

MHT CET 2023 Mathematics Memory Based Question Paper PDF

1. Question 1

If $f(x) = 3^x$; $g(x) = 4^x$, then $\frac{f'(0)-g'(0)}{1+f'(0)g'(0)}$ is

Options:

A. $\frac{\log\left(\frac{3}{4}\right)}{1+(\log 3)(\log 4)}$

B. $\frac{\log\left(\frac{3}{4}\right)}{1+\log 12}$

C. $\frac{\log 12}{1+\log 12}$

D. $\frac{\log\left(\frac{3}{4}\right)}{1-\log 12}$

2. Question 2

If $x = \frac{5}{1-2i}$, $i = \sqrt{-1}$, then the value of $x^3 + x^2 - x + 22$ is

Options:

A. 7

B. 9

C. 17

D. 39

3. Question 3

Two cards are drawn successively with replacement from a well-shuffled pack of 52 cards. Then mean of number of tens is

Options:

A. $\frac{1}{13}$

B. $\frac{1}{169}$

C. $\frac{2}{13}$

D. $\frac{4}{169}$

4. Question 4

$$\int x \sqrt{\frac{2 \sin(x^2+1) - \sin 2(x^2+1)}{2 \sin(x^2+1) + \sin 2(x^2+1)}} dx =$$

Options:

A. $\log \left(\sec \left(\frac{x^2+1}{2} \right) \right) + c$, where c is a constant of integration.

B. $\log \left(\frac{x^2+1}{2} \right) + c$, where c is a constant of integration.

C. $\log \left(\sin \left(\frac{x^2+1}{2} \right) \right) + c$, where c is a constant of integration.

D. $2 \log(x^2 + 1) + c$, where c is a constant of integration.

5. Question 5

If the lines $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-1}{4}$ and $x-3 = \frac{y-k}{2} = z$ intersect, then the value of k is

Options:

- A. $\frac{3}{2}$
- B. $\frac{-2}{9}$
- C. $\frac{-2}{3}$
- D. $\frac{9}{2}$

6. **Question 6**

For all real x , the minimum value of $\frac{1-x+x^2}{1+x+x^2}$ is

Options:

- A. 0
- B. 1
- C. $\frac{1}{3}$
- D. 3

7. **Question 7**

If $\vec{a} = \hat{i} + 4\hat{j} + 2\hat{k}$, $\vec{b} = 3\hat{i} - 2\hat{j} + 7\hat{k}$, $\vec{c} = 2\hat{i} - \hat{j} + 4\hat{k}$, then a vector $\vec{d}$ which is parallel to vector $\vec{a} \times \vec{b}$ and which $\vec{c} \cdot \vec{d} = 15$, is

Options:

- A. $30\hat{i} - \hat{j} - 14\hat{k}$
- B. $90\hat{i} - 3\hat{j} - 42\hat{k}$
- C. $90\hat{i} + \hat{j} - 7\hat{k}$
- D. $30\hat{i} - 3\hat{j} + 7\hat{k}$

8. **Question 8**

If the vertices of a triangle are $(-2, 3)$, $(6, -1)$ and $(4, 3)$, then the co-ordinates of the circumcentre of the triangle are

Options:

- A. $(1, 1)$
- B. $(-1, -1)$
- C. $(-1, 1)$
- D. $(1, -1)$

9. **Question 9**

The solution of $\frac{dx}{dy} + \frac{x}{y} = x^2$ is

Options:

- A. $\frac{1}{y} = cx - x \log x$, where c is a constant of integration.
- B. $\frac{1}{x} = cy - y \log y$, where c is a constant of integration.
- C. $\frac{1}{x} = cx - x \log y$, where c is a constant of integration.
- D. $\frac{1}{y} = cx - y \log x$, where c is a constant of integration.

10. **Question 10**

If $\int \frac{\cos 8x+1}{\cot 2x-\tan 2x} dx = A \cos 8x + c$, where c is an arbitrary constant, then the value of A is

Options:

- A. $\frac{1}{16}$

- B. $\frac{1}{8}$
 C. $\frac{-1}{8}$
 D. $\frac{-1}{16}$

11. **Question 11**

The set of all points, where the derivative of the functions $f(x) = \frac{x}{1+|x|}$ exists, is

Options:

- A. $(-\infty, \infty)$
 B. $[0, \infty)$
 C. $(-\infty, 0) \cup (0, \infty)$
 D. $(0, \infty)$

12. **Question 12**

In triangle ABC with usual notations $b = \sqrt{3}, c = 1, m\angle A = 30^\circ$, then the largest angle of the triangle is

Options:

- A. 135°
 B. 90°
 C. 60°
 D. 120°

13. **Question 13**

A fair die is tossed twice in succession. If X denotes the number of fours in two tosses, then the probability distribution of X is given by

Options:

- A.

$X = x_i$	0	1	2
P_i	1/36	25/36	5/18
- B.

$X = x_i$	0	1	2
P_i	25/36	1/36	5/18
- C.

$X = x_i$	0	1	2
P_i	25/36	5/18	1/36
- D.

$X = x_i$	0	1	2
P_i	5/18	1/36	25/36

14. **Question 14**

If $f(x) = \frac{3x+4}{5x-7}$ and $g(x) = \frac{7x+4}{5x-3}$, then $f(g(x)) =$

Options:

- A. $\frac{x^3+1}{x^2+2}$
 B. $41x$
 C. $g(f(x))$
 D. $\frac{5x-7}{41}$

15. **Question 15**

If the function f is given by $f(x) = x^3 - 3(a-2)x^2 + 3ax + 7$, for some $a \in \mathbb{R}$, is increasing in $(0, 1]$ and decreasing in $[1, 5)$, then a root of the equation $\frac{f(x)-14}{(x-1)^2} = 0 (x \neq 1)$ is

Options:

- A. -7
- B. 6
- C. 7
- D. 5

16. **Question 16**

The unit vector perpendicular to each of the vectors $\bar{a} + \bar{b}$ and $\bar{a} - \bar{b}$, where $\bar{a} = \hat{i} + \hat{j} + \hat{k}$ and $\bar{b} = 3\hat{i} - 2\hat{j} + 5\hat{k}$ is

Options:

- A. $\frac{-14\hat{i}+4\hat{j}+10\hat{k}}{\sqrt{312}}$
- B. $\frac{14\hat{i}-4\hat{j}+10\hat{k}}{\sqrt{312}}$
- C. $\frac{14\hat{i}+4\hat{j}+10\hat{k}}{\sqrt{312}}$
- D. $\frac{-14\hat{i}-4\hat{j}+10\hat{k}}{\sqrt{312}}$

