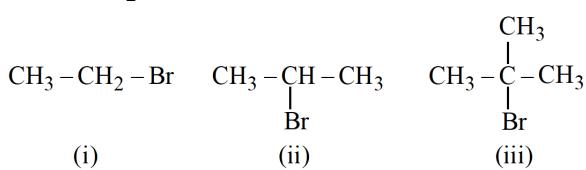
(1) 

(2) 

(3) 

(4) 

- 22.** Find out the order of reactivity of alkyl halide towards E₂ elimination :



- (1) i > ii > iii (2) iii > ii > i
(3) ii > iii > i (4) i > iii > ii

23. $\begin{array}{c} \text{CH}_3 & & \text{CH}_3 \\ & \diagdown \quad \diagup & \\ & \text{C} = \text{C} & \\ & \diagup \quad \diagdown & \\ \text{CH}_3 & & \text{H} \end{array} \xrightarrow[\substack{(2) \text{H}_2\text{O/Zn}}]{(1) \text{O}_3} ?$

Products of above reaction is :-

- (1)  C = O only

- (2)  C = O only

- $$(3) \text{CH}_3-\overset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{CH}_3 \quad \& \quad \text{H}-\overset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{H} \quad \text{both}$$

- (4) $\text{CH}_3-\overset{\text{O}}{\underset{\text{C}}{\text{||}}}-\text{CH}_3$ & $\text{CH}_3-\overset{\text{O}}{\underset{\text{C}}{\text{||}}}-\text{H}$ both

- 24.** Which has most stable enol form?

- (1)  (2)  (3)  (4) 

- 25.** Which of the following example is not an aromatic ?

- (1)  (2)  (3)  (4) 

26. The correct order of acidic strength of the following molecules is-

- (1) $\text{C}_2\text{H}_5\text{OH} < \text{CH}_3\text{COOH} <$ 

- $$(2) \text{ C}_2\text{H}_5\text{OH} < \text{C}_6\text{H}_5\text{OH} < \text{H}_2\text{O}$$

- (3) $\text{CH}_3\text{COOH} < \text{C}_6\text{H}_5\text{OH} < \text{C}_2\text{H}_5\text{OH}$

- (4) $\text{C}_2\text{H}_5\text{OH} < \text{C}_6\text{H}_5\text{OH} < \text{CH}_3\text{COOH}$

27. The correct $-I$ effect order is :-

- (1) $-\text{NH}_2 < -\text{OR} < -\text{F}$
- (2) $-\overset{\oplus}{\text{NR}}_3 > -\text{C}\equiv\text{N} > -\text{OH} > -\text{C}\equiv\text{CH}$
- (3) $-\overset{\oplus}{\text{NH}}_3 > -\text{NO}_2 > \begin{array}{c} \text{O} \\ \parallel \\ -\text{C}-\text{OH} \end{array} > \text{C}_6\text{H}_5$
- (4) All of the above

28. **Assertion :** Allyl free radical is more stable than simple alkyl free radical.

Reason : The allyl free radical is stabilized by resonance.

- (1) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.
- (2) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.
- (3) Assertion is true but Reason is false.
- (4) Both Assertion and Reason are false.

29. Which compound will give blood red colour in Lassaigne's test ?

- (1) $\text{NH}_2 - \underset{\text{O}}{\underset{\parallel}{\text{C}}} - \text{NH}_2$
- (2) $\text{NH}_2 - \underset{\text{S}}{\underset{\parallel}{\text{C}}} - \text{NH}_2$
- (3) NaCN
- (4) CHCl_3

30. Which of the following is most stable conformer of ethylene glycol :

- | | |
|----------------------|--------------------|
| (1) Anti | (2) Gauche |
| (3) Partial Eclipsed | (4) Fully Eclipsed |

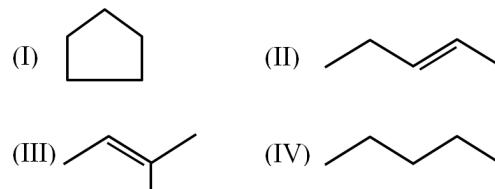
31. Maleic acid & Fumaric acid are :

- (1) Geometrical isomer
- (2) Optical isomer
- (3) Positional isomer
- (4) Chain isomer

32. Incorrect order for given properties -

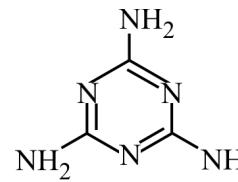
- (1) $\text{CH}_3 - \begin{array}{c} \diagdown \\ \text{C} = \text{C} \\ \diagup \end{array} - \text{CH}_3 > \text{CH}_3 - \begin{array}{c} \diagdown \\ \text{C} = \text{C} \\ \diagup \end{array} - \text{CH}_3$
Dipole moment
- (2) $\text{CH}_3 - \begin{array}{c} \diagdown \\ \text{C} = \text{C} \\ \diagup \end{array} - \text{CH}_3 < \text{CH}_3 - \begin{array}{c} \diagdown \\ \text{C} = \text{C} \\ \diagup \end{array} - \text{CH}_3$
Melting point
- (3) $\text{CH}_3 - \begin{array}{c} \diagdown \\ \text{C} = \text{C} \\ \diagup \end{array} - \text{CH}_3 < \text{CH}_3 - \begin{array}{c} \diagdown \\ \text{C} = \text{C} \\ \diagup \end{array} - \text{CH}_3$
Stability
- (4) $\text{CH}_3 - (\text{CH}_2)_3 - \text{CH}_3 < (\text{CH}_3)_4\text{C}$ Boiling point

33. Select the pair of chain isomers in the followings :



- | | |
|--------------|--------------|
| (1) I & II | (2) II & III |
| (3) III & IV | (4) IV & I |

34. The number of hetero atoms present in the following compound are



- | | | | |
|-------|-------|-------|-------|
| (1) 6 | (2) 0 | (3) 3 | (4) 5 |
|-------|-------|-------|-------|

35. The IUPAC name of $\text{CH}_2=\text{CH}-\text{CH}_2-\text{NO}_2$ is

- | | |
|-----------------------|-----------------------|
| (1) 3-Nitroprop-1-ene | (2) 1-Nitroprop-2-ene |
| (3) Nitropropene | (4) Allyl nitrite |

SECTION-B (CHEMISTRY)

36. The relation between $t_{7/8}$ and $t_{1/2}$ for zero order reaction is:-

- | | |
|--|--|
| (1) $t_{\frac{7}{8}} = 3 \times t_{\frac{1}{2}}$ | (2) $t_{\frac{7}{8}} = \frac{7}{4} \times t_{\frac{1}{2}}$ |
| (3) $t_{\frac{7}{8}} = \frac{3}{2} \times t_{\frac{1}{2}}$ | (4) $t_{\frac{7}{8}} = 2 \times t_{\frac{1}{2}}$ |

37. The slope of Arrhenius Plot $\left(\ln k \text{ v/s } \frac{1}{T} \right)$ of first order reaction is $-5 \times 10^3 \text{ K}$. The value of E_a of the reaction is. [Given $R = 8.314 \text{ JK}^{-1} \text{ mol}^{-1}$]

- 41.5 kJ mol^{-1}
- 83.0 kJ mol^{-1}
- 166 kJ mol^{-1}
- -83 kJ mol^{-1}

38. **Assertion :-** Catalyst increases the rate of reaction for the reaction having ($\Delta G > 0$).

Reason :- Catalyst does not alter Gibbs energy change (ΔG) of a reaction.

- Both Assertion and Reason are correct and Reason is correct explanation of Assertion.
- Both Assertion and Reason are correct but Reason is not correct explanation of Assertion.
- Assertion is incorrect but Reason is correct.
- Both Assertion and Reason are incorrect.