17. **Question 17**

The logical statement $(\sim (\sim p \vee q) \vee (p \wedge r)) \wedge (\sim q \wedge r)$ is equivalent to

Options:

- A. $\sim p \vee r$
- B. $(p \wedge \sim q) \vee r$
- C. $(p \wedge r) \wedge \sim q$
- D. $(\sim p \wedge \sim q) \wedge r$

18. **Question 18**

Let $\bar{a} = 2\hat{i} + \hat{j} - 2\hat{k}$, $\bar{b} = \hat{i} + \hat{j}$ and $\bar{c}$ be a vector such that $|\bar{c} - \bar{a}| = 4$, $|(\bar{a} \times \bar{b}) \times \bar{c}| = 3$ and the angle between $\bar{c}$ and $\bar{a} \times \bar{b}$ is $\frac{\pi}{6}$, then $\bar{a} \cdot \bar{c}$ is equal to

Options:

- A. -3
- B. $\frac{3}{2}$
- C. 3
- D. $\frac{-3}{2}$

19. **Question 19**

If a and b are positive number such that $a > b$, then the minimum value of $a \sec \theta - b \tan \theta$ ($0 < \theta < \frac{\pi}{2}$) is

Options:

- A. $\frac{1}{\sqrt{a^2-b^2}}$
- B. $\frac{1}{\sqrt{a^2+b^2}}$
- C. $\sqrt{a^2+b^2}$

D. $\sqrt{a^2 - b^2}$

20. Question 20

If $l = \lim_{x \rightarrow 0} \frac{x}{|x| + x^2}$, then the value of l is

Options:

A. 1

B. -1

C. 2

D. non-existent

21. Question 21

If $y = [(x+1)(2x+1)(3x+1) \dots (nx+1)]^{\frac{3}{2}}$, then $\frac{dy}{dx}$ at $x = 0$ is

Options:

A. $\frac{3n(n+1)}{4}$

B. $\frac{n(n+1)}{2}$

C. $\frac{3n(n+1)}{2}$

D. $\frac{n(n+1)}{4}$

22. Question 22

If $\cos x + \cos y - \cos(x+y) = \frac{3}{2}$, then

Options:

A. $x + y = 0$

B. $x = 2y$

C. $x = y$

D. $2x = y$

23. Question 23

The joint equation of the lines pair of lines passing through the point $(3, -2)$ and perpendicular to the lines $5x^2 + 2xy - 3y^2 = 0$ is

Options:

A. $3x^2 + 2xy + 5y^2 + 14x + 26y + 5 = 0$

B. $3x^2 + 2xy - 5y^2 - 14x - 26y - 5 = 0$

C. $3x^2 - 2xy - 5y^2 - 14x - 26y + 5 = 0$

D. $3x^2 - 2xy + 5y^2 + 14x + 26y - 5 = 0$

24. Question 24

If the line $\frac{x-1}{2} = \frac{y+1}{3} = \frac{z-2}{4}$ meets the plane $x + 2y + 3z = 15$ at the point P , then the distance of P from the origin is

Options:

A. $\frac{7}{2}$ units

B. $\frac{9}{2}$ units

C. $\frac{\sqrt{5}}{2}$ units

D. $2\sqrt{5}$ units

25. Question 25

If A and B are two events such that $P(A) = \frac{1}{3}$, $P(B) = \frac{1}{5}$, $P(A \cup B) = \frac{1}{3}$, then the value of $P(A'/B') + P(B'/A')$ is

Options:

- A. $\frac{5}{6}$
- B. 1
- C. $\frac{1}{6}$
- D. $\frac{11}{6}$

26. Question 26

If the general solution of the equation $\frac{\tan 3x-1}{\tan 3x+1} = \sqrt{3}$ is $x = \frac{n\pi}{p} + \frac{7\pi}{q}$, $n, p, q \in \mathbb{Z}$, then $\frac{p}{q}$ is

Options:

- A. 12
- B. $\frac{1}{12}$
- C. 3
- D. 36

27. Question 27

If the area of the parallelogram with $\bar{a}$ and $\bar{b}$ as two adjacent sides is 16sq. units, then the area of the parallelogram having $3\bar{a} + 2\bar{b}$ and $\bar{a} + 3\bar{b}$ as two adjacent sides (in sq. units) is

Options:

- A. 96
- B. 112
- C. 144
- D. 128

28. Question 28

The value of $\int (1 - \cos x) \cdot \operatorname{cosec}^2 x dx$ is

Options:

- A. $\frac{1}{2} \tan \frac{x}{2} + c$, where c is a constant of integration.
- B. $\tan \frac{x}{2} + c$, where c is a constant of integration.
- C. $2 \cot \frac{x}{2} + c$, where c is a constant of integration.
- D. $\cot \frac{x}{2} + c$, where c is a constant of integration.

29. Question 29

If $\cos^{-1} \sqrt{p} + \cos^{-1} \sqrt{1-p} + \cos^{-1} \sqrt{1-q} = \frac{3\pi}{4}$, then q is

Options:

- A. $\frac{1}{2}$
- B. $\frac{1}{\sqrt{2}}$
- C. 1
- D. $\frac{1}{3}$

30. **Question 30**

The slope of the tangent to a curve $y = f(x)$ at $(x, f(x))$ is $2x + 1$. If the curve passes through the point $(1, 2)$, then the area (in sq. units), bounded by the curve, the X-axis and the line $x = 1$, is

Options:

- A. $\frac{3}{2}$
- B. $\frac{4}{3}$
- C. $\frac{5}{6}$
- D. $\frac{1}{12}$

31. **Question 31**

A rod AB , 13 feet long moves with its ends A and B on two perpendicular lines OX and OY respectively. When A is 5 feet from O , it is moving away at the rate of 3 feet/sec. At this instant, B is moving at the rate

Options:

- A. $\frac{5}{4}$ ft/sec upwards.
- B. $\frac{4}{3}$ ft/sec upwards.
- C. $\frac{5}{4}$ ft/sec downwards.
- D. $\frac{4}{5}$ ft/sec downwards.

32. **Question 32**

If $f(x) = \begin{cases} \frac{x-3}{|x-3|} + a, & x < 3 \\ a + b, & x = 3 \\ \frac{|x-3|}{x-3} + b, & x > 3 \end{cases}$ is continuous at $x = 3$, then the value of $a - b$ is

Options:

- A. -1
- B. 0
- C. 1
- D. 2

33. **Question 33**

The equation of the tangent to the curve $y = \sqrt{9 - 2x^2}$, at the point where the ordinate and abscissa are equal, is

Options:

- A. $2x + y + \sqrt{3} = 0$
- B. $2x + y + 3\sqrt{3} = 0$
- C. $2x - y - 3\sqrt{3} = 0$
- D. $2x + y - 3\sqrt{3} = 0$

34. **Question 34**

If $\bar{a} = 2\hat{i} + 3\hat{j} + 2\hat{k}$, $\bar{b} = 2\hat{i} + \hat{j} - \hat{k}$ and $\bar{c} = 3\hat{i} - \hat{j}$ are such that $\bar{a} + \lambda\bar{b}$ is perpendicular to $\bar{c}$, then the value of λ is

Options:

- A. $-\frac{1}{5}$

B. 3

C. $\frac{3}{5}$ D. $-\frac{3}{5}$ **35. Question 35**

If a circle passes through points $(4, 0)$ and $(0, 2)$ and its centre lies on Y-axis. If the radius of the circle is r , then the value of $r^2 - r + 1$ is

Options:

A. 25

B. 21

C. 20

D. 10

36. Question 36

If $A = \begin{bmatrix} i & 1 \\ 1 & 0 \end{bmatrix}$ where $i = \sqrt{-1}$ and $B = A^{2029}$, then $B^{-1} =$

Options:A. $-A$ B. $\text{adj } A$ C. $-I$ D. $-\text{adj } A$ **37. Question 37**

The solution of the differential equation $\frac{dy}{dx} + \frac{y}{x} = \sin x$ is

Options:A. $xy + \cos x = \sin x + c$, where c is a constant of integration.B. $x(y + \cos x) = \sin x + c$, where c is a constant of integration.C. $y(x + \cos x) = \sin x + c$, where c is a constant of integration.D. $xy + \sin x = \cos x + c$, where c is a constant of integration.**38. Question 38**

Let $f : [-1, 2] \rightarrow [0, \infty)$ be a continuous function such that $f(x) = f(1-x), \forall x \in [-1, 2]$.

Let $R_1 = \int_{-1}^2 xf(x)dx$ and R_2 be the area of the region bounded by $y = f(x), x = -1, x = 2$ and the X-axis, then R_2 is

Options:A. $\frac{1}{2}R_1$ B. $2R_1$ C. $3R_1$ D. $\frac{1}{3}R_1$ **39. Question 39**

The equation of line passing through the point $(1, 2, 3)$ and perpendicular to the lines $\frac{x-2}{3} = \frac{y-1}{2} = \frac{z+1}{-2}$ and $\frac{x}{2} = \frac{y}{-3} = \frac{z}{1}$ is

Options:

- A. $\bar{r} = (\hat{i} + 2\hat{j} + 3\hat{k}) + \lambda(4\hat{i} + 7\hat{j} - 13\hat{k})$
 B. $\bar{r} = (\hat{i} + 2\hat{j} + 3\hat{k}) + \lambda(-4\hat{i} + 7\hat{j} - 13\hat{k})$
 C. $\bar{r} = (\hat{i} + 2\hat{j} + 3\hat{k}) + \lambda(-4\hat{i} - 7\hat{j} - 13\hat{k})$
 D. $\bar{r} = (\hat{i} + 2\hat{j} + 3\hat{k}) + \lambda(4\hat{i} - 7\hat{j} - 13\hat{k})$

40. **Question 40**

Let a random variable X have a Binomial distribution with mean 8 and variance 4. If $P(X \leq 2) = \frac{K}{2^{16}}$, then K is

Options:

- A. 17
 B. 121
 C. 136
 D. 137

41. **Question 41**

$\pi + \left(\sin^{-1} \frac{4}{5} + \sin^{-1} \frac{5}{13} + \sin^{-1} \frac{16}{65}\right)$ is equal to

Options:

- A. $\frac{\pi}{2}$
 B. $\frac{5\pi}{4}$
 C. $\frac{3\pi}{2}$
 D. $\frac{7\pi}{4}$

42. **Question 42**

If the angles of a triangle are in the ratio 4 : 1 : 1, then the ratio of the longest side to its perimeter is

Options:

- A. $\sqrt{3} : (2 + \sqrt{3})$
 B. $2 : (1 + \sqrt{3})$
 C. $1 : (2 + \sqrt{3})$
 D. $2 : 3$

43. **Question 43**

If truth value of logical statement $(p \leftrightarrow \sim q) \rightarrow (\sim p \wedge q)$ is false, then the truth values of p and q are respectively

Options:

- A. F, T
 B. T, T
 C. T, F
 D. F, F

44. **Question 44**

The teacher wants to arrange 5 students on the platform such that the boy B_1 occupies second position and the girls G_1 and G_2 are always adjacent to each other, then the number of such arrangements is

Options:

- A. 24
- B. 12
- C. 8
- D. 16

45. Question 45

If $\bar{a} = \hat{i} + \hat{j} + \hat{k}$, $\bar{b} = 4\hat{i} + 3\hat{j} + 4\hat{k}$ and $\bar{c} = \hat{i} + \alpha\hat{j} + \beta\hat{k}$ are linearly dependent vectors and $|\bar{c}| = \sqrt{3}$, then the values of α and β are respectively.

Options:

- A. 1, 1
- B. 2, 1
- C. 0, 1
- D. 1, 2

46. Question 46

At present a firm is manufacturing 1000 items. It is estimated that the rate of change of production P w.r.t. additional number of worker x is given by $\frac{dP}{dx} = 100 - 12\sqrt{x}$. If the firm employs 9 more workers, then the new level of production of items is

Options:

- A. 1684
- B. 1648
- C. 2116
- D. 1116

47. Question 47

The maximum value of $z = 3x + 5y$ subject to the constraints $3x + 2y \leq 18$, $x \leq 4$, $y \leq 6$, $x, y \geq 0$, is

Options:

- A. 27
- B. 36
- C. 42
- D. 30

48. Question 48

If $I = \int \sin(\log(x))dx$, then I is given by

Options:

- A. $-\frac{x}{2}(\sin(\log x) - \cos(\log x)) + c$, where c is a constant of integration.
- B. $\frac{x}{2}(\sin(\log x) - \cos(\log x)) + c$, where c is a constant of integration.
- C. $\frac{x}{2}(\sin(\log x) + \cos(\log x)) + c$, where c is a constant of integration.
- D. $-\frac{x}{2}(\sin(\log x) + \cos(\log x)) + c$, where c is a constant of integration.