39. Match the column-I with column-II and mark the appropriate choice :-

	Column-I		Column-II
(A)	$\Delta H_{\text{mix}} = 0$, $\Delta V_{\text{mix}} = 0$	(i)	Non-ideal solution
(B)	$\Delta H_{\text{mix}} \neq 0$, $\Delta V_{\text{mix}} \neq 0$	(ii)	Positive deviation from Raoult's law
(C)	$\Delta H_{\text{mix}} < 0$, $\Delta V_{\text{mix}} < 0$	(iii)	Ideal solution
(D)	$\Delta H_{\text{mix}} > 0$, $\Delta V_{\text{mix}} > 0$	(iv)	Negative deviation from Raoult's law

- (A) \rightarrow (i), (B) \rightarrow (iii), (C) \rightarrow (ii), (D) \rightarrow (iv)
- (A) \rightarrow (iii), (B) \rightarrow (i), (C) \rightarrow (iv), (D) \rightarrow (ii)
- (A) \rightarrow (ii), (B) \rightarrow (iii), (C) \rightarrow (iv), (D) \rightarrow (i)
- (A) \rightarrow (iii), (B) \rightarrow (ii), (C) \rightarrow (i), (D) \rightarrow (iv)

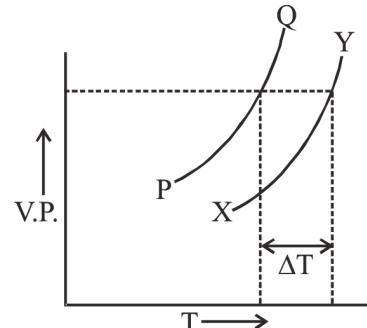
40. Which of the following displacement does not occur:-

- $\text{Zn}_{(\text{s})} + 2\text{H}_{(\text{aq})}^{+} \rightarrow \text{Zn}_{(\text{aq})}^{2+} + \text{H}_{(\text{g})} \uparrow$
- $\text{Fe}_{(\text{s})} + 2\text{Ag}_{(\text{aq})}^{+} \rightarrow \text{Fe}_{(\text{aq})}^{2+} + 2\text{Ag}_{(\text{s})} \downarrow$
- $\text{Cu}_{(\text{s})} + \text{Fe}_{(\text{aq})}^{2+} \rightarrow \text{Cu}_{(\text{aq})}^{2+} + \text{Fe}_{(\text{s})} \downarrow$
- $\text{Zn}_{(\text{s})} + \text{Pb}_{(\text{aq})}^{2+} \rightarrow \text{Zn}_{(\text{aq})}^{2+} + \text{Pb}_{(\text{s})} \downarrow$

41. A solution containing 10 g per dm^3 of urea (mol. wt = 60 g mol^{-1}) is isotonic with a 5% (mass / vol.) of a non-volatile solute. The molecular mass of non-volatile solute is :-

- 350 g mol^{-1}
- 200 g mol^{-1}
- 250 g mol^{-1}
- 300 g mol^{-1}

42. In the graph plotted between vapour pressure (V.P.) and temperature (T) :-



- PQ is the curve for solvent, XY is the curve of solution and ΔT is depression in freezing point
- PQ is the curve for solution, XY is the curve for solvent and ΔT is elevation in boiling point
- PQ is the curve for solvent, XY is the curve for solution and ΔT is molal depression in boiling point
- PQ is the curve for solvent, XY is the curve for solution and ΔT is elevation in boiling point.

43. Which mixture of the solutions will lead to the formation of negatively charged colloidal $[\text{AgI}]^-$ sol?

- (1) 50 mL of 1 M AgNO_3 + 50 mL of 1.5 M KI
- (2) 50 mL of 1 M AgNO_3 + 50 mL of 0.2 M KI
- (3) 50 mL of 2 M AgNO_3 + 50 mL of 1.5 M KI
- (4) 50 mL of 0.1 M AgNO_3 + 50 mL of 0.1 M KI

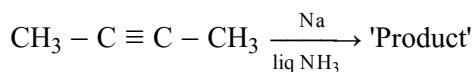
44. Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

Assertion (A) : Chlorine is an electron withdrawing group but it is ortho, para directing in electrophilic aromatic substitution.

Reason (R) : Inductive effect of chlorine destabilises the intermediate carbocation formed during the electrophilic substitution, however due to the more pronounced resonance effect, the halogen stabilises the carbocation at ortho and para positions.

In the light of the above statements, choose the most appropriate answer from the options given below :

- (1) Both (A) and (R) are correct and (R) is the correct explanation of (A).
 - (2) Both (A) and (R) are correct but (R) is not the correct explanation of (A).
 - (3) (A) is correct but (R) is not correct.
 - (4) (A) is not correct but (R) is correct.
45. Find out the major product of following reaction :

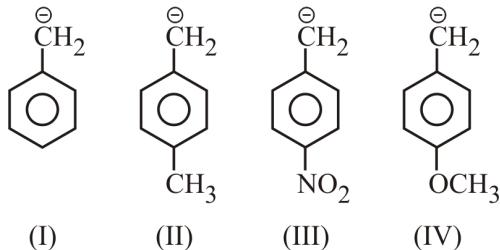


- (1)
- (2)
- (3) $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_3$
- (4) $\text{CH}_3 - \text{C} \equiv \text{C} - \text{CH}_2^{\ominus} \text{Na}^{\oplus}$

46. Which of the following has lowest pK_a value ?

- | | |
|-----|-----|
| (1) | (2) |
| (3) | (4) |

47. Arrange the following carbanions in decreasing order of stability :-



- (1) III > I > IV > II
- (2) I > II > III > IV
- (3) III > I > II > IV
- (4) IV > III > II > I

48. Match the column I with column II.

Column-I (Group attached with benzene ring)		Column-II (Effect shown by the group)	
(A)	$-\text{NO}_2$	(P)	- R effect
(B)	$-\text{O}^-$	(Q)	+ R effect
(C)	$-\text{O}-\text{CH}_3$	(R)	+ I effect
(D)	$-\text{C} \equiv \text{N}$	(S)	- I effect

- (1) (A)-P,S ; (B)-Q,R ; (C)-Q,S ; (D)-P,S
- (2) (A)-P,S ; (B)-Q,S ; (C)-P,R ; (D)-R,S
- (3) (A)-P,S ; (B)-P,R ; (C)-R,S ; (D)-Q,S
- (4) (A)-Q,S ; (B)-P,R ; (C)-Q,S ; (D)-P,S

49. Method which is based on the difference in the solubilities of the compounds -

- (1) Crystallisation
- (2) Distillation
- (3) Sublimation
- (4) All

50. During Lassaigne's test for nitrogen, the prussian blue colour is obtained due to formation of

- (1) $\text{Na}_4[\text{Fe}(\text{CN})_6]$
- (2) $\text{Fe}_4[\text{Fe}(\text{CN})_6]_3$
- (3) $\text{Fe}_2[\text{Fe}(\text{CN})_6]$
- (4) $\text{Fe}_3[\text{Fe}(\text{CN})_6]_4$

SECTION-A (BOTANY)

- 57.** Read the following Assertion (A) and Reason (R) and choose the correct option :

Assertion (A) : C₄ plants lack a process called photorespiration.

Reason (R) : RuBisCO has a greater affinity for CO₂ when CO₂ : O₂ is nearly equal.

 - Both Assertion & Reason are True & the Reason is a correct explanation of the Assertion.
 - Both Assertion & Reason are True but Reason is not a correct explanation of the Assertion.
 - Assertion is True but the Reason is False.
 - Both Assertion & Reason are False.

58. Read the following statements –

Statement-I: In aerobic respiration, there is an external final electron acceptor i.e. O₂.

Statement-II: In fermentation there is no external electron acceptor.

choose the correct option –

 - Both Statements are correct.
 - Both Statements are incorrect.
 - Statement-I is correct but Statement-II is incorrect.
 - Statement-I is incorrect but Statement-II is correct.