49. Question 49

If both mean and variance of 50 observations $x_1, x_2, \dots, x_{50}$ are equal to 16 and 256 respectively, then mean of $(x_1 - 5)^2, (x_2 - 5)^2, \dots, (x_{50} - 5)^2$ is

Options:

- A. 357
- B. 387
- C. 377
- D. 397

50. **Question 50**

The angle between the line $\frac{x+1}{2} = \frac{y-2}{1} = \frac{z-3}{-2}$ and plane $x - 2y - \lambda z = 3$ is $\cos^{-1}\left(\frac{2\sqrt{2}}{3}\right)$, then value of λ is

Options:

- A. $\sqrt{\frac{3}{5}}$
- B. $\frac{5}{\sqrt{3}}$
- C. $\sqrt{\frac{5}{3}}$
- D. $\frac{1}{\sqrt{3}}$

Chemistry

51. **Question 51**

Identify the reagent 'R' used in the following reaction.

Options:

- A. CO, HCl
- B. H_2 , Pd-BaSO₄
- C. H_2O
- D. DIBAL-H

52. **Question 52**

Which among the following phenols has highest melting point?

Options:

- A. o-Nitrophenol
- B. p-Nitrophenol
- C. p-Cresol
- D. Phenol

53. **Question 53**

Identify the element having general electronic configuration ns^1 from following.

Options:

- A. Ca
- B. Sr
- C. Ba
- D. Fr

54. **Question 54**

Which of the following enzyme is found in saliva?

Options:

- A. Amylase
- B. Lipase
- C. Glucose isomerase
- D. Proteases

55. **Question 55**

Which from following molecules exhibits lowest thermal stability?

Options:

- A. H_2O
- B. H_2Te
- C. H_2Se
- D. H_2S

56. **Question 56**

The common name of Benzene-1,3-diol is:

Options:

- A. catechol
- B. resorcinol
- C. quinol
- D. pyrogallol

57. **Question 57**

For a reaction $A + B \rightarrow \text{product}$, if $[A]$ is doubled keeping $[B]$ constant, the rate of reaction doubles. Calculate the order of reaction with respect to A.

Options:

- A. 0
- B. $1/2$
- C. 1
- D. 2

58. **Question 58**

Identify the salt that undergoes hydrolysis and forms acidic solution from following.

Options:

- A. Na_2CO_3
- B. NH_4NO_3
- C. NH_4CN
- D. KCN

59. **Question 59**

Which from following sentences is NOT correct?

Options:

- A. ΔG° is an extensive property.
- B. E_{cell}° is an intensive property.

C. Electrical work is equal to nFE_{cell} .

D. For a chemical reaction to be spontaneous E_{cell}^0 must be negative.

60. Question 60

A solution of nonvolatile solute is obtained by dissolving 1.5 g in 30 g solvent has boiling point elevation 0.65 K. Calculate the molal elevation constant if molar mass of solute is 150 g mol^{-1} .

Options:

A. $1.95 \text{ K kg mol}^{-1}$

B. $2.23 \text{ K kg mol}^{-1}$

C. $1.52 \text{ K kg mol}^{-1}$

D. $2.72 \text{ K kg mol}^{-1}$

61. Question 61

A weak base is 1.42% dissociated in its 0.05 M solution. Calculate its dissociation constant.

Options:

A. 5.5×10^{-5}

B. 4.0×10^{-5}

C. 1.8×10^{-5}

D. 1.0×10^{-5}

62. Question 62

What is the value of percent atom economy when an organic compound of formula weight 75 u is obtained from reactants having sum formula weight 225 u?

Options:

A. 13.5

B. 33.3

C. 40.4

D. 70.5

63. Question 63

Calculate ΔS_{total} for the following reaction at 300 K.



($\Delta H = 28.1 \text{ kJ mol}^{-1}$, $\Delta S_{sys} = 108.7 \text{ J K}^{-1} \text{ mol}^{-1}$)

Options:

A. $15.1 \text{ J K}^{-1} \text{ mol}^{-1}$

B. $93.6 \text{ J K}^{-1} \text{ mol}^{-1}$

C. $84.3 \text{ J K}^{-1} \text{ mol}^{-1}$

D. $202.3 \text{ J K}^{-1} \text{ mol}^{-1}$

64. Question 64

Which from following properties is NOT exhibited by LDP?

Options:

- A. It is crystalline.
- B. It is moisture resistant.
- C. LDP films are extremely flexible.
- D. It is poor conductor of electricity.

65. Question 65

Identify the FALSE statement about ideal solution from following.

Options:

- A. Ideal solutions obey Raoult's law over entire range of concentration.
- B. No heat is evolved or absorbed when two components forming an ideal solution are mixed.
- C. Volume of ideal solution is same as sum of volumes of two components taken for mixing.
- D. The vapour pressure of ideal solution is either higher or lower than vapour pressure of pure components.

66. Question 66

Which from following is NOT an example of amorphous solid?

Options:

- A. Glass
- B. Plastic
- C. Rubber
- D. Diamond

67. Question 67

Which of the following statements is NOT true about Bohr atomic model?

Options:

- A. An electron in hydrogen atom can move around the nucleus in one of the many possible orbits of fixed radius and energy.
- B. The energy of an electron in the orbit does not change with time.
- C. An electron can move only in those orbits for which angular momentum is integral multiple of $\frac{h}{2\pi}$.
- D. This model can explain the ability of atoms to form molecules by chemical bonds.

68. Question 68

Calculate the rate constant of the first order reaction if 80% of the reactant reacted in 15 minute.

Options:

- A. 0.11 minute^{-1}
- B. 0.22 minute^{-1}
- C. 0.34 minute^{-1}
- D. 0.42 minute^{-1}

69. Question 69

Calculate the degree of dissociation of 0.01 M acetic acid at 25°C [$\Lambda_c = 15.0 \Omega^{-1} \text{ cm}^2 \text{ mol}^{-1}$ and $\Lambda_0 = 300 \Omega^{-1} \text{ cm}^2 \text{ mol}^{-1}$]

Options:

- A. 0.042
- B. 0.035
- C. 0.025
- D. 0.05

70. Question 70

Which element from following does NOT exhibit spin only magnetic moment in +3 state?

Options:

- A. Cr
- B. V
- C. Ti
- D. Sc

71. Question 71

Identify the final product formed on ammonolysis of benzyl chloride followed by the reaction with two moles of CH_3I .