59. Match the following :

	Column-I		Column-II
A	GA ₃	i	Stress Hormone
B	Kinetin	ii	Apical dominance
C	ABA	iii	Brewing industry
D	IBA	iv	Coconut milk

 - A - i, B - ii, C - iii, D - iv
 - A - ii, B - iii, C - iv, D - i
 - A - iii, B - iv, C - i, D - ii
 - A - iii, B - iv, C - ii, D - i

60. Select the correct statements :

- (a) Plasticity is the ability of plants to follow same pathways in response to environment or phases of life to form different kinds of structures.
 - (b) Cotton, Coriander and larkspur are heterophyllous plants.
 - (c) The growth, differentiation and development are very closely related events in the life of a plant.
 - (d) Development in plants is not under the control of intrinsic or extrinsic factors.
- (1) a, b and c (2) b and d
 (3) b and c (4) b, c and d

61. Read the following statements and choose the correct option.

Statement-I : One meiotic and eight mitotic divisions are required for the formation of four mature male gametophytes in a typical angiosperm from a microspore mother cells.

Statement-II : One meiotic and three mitotic divisions are required for the formation of one mature female gametophyte in typical angiosperm from a megasporangium.

- (1) Both statements are correct.
- (2) Both statements are incorrect.
- (3) Statement-I is correct but Statement-II is incorrect.
- (4) Statement-I is incorrect but Statement-II is correct.

62. **Assertion (A)** : Geitonogamy from the genetical point of view is similar to autogamy.

Reason (R) : In Geitonogamy pollen grains come from the same plant.

Choose the correct option:-

- (1) Both **A** and **R** are true but **R** is not the correct explanation of **A**.
- (2) **A** is true but **R** is false.
- (3) **A** is false but **R** is true.
- (4) Both **A** and **R** are true but **R** is the correct explanation of **A**.

63. Match List-I with List-II :

	List-I		List-II
A	Ovary	I	Outer seed coat
B	Ovule	II	Inner seed coat
C	Testa	III	After fertilization mature into fruit
D	Tegmen	IV	After fertilization mature into seed

Choose the correct answer from the options given below :

- (1) A-III, B-IV, C-II, D-I
- (2) A-IV, B-III, C-II, D-I
- (3) A-III, B-IV, C-I, D-II
- (4) A-IV, B-III, C-I, D-II

64. Read the following statements and select the correct option given below :

Statement-I : A bud is present in the axil of petiole of simple leaves but not in the axil of petiole of compound leaves.

Statement-II : A bud is present in the axil of leaflets of the compound leaf.

- (1) Statement-I and Statement-II both are correct
- (2) Statement-I and Statement-II both are incorrect
- (3) Only statement-I is correct
- (4) Only Statement-II is incorrect

65. **Assertion (A)** : Leaves of dicotyledonous plants generally possess reticulate venation, while parallel venation is the characteristic of most monocotyledons.

Reason (R) : In dicotyledons leaves veinlets form a network whereas in monocotyledon leaves veins run parallel to each other within a lamina.

- (1) Assertion and Reason both are correct and Reason is correct explanation of Assertion.
- (2) Assertion and Reason both are correct but Reason is not correct explanation of Assertion.
- (3) Assertion is correct but Reason is not correct
- (4) Assertion and Reason both are not correct

- 66.** How many ATP will be formed by partial oxidation of Glucose in absence of oxygen?
- 2 ATP
 - 38 ATP
 - 8 ATP
 - 30 ATP
- 67.** Electron transport system and ATP synthase are present in which of the following parts of mitochondria ?
- Outer membrane
 - Inner membrane
 - Matrix
 - Peri mitochondrial space
- 68.** How many net $\text{NADH}^+ + \text{H}^+$ are produced during alcoholic fermentation ?
- 2
 - 4
 - 1
 - 0
- 69.** Which one is the link between glycolysis and kreb's cycle :-
- Acetyl-Co-A
 - Pyruvate
 - Oxalo acetic acid
 - Tricarboxylic acid
- 70.** In which of following is RQ value of Triplamitin?
- 0.9
 - 0.2
 - 0.1
 - 0.7
- 71.** Growth is result of :
- Anabolic activities
 - Catabolic activities
 - Anabolic and Catabolic activities
 - Not defined
- 72.** Which hormone play a major role in seed dormancy.
- Gibberellins
 - Ethylene
 - Abscissic Acid (ABA)
 - Cytokinins
- 73.** Ethylene is used to initiate flowering and for synchronising fruit set in –
- Rice
 - Potato
 - Pineapples
 - Cherry
- 74.** Male reproductive whorl organ is-
- Microspore
 - Gynoecium
 - Androecium
 - Carpel
- 75.** When many embryos are present inside the single seed then it is called.
- Polyembryony
 - Parthenocarpy
 - Parthenogenesis
 - Adventive embryony
- 76.** Embryosac is :-
- Megasporangium
 - Megaspore
 - Female gametophyte
 - Female gamete
- 77.** In angiosperm triple fusion is necessary for the formation of ?
- Seed coat
 - Fruit wall
 - Embryo
 - Endosperm
- 78.** Geitonogamy occurs in :
- Monoecious Plants only
 - Dioecious Plants only
 - Monoceious plants and Bisexual flowers
 - Dioecious plants and Unisexual flowers

- 79.** In which of the following the seed coat is membranous and generally fused with the fruit wall ?
- (1) Maize
 - (2) Bean
 - (3) Gram
 - (4) Pea
- 80.** Drupe is recognised by –
- (1) Stony endocarp
 - (2) Stony mesocarp
 - (3) Fleshy seed coat
 - (4) Thin seed coat
- 81.** Which tissue functions as a conducting tissue for water & minerals, food respectively and also provides mechanical strength to the plant parts?
- (1) Phloem, Xylem
 - (2) Sclerenchyma, Parenchyma
 - (3) Parenchyma, Sclerenchyma
 - (4) Xylem, Phloem
- 82.** The meristem which occurs between mature tissues and responsible for the formation of primary plant body is called :–
- (1) Secondary meristem
 - (2) Lateral meristem
 - (3) Apical meristem
 - (4) Intercalary meristem
- 83.** Bulliform or motor cells are present in.
- (1) Dicot stem
 - (2) Upper epidermis of dicot leaves
 - (3) Lower epidermis of monocot leaves
 - (4) Upper epidermis of monocot leaves
- 84.** Which of the following tissue provides mechanical support to the growing parts of the plant such as young stem and petiole of a leaf ?
- (1) Parenchyma
 - (2) Sclerenchyma
 - (3) Collenchyma
 - (4) Chlorenchyma
- 85.** Conjoint, collateral, close vascular bundle are present in :-
- (1) Leaf
 - (2) Dicot stem
 - (3) Dicot root
 - (4) Dicot root and dicot stem

SECTION-B (BOTANY)

- 86.** Read the following statements carefully, select true statements and select the correct option from the options given below.
- (a) Tropical plants have a higher temperature optimum than the plants adapted to temperate climate.
 - (b) C₄ plants respond to lower temperature and show higher rates of photosynthesis than C₃ plants.
 - (c) temperature does not affect to dark reaction of photosynthesis.
 - (d) dependency of plants on temperature for photosynthesis also depends on habitats of plants.
- (1) a, c and d
 - (2) a, b and d
 - (3) a and d
 - (4) a, b, c and d

- 87.** What are the products of light reactions :
- ATP and NADPH
 - Sugar
 - CO_2
 - All of the above
- 88.** Select the correct statements :
- Pigments are substances that have an ability to absorb light at specific wavelength.
 - Dark reaction occur in darkness only.
 - We can separate the leaf pigments of any green plant through paper chromatography.
 - Accessory pigments enable a wider range of wavelength of incoming light to be utilized for photosynthesis.
- a, b and c
 - a, c and d
 - a and d only
 - c and d only
- 89.** Match List I with List II and select the correct options with respect to the ETS :

List - I		List - II	
A	Complex I	(i)	Succinate dehydrogenase
B	Complex II	(ii)	Cytochrome C oxidase
C	Complex III	(iii)	NADH dehydrogenase
D	Complex IV	(iv)	Cytochrome bc_1

	A	B	C	D
1	iii	i	ii	iv
2	iv	ii	iii	i
3	iii	i	iv	ii
4	i	ii	iv	iii

- 90.** Select incorrect statement ?
- Five free stigmas are present in a dissected flower of *Hibiscus* showing pistil.
 - Pollen grain are rich in nutrients
 - Megasporangium is also known as pollen sac
 - Chalaza representing the basal part of the ovule
- 91.** How many statements are **incorrect**?
- Parenchyma forms the major component within plant organs.
 - The collenchyma occurs in layers below the epidermis in most of the monocotyledonous plant.
 - The sclereids are thick walled elongated and pointed cells, generally occurring in groups in various parts of the plant.
 - Gymnosperm generally lack vessels in their xylem.
- One
 - Two
 - Three
 - Four
- 92.** Identify the correct statements -
- Pollination by water is more common in abiotic pollinations.
 - Wind pollination is quite common in grasses.
 - Self-incompatibility is a outbreeding device which prevents inbreeding.
 - In most of the water-pollinated species, pollen grains are protected from wetting by a mucilaginous covering.
 - The portion of embryonal axis above the level of cotyledons is the hypocotyl.
- Choose the correct answer from the options given below :
- B, C, D only
 - C, D, E only
 - D, E, A only
 - A, B, C only

93. Choose the incorrect statement from the following.

- (1) Auxin promote flowering in pineapple.
- (2) All GA are acidic.
- (3) Ethylene promotes male flowers in cucumbers thereby increasing the yield.
- (4) Cytokinins help overcome the apical dominance.

94. Auxin was isolated from :-

- (1) Coleoptile of canary grass.
- (2) Coleoptile of oat seedlings.
- (3) Coleorhiza of canary grass.
- (4) Coleorhiza of oat seedlings.

95. Which of the following structure exhibits a fascinating array of patterns and design?

- (1) Intine
- (2) Exine
- (3) Germ pore
- (4) Filiform apparatus

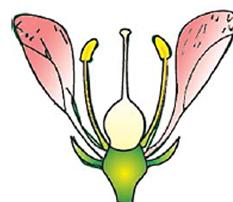
96. If more than two leaves arise at a node then the type of phyllotaxy is :

- (1) Alternate
- (2) Opposite
- (3) Whorled
- (4) Valvate

97. Read the following statements and find out the incorrect statement -

- (1) Underground stem of turmeric, colocasia are modified to store food.
- (2) In cucumber apical bud is modified into tendril to protect from grazing animals.
- (3) Each node of Eichhornia bears a rosette of leaves and tuft of roots.
- (4) Thorns are woody curved structures found in citrus and Bougainvillea for protecting them from browsing animals.

98.



Which one of the following is correct for the above figure ?

- (1) It shows superior ovary, with hypogynous flower.
- (2) Such flower are found in chinarose, brinjal, *Lilium*, *Aloe*
- (3) Shows perfect flower
- (4) All of the above

99. Which one is not an example of lateral meristem.

- (1) Fasicular vascular combium
- (2) Intercalary meristem
- (3) Interfasicular cambium
- (4) Cork-cambium

100. In dorsiventral leaves, the location of xylem and spongy tissue towards :-

- (1) Abaxial side
- (2) Adaxial side
- (3) Adaxial and abaxial side respectively
- (4) Abaxial and adaxial side respectively

SECTION-A (ZOOLOGY)

- 101.** Irritability and conductivity are maximum developed in :-
- Muscular tissue
 - Nervous tissue
 - Connective tissue
 - Epithelial tissue
- 102.** Rapid, short lived and immediate co-ordination is involved with ?
- Nervous System
 - Endocrine system
 - Excretory system
 - (1) & (2) both
- 103.** Which part of the brain regulates the body temperature, hunger, and osmoregulation :-
- Medulla - oblongata
 - Hypothalamus
 - Pons - veroli
 - olfactory - lobe
- 104.** Which of the following statements is incorrect about cortex of cerebrum (Cerebral cortex) ?
- It consists of grey matter
 - It consists of white matter
 - It shows prominent folds
 - It contains motor areas, sensory areas and association areas.
- 105.** Myelin sheath is characteristics of :
- Vertebrates
 - Mammals
 - Cyclostomates
 - Both Mammals and cyclostomates

106. Match these columns :-

	Column-I		Column-II
A	CNS	i	Cranial and spinal nerves
B	PNS	ii	Relay impulses from CNS to skeletal muscles
C	Somatic neural system	iii	transmits impulses from CNS to involuntary organs and smooth muscles
D	Autonomic neural system	iv	Site of information processing and control

- A-iv, B-iii, C-i, D-ii
- A-iv, B-i, C-iii, D-ii
- A-iv, B-i, C-ii, D-iii
- A-iv, B-ii, C-iii, D-i

107. A hormone is synthesized by hypothalamic nuclei and carried by axon and secreted by axonal terminal within hypothalamus is carried to pituitary gland by blood is :

- Oxytocin
- GnRH
- Gonadotropin
- Growth Hormone

108. Pineal secretes a hormone called :

- Oxytocin
- Vasopressin
- Melatonin
- MSH

109. Immune system is weaker in old persons, due to :-

- Nutritional deficiency
- Due to weaken muscle
- Decrease melatonin
- Decrease level of thymosin

110. Oversecretion of growth hormone leads to (A) and hyposecretion of thyroxin leads to (B) : (A) and (B) are :

- (1) (A)-Dwarfism, (B)-Gigantism
- (2) (A)-Gigantism, (B)-Exophthalmic goitre
- (3) (A)-Gigantism, (B)-Grave's disease
- (4) (A)-Gigantism, (B)-Cretinism

111. Which is not an organised endocrine gland in the following ?

- | | |
|---------------|-------------|
| (1) Pancreas | (2) Liver |
| (3) Pituitary | (4) Adrenal |

112. Mark antagonistic hormones—

- (1) Insulin and glucagon
- (2) Adrenaline and nor adrenaline
- (3) Calcitonin and parathormone
- (4) Both (1) and (3)

113. Match the items in Columns I and II -

	Column-I		Column-II
(A)	Adenohypophysis	(1)	Epinephrine
(B)	Adrenal medulla	(2)	Somatotropin
(C)	Thyroid gland	(3)	Androgens
(D)	Adrenal cortex	(4)	Calcitonin

- (1) A-3, B-1, C-4, D-2 (2) A-1, B-2, C-3, D-4
- (3) A-2, B-1, C-4, D-3 (4) A-4, B-3, C-2, D-1

114. **Assertion** : Adrenaline & noradrenaline are rapidly secreted in response to stress of any kind.

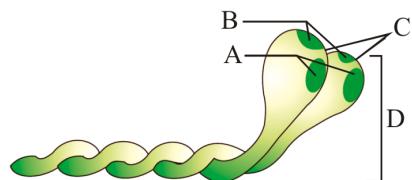
Reason : Adrenaline & noradrenaline are hormones of fight and flight.

- (1) Both assertion and reason are true and the reason is a correct explanation of the assertion.
- (2) Both assertion and reason are true but reason is not a correct explanation of the assertion.
- (3) Assertion is true but the reason is false.
- (4) Both assertion and reason are false.