Options:

- A. $\text{C}_6\text{H}_5\text{CH}_2\text{NHCH}_3$
- B. $\text{C}_6\text{H}_5\text{CH}_2\text{NH}_2$
- C. $\text{C}_6\text{H}_5\text{N}(\text{CH}_3)_2$
- D. $\text{C}_6\text{H}_5\text{CH}_2\text{N}(\text{CH}_3)_2$

72. Question 72

Which from following elements is isoelectronic with Na^+ ?

Options:

- A. F
- B. O
- C. Mg
- D. Ne

73. Question 73

Which of the following is positively charged sol?

Options:

- A. Haemoglobin in blood
- B. Sol of starch
- C. Gelatin
- D. 'Ag' sol

74. Question 74

When tert-butyl bromide is heated with silver fluoride, the major product obtained is:

Options:

- A. 1-Fluoro-2-methylpropane
- B. 2-Fluoro-2-methylpropane
- C. 1-Fluorobutane
- D. 2-Fluorobutane

75. Question 75

Which among the following is NOT a feature of S_N2 mechanism?

Options:

- A. Single step mechanism
- B. Backside attack of nucleophile
- C. Formation of planar carbocation intermediate
- D. Involves simultaneous bond breaking and bond forming

76. Question 76

What is the pH of 0.005 M NaOH solution?

Options:

- A. 2.30
- B. 12.6
- C. 11.7
- D. 3.2

77. Question 77

What is the oxidation number of sulfur in H_2SO_5 ?

Options:

- A. +4
- B. +6
- C. +8
- D. +5

78. Question 78

If N_2 gas is compressed at 2 atmosphere from 9.0 L to 3.0 L at 300 K, find the final pressure at same temperature.

Options:

- A. 1.66 atm
- B. 3.32 atm
- C. 6.0 atm
- D. 9.0 atm

79. Question 79

What is the number of moles of secondary carbon atoms in n mole isopentane?

Options:

- A. $4n$
- B. $3n$
- C. $2n$
- D. n

80. **Question 80**

Which from following substances consists of total 1 mole atoms in it? (Molar mass of $\text{NH}_3 = 17$, $\text{H}_2\text{O} = 18$, $\text{N}_2 = 28$, $\text{CO}_2 = 44$)

Options:

- A. 4.25 g NH_3
- B. 1.8 g H_2O
- C. 2.8 g N_2
- D. 4.4 g CO_2

81. **Question 81**

Identify the formula of potassium trioxalatoaluminate(III).

Options:

- A. $\text{K}_3 [\text{Al}(\text{C}_2\text{O}_4)_3]$
- B. $\text{Al} [\text{K}_3(\text{C}_2\text{O}_4)_3]$
- C. $\text{K}_3 [\text{Al}(\text{C}_2\text{O}_4)_3]^{2-}$
- D. $\text{K}_4 [\text{Al}_3(\text{C}_2\text{O}_4)_3]^{2+}$

82. **Question 82**

If, Aniline $\xrightarrow[\text{ii) } \text{H}_2\text{O}, \Delta]{\text{i) } \text{NaNO}_2 + \text{HCl}, 273\text{K}}$ Product.

Identify the product of above reaction.

Options:

- A. o-Nitroaniline
- B. m-Nitroaniline
- C. p-Nitroaniline
- D. Phenol

83. **Question 83**

Identify nonbenzenoid aromatic compound from following.

Options:

- A. Aniline
- B. Tropone
- C. Naphthalene
- D. Phenol

84. **Question 84**

Methyl propanoate on hydrolysis with dil NaOH forms a salt which on further acidification with conc. HCl forms -----.

Options:

A. $\text{CH}_3 - \text{COOH}$

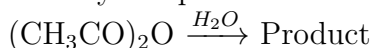
B.

C.

D.

85. **Question 85**

Identify the product obtained in the following reaction.



Options:

A. CH_3COCH_3

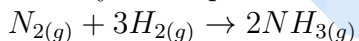
B.

C. $\text{CH}_3 - \text{OH}$

D. CH_3COOH

86. **Question 86**

Identify the expression for average rate for following reaction.



Options:

A. $\frac{-\Delta[\text{N}_2]}{\Delta t} = -\frac{1}{3} \frac{\Delta[\text{H}_2]}{\Delta t} = \frac{1}{2} \frac{\Delta[\text{NH}_3]}{\Delta t}$

B. $-\frac{1}{3} \frac{\Delta[\text{N}_2]}{\Delta t} = \frac{\Delta[\text{H}_2]}{\Delta t} = \frac{1}{2} \frac{\Delta[\text{NH}_3]}{\Delta t}$

C. $\frac{-\Delta[\text{N}_2]}{\Delta t} = \frac{-\Delta[\text{H}_2]}{\Delta t} = \frac{\Delta[\text{NH}_3]}{\Delta t}$

D. $-\frac{1}{2} \frac{\Delta[\text{N}_2]}{\Delta t} = \frac{-\Delta[\text{H}_2]}{\Delta t} = \frac{1}{3} \frac{\Delta[\text{NH}_3]}{\Delta t}$

87. **Question 87**

The reaction of aryl halide with alkyl halide and sodium metal in dry ether to form substituted aromatic compounds is known as:

Options:

A. Wurtz reaction

B. Fittig reaction

C. Wurtz Fittig reaction

D. Friedel Craft's reaction

88. **Question 88**

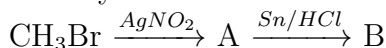
Identify anionic complex from following.

Options:

- A. Pentaammineaquacobalt(III) iodide
- B. Pentamminecarbonatocobalt(III) chloride
- C. Tetracyanonickelate(II) ion
- D. Triamminetrinitrocobalt(III)

89. **Question 89**

Identify 'A' and 'B' in the following reaction.