115. First pair of rib is found between :-

- (1) First and second thoracic vertebrae
- (2) Second and third thoracic vertebrae
- (3) Sixth and seventh cervical vertebrae
- (4) Seventh cervical and first thoracic vertebrae

116. Identify A,B,C and D in the given diagram and choose the correct option :-



- (1) A - ATP binding site
B - Actin binding site
C - Head
D - Tail
- (2) A - ATP binding site
B - Actin binding site
C - Head
D - Cross arm
- (3) A - ATP binding site
B - Myosin binding site
C - Head
D - Cross arm
- (4) A - ATPase enzyme
B - Actin binding site
C - Cross arm
D - Head

117. The central parts of thick filament not overlapped by thin filaments is called :-

- (1) M-line
- (2) A-Band
- (3) I-Band
- (4) H-zone

118. Which type of bones are included in Appendicular skeleton :-

- (1) Skull and Ribs
- (2) Skull and Sternum
- (3) Limbs and Girdles
- (4) Only vertebral column

- 119.** Choose incorrect statement.

 - (1) Facial region has 14 skeletal elements.
 - (2) Human skull is dicondylic.
 - (3) Cranial bones are 8 in number.
 - (4) Sternum is located on dorsal midline of thorax.

120. In the centre of I-Band is an elastic fiber present, which bisect it :-

 - (1) 'H'-zone
 - (2) 'M'-line
 - (3) 'Z'-line
 - (4) 'A'-band

121. Given below are two statements :-

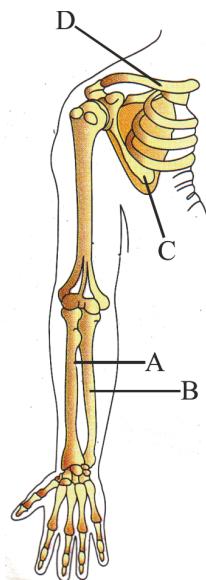
Statement-I:- Myoglobin content is high in some of the muscles which gives a reddish appearance.

Statement-II:- White muscles depends on anaerobic process of energy.

Choose the correct answer from the following :-

 - (1) Both statement I and II are false
 - (2) Statement I is true but statement II is false.
 - (3) Statement I is false but statement II is true
 - (4) Both statement I and II are true

122. In given diagram A,B,C and D respectively represents :-



- (1) Radius, Ulna, Scapula, Clavicle
 - (2) Ulna, Radius, Scapula, Clavicle
 - (3) Radius, Ulna, Clavicle, Scapula
 - (4) Ulna, Radius, Clavicle, Scapula

- 123.** The male sex accessory ducts include :-

(1) Rete testis (2) Vas deferens
(3) Epididymis (4) All

124. Find the **odd** one with respect to number of chromosomes :-

(1) Zygote, spermatogonia, primary spermatocyte
(2) Ovum, polarbody, secondary oocyte
(3) Sperm, spermatid, secondary spermatocyte
(4) Spermatogonia, oogonia, ovum

125. Capacitation of sperms occurs in :-

(1) Uterus (2) Epididymis
(3) Vagina (4) Fallopian tube

126. Major cause of FSH and LH surge at the end of pre-ovulatory phase is :-

(1) Progesterone released from corpus luteum
(2) Estrogen from corpus luteum
(3) Estrogen from theca interna
(4) Negative feedback of LH and FSH

127. In human, the unpaired male reproductive structure is -

(1) Seminal vesicle
(2) Prostate gland
(3) Bulbourethral gland
(4) Testes

128. Which of the following hormone is released only during pregnancy ?

(1) Thyroxine (2) Progesterone
(3) hCG (4) Estrogen

129. How many sperms an human male ejaculates during coitus ?

(1) 200 – 300 Million (2) 20 – 30 Million
(3) 200 – 300 Billion (4) 20 – 30 Billion



SECTION-B (ZOOLOGY)

136. Nissl's granules are found in and helps in :-

 - (1) Cyton only, lipid synthesis
 - (2) Cyton and Axon, Protein synthesis
 - (3) Dendron and Axon, Protein synthesis
 - (4) Dendron and cyton, Protein synthesis

- 137.** Find out the correct labelling for given diagram ?

	A	B	C
(1)	Thirst centre	voluntary muscle coordination	Relay centre
(2)	Sexual maturation	involuntary muscle control	Cardiac control
(3)	Relay Centre	involuntary control of voluntary muscle	Satisfaction centre
(4)	Breathing centre	Commissure	Relay centre

138. Which event is shown at B point in given graph :-

(1) Na^+ VGC open (2) Na^+ VGC close
 (3) K^+ VGC close (4) 2 and 3 both

139. Lipid soluble hormone group is :-

(1) Oxytocin and ADH
 (2) FSH and LH
 (3) Cortisol and Aldosterone
 (4) PTH and MSH

140. **Assertion :** When Blood Pressure is increased, ANF is secreted from atrial wall of our heart.
Reason : ANF - decreases blood pressure by causing dilation of blood vessels.

(1) Both assertion and reason are true and the reason is a correct explanation of the assertion.
 (2) Both assertion and reason are true but reason is not a correct explanation of the assertion.
 (3) Assertion is true but the reason is false.
 (4) Both assertion and reason are false.

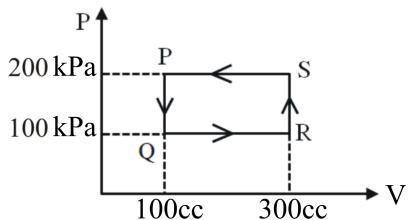
- 141.** Epinephrine regulates all the following functions except-
- Piloerection
 - Glycogenolysis
 - Glycogenesis
 - Proteolysis and lipolysis
- 142.** Which one is not a cranial bone ?
- Frontal
 - Zygomatic
 - Temporal
 - Sphenoid
- 143.** Spread of an action potential towards a T/L tubule:-
- Causes a contraction of thick filament
 - Triggers release of Ca^+ from actin filaments
 - Triggers release of Ca^+ from sarcoplasmic reticulum
 - Triggers release of Ca^+ from H-zone
- 144.** **Statement - I :** Smooth muscles assist in the transportation of gametes through the genital tract.
Statement - II : In the resting state, a subunit of troponin masks the active binding sites for myosin on the actin filaments.
- Both **Statement I** and **Statement II** are correct.
 - Both **Statement I** and **Statement II** are incorrect.
 - Statement I** is correct but **Statement II** is incorrect.
 - Statement I** is incorrect but **Statement II** is correct.
- 145.** Hormone responsible for the secretion of milk after parturition is :-
- ACTH
 - LH
 - ICSH
 - Prolactin
- 146.** Corpus luteum is the source of secretion of:-
- Prolactin
 - Progesterone
 - LH
 - Testosterone
- 147.** Find out correct sequence of menstrual cycle's phase?
- Ovulation, Bleeding phase, Luteal phase
 - Bleeding phase, ovulation, Postovulatory phase, Progesteronic phase
 - Bleeding phase, Oestrogenic phase, Ovulation, Secretory phase
 - Bleeding phase, Ovulation, Oestrogenic phase
- 148.** Identical twins will be produced when :-
- Two eggs are fertilised
 - One sperm fertilises two ova
 - One fertilised egg divides into two blastomeres and they become separate
 - One ovum is fertilised by two sperm
- 149.** Medical Termination of Pregnancy (MTP) is considered safe up to how many weeks of pregnancy ?
- Eight weeks
 - Twelve weeks
 - Eighteen weeks
 - Six weeks
- 150.** Select the **correct** statement :-
- MTPs are safe during the first trimester
 - SAHELI oral contraceptive pills are non-steroidal
 - Natural method of contraception work on the principle of avoiding chances of ovum and sperms meeting
 - All the above

SECTION-A (PHYSICS)

151. A Carnot engine works between ice point and steam point. Its efficiency will be -

- (1) 26.81 %
- (2) 53.36 %
- (3) 71.23 %
- (4) 85.42 %

152. A thermodynamic system is taken through the cycle PQRSP process. The net work done by the system is:



- (1) 20 J
- (2) - 20 J
- (3) 400 J
- (4) - 374 J

153. When an ideal diatomic gas is heated at constant pressure the fraction of the heat energy supplied which increases the internal energy of the gas is-

- (1) 2/5
- (2) 3/5
- (3) 3/7
- (4) 5/7

154. A mixture of 2 moles of helium gas (atomic mass = 4 amu), and 1 mole of argon gas (atomic mass = 40 amu) is kept at 300 K in a container.

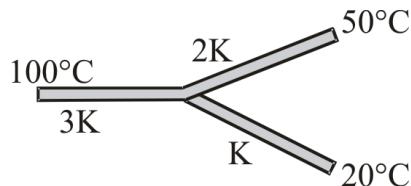
The ratio of the rms speeds $\left(\frac{V_{rms}(\text{helium})}{V_{rms}(\text{argon})} \right)$ is :

- (1) 0.32
- (2) 0.45
- (3) 2.24
- (4) 3.16

155. The temperature of a body falls from 62°C to 50°C in 10 minutes. If the temperature of the surroundings is 26°C, the temperature in next 10 minutes will become :-

- (1) 42°C
- (2) 40°C
- (3) 56°C
- (4) 55°C

156. Three rods of the same dimension have thermal conductivities 3K, 2K and K. They are arranged as shown in figure given below, with their ends at 100°C, 50°C and 20°C. The temperature of their junction is :-



- (1) 60°C
- (2) 70°C
- (3) 50°C
- (4) 35°C

157. Two liquids are at temperature 20°C and 40°C when same masses of both of them are mixed, the temperature of the mixture is 32°C. What is the ratio of their respective specific heats?

- (1) 1/3
- (2) 2/3
- (3) 1/5
- (4) 2/5

158. If on heating liquid through 80°C, the liquid expelled is $\left(\frac{1}{100} \right)^{\text{th}}$ of liquid still remaining in vessel the coefficient of apparent expansion of liquid is :

- (1) $1.25 \times 10^{-4}/^{\circ}\text{C}$
- (2) $12.5 \times 10^{-4}/^{\circ}\text{C}$
- (3) $1.25 \times 10^{-5}/^{\circ}\text{C}$
- (4) $1.25 \times 10^{-6}/^{\circ}\text{C}$

159. Two thermometers X and Y have ice points marked at 15° and 25° and steam points marked as 75° and 125° respectively. When thermometer X measures the temperature of a bath as 60° on it, what would thermometer Y read when it is used to measure the temperature of the same bath?

- (1) 60°
- (2) 75°
- (3) 100°
- (4) 90°

160. Energy is being emitted from the surface of a black body at 127°C temperature at the rate of $1.0 \times 10^6 \text{ J/sec-m}^2$. Temperature of the black body at which the rate of energy emission is $16.0 \times 10^6 \text{ J/sec-m}^2$ will be :-

- (1) 254°C
- (2) 508°C
- (3) 527°C
- (4) 727°C

161. Time period of spring pendulum is T. If spring is divided in 64 equal parts & only 4 pieces of spring are connected in parallel to the same mass, the time period of this system will be :-

(1) $\frac{T}{4}$ (2) $\frac{T}{8}$ (3) $\frac{T}{16}$ (4) $\frac{T}{64}$

162. A body of mass 1 kg is executing simple harmonic motion. Its displacement y (cm) at t seconds is given by $y = 6 \sin(100t + \pi/4)$. Its maximum kinetic energy is

(1) 6 J (2) 18 J (3) 24 J (4) 36 J

163. A particle executes simple harmonic motion with amplitude A and time period T. The minimum time taken by the particle to reach $x = \frac{\sqrt{3}}{2}A$ from $x = \frac{A}{\sqrt{2}}$.

(1) $\frac{T}{8}$ (2) $\frac{T}{6}$ (3) $\frac{T}{12}$ (4) $\frac{T}{24}$

164. A tuning fork with frequency 600 Hz produces resonance in a resonance column tube with upper end open and lower end closed by water surface. Successive resonance are observed at length 13 cm, 38 cm and 63 cm. The speed of sound in air is :-

(1) 330 m/s (2) 340 m/s
 (3) 320 m/s (4) 300 m/s

165. The first two resonance lengths in a resonance tube formed are 16.5 cm and 51 cm. The end correction for the tube is -

(1) 0.25 cm (2) 0.50 cm
 (3) 0.75 cm (4) 1.00 cm

166. The displacement y of a particle in a medium can be expressed as :

$$y = 10^{-6} \sin(100t + 20x + \pi/4)$$

Where t is in second and x in meter. The speed of the wave is :

(1) 2000 m/s (2) 5 m/s
 (3) 20 m/s (4) 5π m/s

167. The equation of a wave on a string of linear density 0.04 kg m^{-1} is given by

$$y = 0.02(\text{m}) \sin\left[2\pi\left(\frac{t}{0.04(\text{s})} - \frac{x}{0.50(\text{m})}\right)\right]$$

The tension in the string is :

(1) 6.25 N (2) 4.0 N (3) 12.5 N (4) 0.5 N

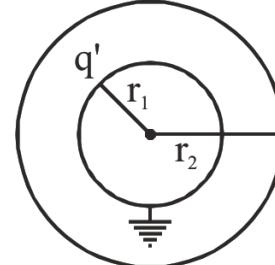
168. An electric dipole of length 4 cm is placed with its axis making an angle of 30° with a uniform electric field 10^6 N/C . If it experiences a torque of $20\sqrt{3} \text{ Nm}$, then potential energy of the dipole :

(1) - 10 J (2) - 60 J (3) - 30 J (4) - 40 J

169. An electric dipole of length 4 cm, when placed with its axis making an angle of 60° with a uniform electric field, experience a torque of $4\sqrt{3} \text{ Nm}$. Calculate the magnitude of the electric field ? dipole has charges $\pm 8 \text{nC}$.

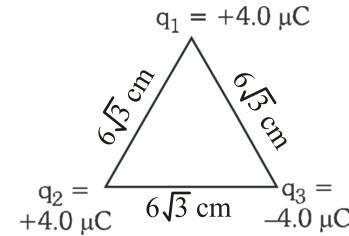
(1) $2.5 \times 10^{10} \text{ N/C}$ (2) $3 \times 10^9 \text{ N/C}$
 (3) $8.5 \times 10^{10} \text{ N/C}$ (4) $5 \times 10^8 \text{ N/C}$

170. The concentric spheres are of radii r_1 and r_2 . The outer sphere is given a charge q . the charge q' on the inner sphere will be (inner sphere is grounded) :-



(1) q (2) $-q$ (3) $-q \frac{r_1}{r_2}$ (4) zero

171. What is the electric potential at the center of the triangle in figure

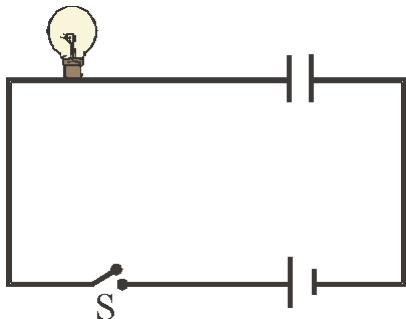


(1) 10^5 V (2) Zero
 (3) $6 \times 10^5 \text{ V}$ (4) $8 \times 10^5 \text{ V}$

172. The insulation property of air breaks down at $E = 3 \times 10^6$ volt/metre. The maximum charge that can be given to a sphere of diameter 5m is approximately (in coulombs)

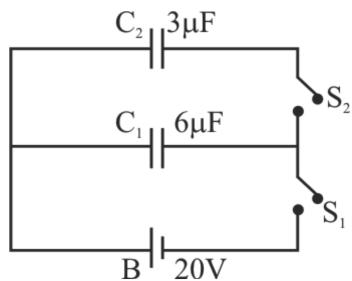
- (1) 2×10^{-2} (2) 2×10^{-3}
 (3) 2×10^{-4} (4) 2×10^{-5}

173. A light bulb, a capacitor and a battery are connected together as shown here, with switch S initially open. When the switch S is closed, which one of the following is true :-



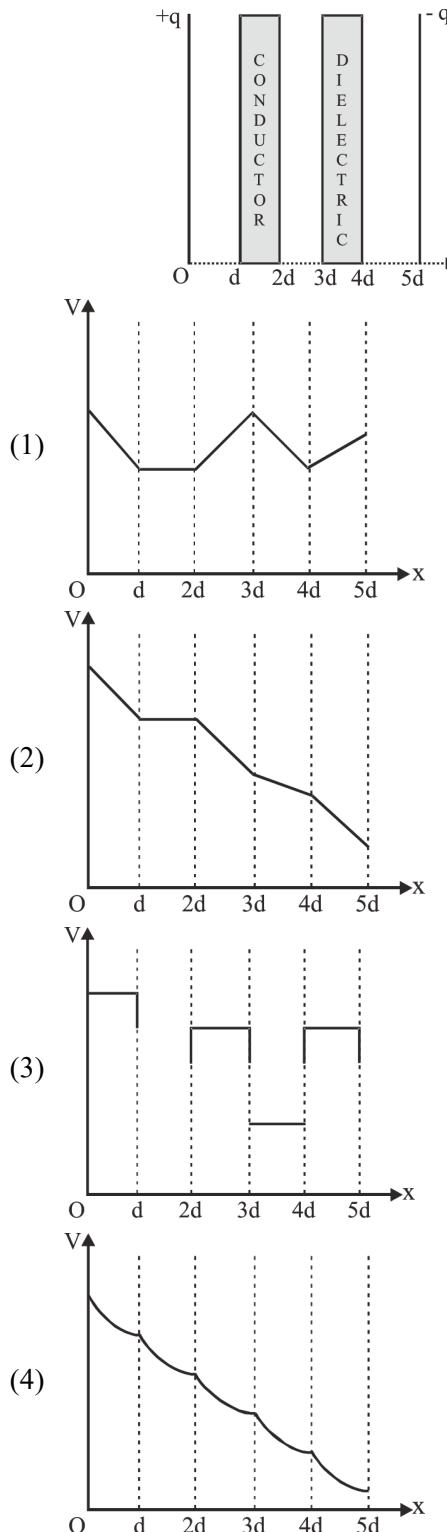
- (1) The bulb will light up for an instant when the capacitor starts charging
 (2) The bulb will light up when the capacitor is fully charged
 (3) The bulb will not light up at all
 (4) The bulb will light up and go off at regular intervals

174. In the circuit shown here $C_1 = 6\mu F$, $C_2 = 3\mu F$ and emf of battery B is 20V. The switch S_1 is first closed. It is then opened and afterward S_2 is closed. What is the charge finally on C_2 ?

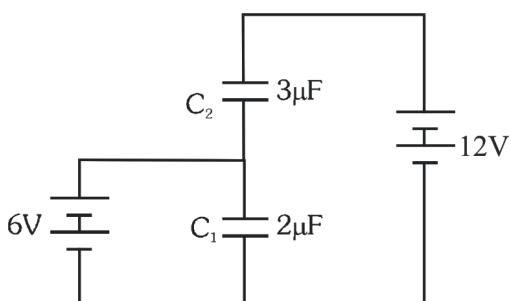


- (1) $120 \mu C$ (2) $80 \mu C$
 (3) $40 \mu C$ (4) $20 \mu C$

175. The distance between plates of a parallel plate capacitor is $5d$. The positively charged plate is at $x=0$ and negatively charged plate is at $x=5d$. Two slabs – one of conductor and the other of a dielectric, both of same thickness d are inserted between the plates as shown in figure. Potential (v) versus distance x graph will be

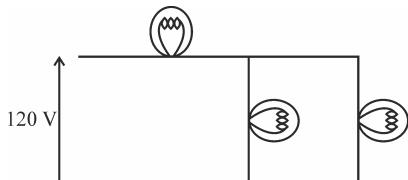


176. Calculate energy stored in capacitance C_1 & C_2



- (1) $U_1 = 36 \text{ J}, U_2 = 24 \text{ J}$
- (2) $U_1 = 24 \text{ J}, U_2 = 36 \text{ J}$
- (3) $U_1 = 36 \mu\text{J}, U_2 = 54 \mu\text{J}$
- (4) $U_1 = 24 \text{ mJ}, U_2 = 36 \text{ mJ}$

177. Three 60 W, 120 V light bulbs are connect across a 120V power source. Find out total power delivered to three bulbs.



- (1) 180 W
- (2) 20 W
- (3) 40 W
- (4) 60 W

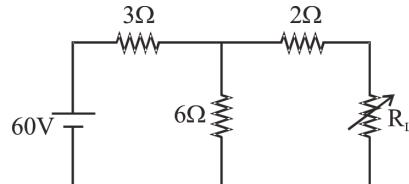
178. A galvanometer having a coil resistance of 30Ω shows full scale deflection when a current of 2A passes through it. It can be converted into an ammeter to read currents upto 10A by :-

- (1) by putting in series a resistance of 240Ω
- (2) by putting in parallel a resistance of 240Ω
- (3) by putting in series a resistance of 7.5Ω
- (4) by putting in parallel a resistance of 7.5Ω

179. A meter bridge is used with a standard 12Ω resistor to determine the resistance of a coil of wire. The balance point is obtained at 60 cm along the wire. If the area of cross-section of wire is $0.1 \times 10^{-6} \text{ m}^2$, the resistivity of wire of coil (in $\Omega - \text{m}$) (length of wire of coil is 0.5 m) :-

- (1) 1.6×10^{-6}
- (2) 4×10^{-6}
- (3) 8×10^{-5}
- (4) 12×10^{-6}

180. In the given circuit find maximum power consumed by the variable load resistance R_L

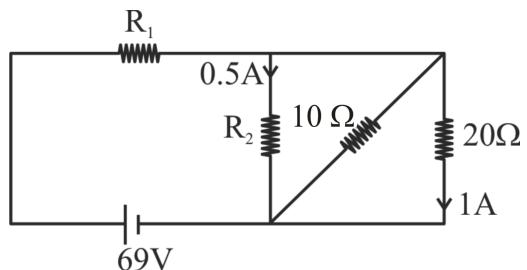


- (1) 100 W
- (2) 20 W
- (3) 25 W
- (4) 50 W

181. A storage battery of emf 8.0 V and internal resistance 0.5Ω is being charged by a 120 V d.c. supply using a series resistor of 15.5Ω . Terminal voltage of the battery during charging :-

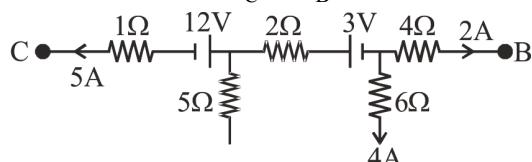
- (1) 10.5V
- (2) 9.5V
- (3) 8.5V
- (4) 11.5V

182. In the circuit shown in the given figure the resistance R_1 and R_2 are respectively



- (1) 14Ω and 40Ω
- (2) 40Ω and 14Ω
- (3) 40Ω and 30Ω
- (4) 14Ω and 30Ω

183. The figure shows part of certain circuit, find potential difference $V_C - V_B$:-



- (1) 6 V
- (2) -6 V
- (3) 8 V
- (4) 10 V

184. The ratio of the length of four wires is $1 : 2 : 3 : 4$. The wires are of the same metal and same radius. If a battery is connected in parallel with them, the ratio of currents in these wires is :-

- (1) $12 : 6 : 4 : 3$
- (2) $6 : 3 : 2 : 1$
- (3) $4 : 3 : 2 : 1$
- (4) $1 : 2 : 3 : 4$

185. A conductor wire having 10^{29} free electrons/m³ carries a current of 20 A. If the cross-section of wire is 1 mm^2 , then the drift velocity of electrons will be :-

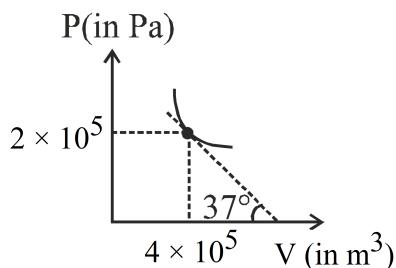
- (1) $6.25 \times 10^{-3} \text{ ms}^{-1}$
- (2) $1.25 \times 10^{-5} \text{ ms}^{-1}$
- (3) $1.25 \times 10^{-3} \text{ ms}^{-1}$
- (4) $1.25 \times 10^{-4} \text{ ms}^{-1}$

SECTION-B (PHYSICS)

186. PV diagram of a diatomic gas is a straight line passing through origin. The molar heat capacity of the gas in the process will be :-

- (1) $4R$
- (2) $2.5 R$
- (3) $3R$
- (4) $4R/3$

187. P-V graphs for an ideal gas undergoing polytropic process $PV^m = \text{constant}$ is shown here. Find the value of m :



- (1) $3/4$
- (2) $-3/2$
- (3) $5/3$
- (4) $3/2$

188. Certain perfect gas is found to obey $PV^{3/2} = \text{constant}$ during a process. If such a gas at initial temperature T is compressed to half the initial volume, its final temperature will be

- (1) $\sqrt{2} T$
- (2) $2T$
- (3) $2\sqrt{2} T$
- (4) $4T$

189. **Assertion (A)** :- The specific heat of a gas in an adiabatic process is zero and in a isothermal process is infinite.

Reason (R) :- Specific heat of gas is directly proportional to change of heat in system and inversely proportional to change in temperature.

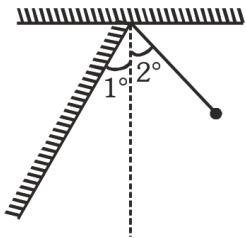
- (1) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
- (2) (A) is correct but (R) is not correct
- (3) (A) is not correct but (R) is correct
- (4) Both (A) and (R) are correct and (R) is the correct explanation of (A)

190. **Assertion (A)** :- For higher temperature, the peak emission wavelength of a black body shifts to lower wavelengths.

Reason (R) :- Peak emission wavelength of a blackbody is proportional to the fourth power of temperature.

- (1) Both (A) and (R) are correct and (R) is the correct explanation of (A)
- (2) Both (A) and (R) are correct but (R) is not the correct explanation of (A)
- (3) (A) is correct but (R) is not correct
- (4) (A) is incorrect but (R) is correct

191. A simple pendulum of length 1m is allowed to oscillate with amplitude 2° . It collides elastically with a wall inclined at 1° to the vertical. Its time period will be : (use $g = \pi^2$)



- (1) $\frac{2}{3}$ sec
- (2) $\frac{4}{3}$ sec
- (3) 2 sec
- (4) None of these

192. A tuning fork gives 4 beats with 50 cm length of a sonometer wire. If the length of the wire is shortened by 1 cm, the number of beats is still the same. The frequency of the fork is :-

- (1) 404 Hz
- (2) 400 Hz
- (3) 396 Hz
- (4) 384 Hz

193. A sonometer wire supports 4 kg load and vibrates in fundamental mode with tuning fork of frequency 416 Hz. The length of wire between the bridges is now doubled. In order to maintain fundamental mode the load should be :-

- | | |
|----------|-----------|
| (1) 1 kg | (2) 2 kg |
| (3) 8 kg | (4) 16 kg |

194. Amount of work done in moving a charge q_0 from centre of ring to an axial point at $x = \sqrt{8}a$ will be if charge given to ring is Q and 'a' being the radius:-

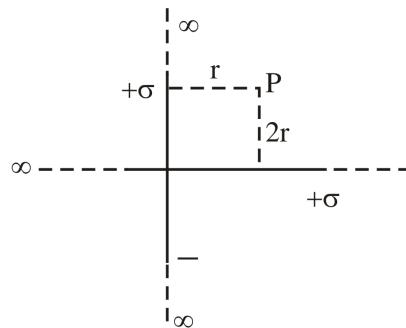
- | | |
|-------------------------------------|--------------------------------------|
| (1) $\frac{Qq_0}{6\pi\epsilon_0 a}$ | (2) $-\frac{Qq_0}{6\pi\epsilon_0 a}$ |
| (3) Zero | (4) $\frac{Qq_0}{4\pi\epsilon_0 a}$ |

195. **Assertion (A) :-** If a spherical cavity is made inside a uniformly charged sphere, then electric field inside the cavity is uniform.

Reason (R) :- The electric field inside the cavity is independent of radius of cavity, but depends on radius of sphere.

- (1) Both (A) and (R) are true and (R) is the correct explanation of (A).
- (2) Both (A) and (R) are true but (R) is NOT the correct explanation of (A).
- (3) (A) is true but (R) is false.
- (4) (A) is false but (R) is true.

196. Two infinitely long uniformly charged non-conducting sheets of charge density $\sigma = \sqrt{2}\epsilon_0 \times 10^{-3} \text{ C/m}^2$ each are placed perpendicular to each other as shown in fig. then net electric field at P is –



- (1) $\sqrt{2} \times 10^{-3} \text{ N/C}$
- (2) 10^{-3} N/C
- (3) $2 \times 10^{-3} \text{ N/C}$
- (4) $\frac{1}{2} \times 10^{-3} \text{ N/C}$

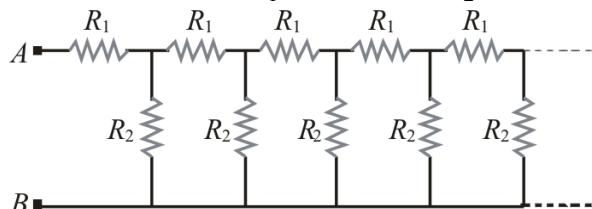
197. Choose the correct statement :-

- (1) Gauss law is valid only for charges placed in vacuum.
- (2) Gauss law is valid only for symmetrical charges distribution.
- (3) The flux of electric field through a closed surface due to all the charges (inside or outside) is equal to the flux due to the charges enclosed by the surface.
- (4) None of the above is a correct statement.

198. A parallel plate capacitor is charged to a potential difference of 50 volts. It is then discharged through a resistance for 2 seconds & its potential drops by 10 volts. Calculate ratio of final energy stored to initial energy stored in capacitor.

(1) 0.14 (2) 0.25 (3) 0.50 (4) 0.64

199. An infinite sequence of resistance is shown in the figure. The resultant resistance between A and B will be, when $R_1 = 1 \text{ ohm}$ and $R_2 = 2 \text{ ohm}$



(1) Infinity (2) 1Ω
 (3) 2Ω (4) 1.5Ω

200. A wire has a resistance of 2.5Ω at 84°C and a resistance of 2.9Ω at 100°C . The temperature coefficient of resistivity of material of the wire is.

(1) $10^{-3} \text{ }^\circ\text{C}^{-1}$

(2) $3.5 \times 10^{-2} \text{ }^\circ\text{C}^{-1}$

(3) $10^{-2} \text{ }^\circ\text{C}^{-1}$

(4) $4 \times 10^{-2} \text{ }^\circ\text{C}^{-1}$

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