Options:

- A. CH_3NO_2 and CH_3Cl
- B. CH_3NO_2 and CH_3NH_2
- C. CH_3NH_2 and CH_3Cl
- D. CH_3NH_2 and $\text{CH}_3\text{CH}_2\text{NO}_2$

90. **Question 90**

Calculate the molar mass of metal having density 9.3 g cm^{-3} that forms simple cubic unit cell. $[a^3 \cdot N_A = 22.6 \text{ cm}^3 \text{ mol}^{-1}]$

Options:

- A. 210.2 g mol^{-1}
- B. 105.3 g mol^{-1}
- C. 52.6 g mol^{-1}
- D. 70.2 g mol^{-1}

91. **Question 91**

Calculate the E_{cell}° for $\text{Zn}_{(\text{s})} | \text{Zn}_{(1\text{M})}^{++} || \text{Cd}_{(1\text{M})}^{++} | \text{Cd}_{(\text{s})}$ at 25°C [$E_{\text{Zn}}^0 = -0.763 \text{ V}$; $E_{\text{Cd}}^0 = -0.403 \text{ V}$]

Options:

- A. 0.36 V
- B. 1.17 V
- C. -0.36 V
- D. -1.17 V

92. **Question 92**

What is the work done during oxidation of 4 moles of $\text{SO}_{2(\text{g})}$ to $\text{SO}_{3(\text{g})}$ at 27°C ? ($R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$)

Options:

- A. 4.988 kJ
- B. -1.125 kJ
- C. 3.234 kJ
- D. -4.988 kJ

93. Question 93

Identify the type of system if boiling water is kept in a half filled closed vessel.

Options:

- A. Homogeneous closed system
- B. Heterogeneous closed system
- C. Homogeneous isolated system
- D. Heterogeneous isolated system

94. Question 94

What is the formal charge on sulfur in following Lewis structure?

Options:

- A. 2
- B. -2
- C. 0
- D. -1

95. Question 95

Identify weakest halogen acid from following.

Options:

- A. HCl
- B. HI
- C. HF
- D. HBr

96. Question 96

Which of the following phenomena is NOT explained by the open chain structure of glucose?

Options:

- A. Formation of pentaacetate of glucose with acetic anhydride.
- B. Formation of oxime with hydroxylamine.
- C. Formation of silver mirror with Tollen's reagent.
- D. Existence of α and β forms of glucose.

97. Question 97

Which from following polymers is obtained from isoprene?

Options:

- A. Teflon
- B. Natural rubber
- C. Viscose rayon
- D. Cuprammonium rayon

98. **Question 98**

Find the radius of an atom in fcc unit cell having edge length 405pm.

Options:

- A. 202.5 pm
- B. 175.3 pm
- C. 143.2 pm
- D. 181.0 pm

99. **Question 99**

Which from following cations in their respective oxidation states develops colourless aqueous solution?

Options:

- A. Fe^{3+}
- B. Fe^{2+}
- C. Cu^{2+}
- D. Cu^{+}

100. **Question 100**

Calculate osmotic pressure of 0.2 M aqueous KCl solution at 0°C if van't Hoff factor for KCl is 1.83. [$R = 0.082 \text{ dm}^3 \text{ atm mol}^{-1} \text{ K}^{-1}$]

Options:

- A. 8.2 atm
- B. 9.4 atm
- C. 10.6 atm
- D. 6.5 atm

Physics

101. Question 101

The magnetic flux through a circuit of resistance 'R' changes by an amount $\Delta\phi$ in the time Δt . The total quantity of electric charge 'Q' which passes during this time through any point of the circuit is

Options:

- A. $-\frac{\Delta\phi}{\Delta t} + R$
- B. $\frac{\Delta\phi}{R}$
- C. $\frac{\Delta\phi}{\Delta t}$
- D. $\frac{\Delta\phi}{\Delta t} \times R$

102. Question 102

A beam of light of wavelength 600 nm from a distant source falls on a single slit 1 mm wide and the resulting diffraction pattern is observed on a screen 2 m away. The distance between the first dark fringe on either side of the central bright fringe is

Options:

- A. 1.2 mm
- B. 2.4 mm
- C. 1.2 cm
- D. 2.4 cm

103. Question 103

An electron of mass 'm' and charge 'q' is accelerated from rest in a uniform electric field of strength 'E'. The velocity acquired by the electron, when it travels a distance 'L', is

Options:

- A. $\sqrt{\frac{2qm}{mL}}$
- B. $\sqrt{\frac{2qEL}{m}}$
- C. $\sqrt{\frac{2Em}{qL}}$
- D. $\sqrt{\frac{qE}{mL}}$

104. Question 104

Two bodies have their moments of inertia I and 2I respectively about their axis of rotation. If their kinetic energies of rotation are equal, their angular momenta will be in the ratio

Options:

- A. 1 : 2
- B. $\sqrt{2} : 1$
- C. 2 : 1
- D. $1 : \sqrt{2}$

105. Question 105

A ball kept at 20 m height falls freely in vertically downward direction and hits the ground. The coefficient of restitution is 0.4. Velocity of the ball first rebound is [$g = 10 \text{ ms}^{-2}$]

Options:

- A. 4 ms^{-1}
- B. 8 ms^{-1}
- C. 12 ms^{-1}
- D. 16 ms^{-1}

106. Question 106

Two long conductors separated by a distance 'd' carry currents I_1 and I_2 in the same direction. They exert a force 'F' on each other. Now the current in one of them is increased to two times and its direction is reversed. The distance between them is also increased to 3 d. The new value of force between them is

Options:

- A. $-2 F$
- B. $\frac{F}{3}$
- C. $\frac{-2 F}{3}$
- D. $\frac{-F}{3}$

107. Question 107

The a.c. source is connected to series LCR circuit. If voltage across R is 40 V, that across L is 80 V and that across C is 40 V, then the e.m.f. 'e' of a.c. source is

Options:

- A. 40 V
- B. $40\sqrt{2}$ V
- C. 80 V
- D. 160 V

108. Question 108

In the study of transistor as an amplifier if $\alpha = \frac{I_C}{I_E} = 0.98$ and $\beta = \frac{I_C}{I_B} = 49$, where I_C, I_B and I_E are collector, base and emitter current respectively then $\left(\frac{1}{\alpha} - \frac{1}{\beta}\right)$ is equal to

Options:

- A. zero
- B. $\frac{1}{2}$
- C. 2
- D. 1

109. Question 109

A liquid drop of radius 'R' is broken into 'n' identical small droplets. The work done is [T = surface tension of the liquid]

Options:

- A. $4\pi R^2 \left(n^{\frac{2}{3}} - 1\right) T$

- B. $4\pi R^2 \left(n^{\frac{1}{3}} - 1 \right) T$
 C. $4\pi R^2 \left(1 - n^{\frac{1}{3}} \right) T$
 D. $4\pi R^2 \left(1 - n^{\frac{2}{3}} \right) T$

110. **Question 110**

For a gas, $\frac{R}{C_v} = 0.4$, where R is universal gas constant and C_v is molar specific heat at constant volume. The gas is made up of molecules which are

Options:

- A. rigid diatomic
 B. monoatomic
 C. non-rigid diatomic
 D. polyatomic

111. **Question 111**

Two bodies A and B at temperatures ' T_1 ' K and ' T_2 ' K respectively have the same dimensions. Their emissivities are in the ratio 1 : 3. If they radiate the same amount of heat per unit area per unit time, then the ratio of their temperatures ($T_1 : T_2$) is

Options:

- A. 1 : 3
 B. $3^{1/4} : 1$
 C. $9^{1/4} : 1$
 D. 81 : 1

112. **Question 112**

In a conical pendulum the bob of mass ' m ' moves in a horizontal circle of radius ' r ' with uniform speed ' V '. The string of length ' L ' describes a cone of semi vertical angle ' θ '. The centripetal force acting on the bob is (g = acceleration due to gravity)

Options:

- A. $\frac{mgr}{\sqrt{L^2 - r^2}}$
 B. $\frac{mgr}{(L^2 - r^2)}$
 C. $\frac{\sqrt{L^2 - r^2}}{mgL}$
 D. $\frac{mgL}{\sqrt{L^2 - r^2}}$

113. Question 113

A fluid of density ' ρ ' is flowing through a uniform tube of diameter ' d '. The coefficient of viscosity of the fluid is ' η ', then critical velocity of the fluid is

Options:

- A. inversely proportional to ' η '
- B. directly proportional to ' η '
- C. directly proportional to ' d '
- D. directly proportional to ' ρ '

114. Question 114

The self inductance ' L ' of a solenoid of length ' l ' and area of cross-section ' A ', with a fixed number of turns ' N ' increases as

Options:

- A. both l and A increase
- B. l decreases and A increases
- C. l increases and A decreases
- D. both l and A decrease

115. Question 115

A transverse wave in a medium is given by $y = A \sin 2(\omega t - kx)$. It is found that the magnitude of the maximum velocity of particles in the medium is equal to that of the wave velocity. What is the value of A ?

Options:

- A. $\frac{2\lambda}{\pi}$
- B. $\frac{\lambda}{\pi}$
- C. $\frac{\lambda}{2\pi}$
- D. $\frac{\lambda}{4\pi}$

116. Question 116

The radius of the orbit of a geostationary satellite is (mean radius of earth is ' R ', angular velocity about own axis is ' ω ' and acceleration due to gravity on earth's surface is ' g ')

Options:

- A. $\left(\frac{gR^2}{\omega^2}\right)^{\frac{1}{3}}$
- B. $\left(\frac{gR^2}{\omega^2}\right)^{\frac{2}{3}}$
- C. $\left(\frac{gR^2}{\omega^2}\right)^{\frac{1}{2}}$
- D. $\frac{gR^2}{\omega^2}$

117. Question 117

According to Bohr's theory of hydrogen atom, the total energy of the electron in the n^{th} stationary orbit is

Options:

- A. directly proportional to n

- B. inversely proportional to n
- C. directly proportional to n^2
- D. inversely proportional to n^2

118. **Question 118**

In a series LCR circuit, $C = 2\mu\text{F}$, $L = 1\text{mH}$ and $R = 10\Omega$. The ratio of the energies stored in the inductor and the capacitor, when the maximum current flows in the circuit, is

Options:

- A. 5 : 1
- B. 3 : 2
- C. 1 : 2
- D. 1 : 5

119. **Question 119**

In Young's double slit experiment, the fifth maximum with wavelength ' λ_1 ' is at a distance ' y_1 ' and the same maximum with wavelength ' λ_2 ' is at a distance ' y_2 ' measured from the central bright band. Then $\frac{y_1}{y_2}$ is equal to [D and d are constant]

Options:

- A. $\frac{\lambda_1}{\lambda_2}$
- B. $\frac{\lambda_2}{\lambda_1}$
- C. $\frac{\lambda_1^2}{\lambda_2^2}$
- D. $\frac{\lambda_2^2}{\lambda_1^2}$

120. **Question 120**

Bohr model is applied to a particle of mass ' m ' and charge ' q ' moving in a plane under the influence of a transverse magnetic field ' B '. The energy of the charged particle in the n^{th} level will be [h = Planck's constant]

Options:

- A. $\frac{nhqB}{4\pi m}$
- B. $\frac{nhqB}{2\pi m}$
- C. $\frac{nhqB}{\pi m}$
- D. $\frac{2nhqB}{\pi m}$

121. **Question 121**

A rectangular block of mass ' m ' and crosssectional area A , floats on a liquid of density ' ρ '. It is given a small vertical displacement from equilibrium, it starts oscillating with frequency ' n ' equal to (g = acceleration due to gravity)

Options:

- A. $\frac{1}{2\pi} \sqrt{\frac{A\rho g}{m}}$
- B. $2\pi \sqrt{\frac{A\rho g}{m}}$
- C. $\frac{1}{2\pi} \sqrt{\frac{m}{A\rho g}}$

D. $2\pi\sqrt{\frac{m}{A\rho g}}$

122. **Question 122**

Two spherical conductors of capacities $3\mu\text{F}$ and $2\mu\text{F}$ are charged to same potential having radii 3 cm and 2 cm respectively. If ' σ_1 ' and ' σ_2 ' represent surface density of charge on respective conductors then $\frac{\sigma_1}{\sigma_2}$ is

Options:

A. $\frac{1}{3}$

B. $\frac{1}{2}$

C. $\frac{2}{3}$

D. $\frac{3}{4}$

123. **Question 123**

A circular arc of radius 'r' carrying current 'I' subtends an angle $\frac{\pi}{16}$ at its centre. The radius of a metal wire is uniform. The magnetic induction at the centre of circular arc is [μ_0 = permeability of free space]

Options:

A. $\frac{\mu_0 I}{32r}$

B. $\frac{\mu_0 I}{16r}$

C. $\frac{\mu_0 I}{64r}$

D. $\frac{\mu_0 I}{8r}$

124. **Question 124**

A sound of frequency 480 Hz is emitted from the stringed instrument. The velocity of sound in air is 320 m/s. After completing 180 vibrations, the distance covered by a wave is

Options:

A. 60 m

B. 90 m

C. 120 m

D. 180 m

125. **Question 125**

A sonometer wire 'A' of diameter 'd' under tension 'T' having density ' ρ_1 ' vibrates with fundamental frequency 'n'. If we use another wire 'B' which vibrates with same frequency under tension '2 T' and diameter '2D' then density ' ρ_2 ' of wire 'B' will be

Options:

A. $\rho_2 = 2\rho_1$

B. $\rho_2 = \rho_1$

C. $\rho_2 = \frac{\rho_1}{2}$

D. $\rho_2 = \frac{\rho_1}{4}$

126. Question 126

The upper end of the spring is fixed and a mass 'm' is attached to its lower end. When mass is slightly pulled down and released, it oscillates with time period 3 second. If mass 'm' is increased by 1 kg, the time period becomes 5 second. The value of 'm' is (mass of spring is negligible)

Options:

- A. $\frac{3}{8}$ kg
- B. $\frac{5}{9}$ kg
- C. $\frac{8}{13}$ kg
- D. $\frac{9}{16}$ kg

127. Question 127

What should be the diameter of a soap bubble, in order that the excess pressure inside it is 25.6 Nm^{-2} ? [surface tension of soap solution = $3 \cdot 2 \times 10^{-2} \text{ Nm}^{-2}$]

Options:

- A. 2 cm
- B. 1.5 cm
- C. 1 cm
- D. 0.5 cm

128. Question 128

If temperature of gas molecules is raised from 127°C to 527°C , the ratio of r.m.s. speed of the molecules is respectively

Options:

- A. 1 : 2
- B. 2 : 1
- C. $1 : \sqrt{2}$
- D. $2 : \sqrt{2}$

129. Question 129

The ratio of energy required to raise a satellite to a height 'h' above the earth's surface to that required to put it into the orbit at the same height is (R = radius of earth)

Options:

- A. $\frac{2h}{R}$
- B. $\frac{h}{R}$
- C. $\frac{R}{h}$
- D. $\frac{R}{2h}$

130. Question 130

According to Boyle's law, the product PV remains constant. The unit of PV is same as that of

Options:

- A. energy
- B. force

- C. impulse
- D. momentum

131. **Question 131**

When a metallic surface is illuminated with radiation of wavelength ' λ ', the stopping potential is ' V '. If the same surface is illuminated with radiation of wavelength ' 2λ ', the stopping potential is ' $\left(\frac{V}{4}\right)$ '. The threshold wavelength for the metallic surface is

Options:

- A. $\frac{5}{2}\lambda$
- B. 3λ
- C. 4λ
- D. 5λ

132. **Question 132**

Three identical capacitors of capacitance ' C ' each are connected in series and this connection is connected in parallel with one more such identical capacitor. Then the capacitance of whole combination is

Options:

- A. $3C$
- B. $2C$
- C. $\frac{4}{3}C$
- D. $\frac{3}{4}C$

133. **Question 133**

In Young's double slit experiment, green light is incident on two slits. The interference pattern is observed on a screen. Which one of the following changes would cause the observed fringes to be more closely spaced?

Options:

- A. Reducing the separation between the slits
- B. Using blue light instead of green light
- C. Using red light instead of green light
- D. Moving the screen away from the slits

134. **Question 134**

Two batteries, one of e.m.f. 12 V and internal resistance 2Ω and other of e.m.f. 6 V and internal resistance 1Ω , are connected as shown in the figure. What will be the reading of the voltmeter ' V '?

Options:

- A. 12 V
- B. 8 V
- C. 6 V
- D. 4 V

135. **Question 135**

Potential difference between the points P and Q is nearly

Options:

- A. 17 V
- B. 14 V
- C. 12 V
- D. 8 V

136. **Question 136**

A coil having effective area 'A' is held with its plane normal to a magnetic field of induction 'B'. The magnetic induction is quickly reduced to 25% of its initial value in 1 second. The e.m.f. induced in the coil (in volt) will be

Options:

- A. $\frac{BA}{4}$
- B. $\frac{BA}{2}$
- C. $\frac{3BA}{8}$
- D. $\frac{3BA}{4}$

137. **Question 137**

The path difference between two waves, represented by $y_1 = a_1 \sin \left(\omega t - \frac{2\pi x}{\lambda} \right)$ and $y_2 = a_2 \cos \left(\omega t - \frac{2\pi x}{\lambda} + \phi \right)$ is

Options:

- A. $\frac{\lambda}{2\pi}(\phi)$
- B. $\frac{\lambda}{2\pi} \left(\phi + \frac{\pi}{2} \right)$
- C. $\frac{2\pi}{\lambda} \left(\phi - \frac{\pi}{2} \right)$
- D. $\frac{2\pi}{\lambda}(\phi)$

138. **Question 138**

An electromagnetic wave, whose wave normal makes an angle of 45° with the vertical, travelling in air strikes a horizontal liquid surface. While travelling through the liquid it gets deviated through 15° . What is the speed of the electromagnetic wave in the liquid,

if the speed of electromagnetic wave in air is 3×10^8 m/s ?

$$\left(\sin 30^\circ = 0.5, \sin 45^\circ = \frac{1}{\sqrt{2}} \right)$$

Options:

- A. $\frac{\sqrt{2}}{3} \times 10^8$ m/s
- B. 1.5×10^8 m/s
- C. 2.1×10^8 m/s
- D. 2.5×10^8 m/s

139. Question 139

The difference in length between two rods A and B is 60 cm at all temperatures. If $\alpha_A = 18 \times 10^{-6}/^\circ\text{C}$ and $\beta_B = 27 \times 10^{-6}/^\circ\text{C}$, the lengths of the two rods are

Options:

- A. $l_A = 200$ cm, $l_B = 140$ cm
- B. $l_A = 180$ cm, $l_B = 120$ cm
- C. $l_A = 160$ cm, $l_B = 100$ cm
- D. $l_A = 120$ cm, $l_B = 60$ cm

140. Question 140

A parallel plate capacitor is charged by a battery and battery remains connected. The dielectric slab of constant 'K' is inserted between the plates and then taken out. Then electric field between the plates

Options:

- A. remains the same
- B. increases
- C. decreases
- D. becomes zero

141. Question 141

From a disc of mass 'M' and radius 'R', a circular hole of diameter 'R' is cut whose rim passes through the centre. The moment of inertia of the remaining part of the disc about perpendicular axis passing through the centre is

Options:

- A. $\frac{13MR^2}{32}$
- B. $\frac{11MR^2}{32}$
- C. $\frac{9MR^2}{32}$

D. $\frac{7MR^2}{32}$

142. **Question 142**

If $p - n$ junction diode is in forward bias then

Options:

- A. width of depletion layer increases
- B. electric conduction is not possible at all
- C. barrier voltage increases
- D. width of depletion layer decreases

143. **Question 143**

The orbital magnetic moment associated with orbiting electron of charge 'e' is

Options:

- A. inversely proportional to angular momentum
- B. directly proportional to mass of electron
- C. directly proportional to angular momentum
- D. inversely proportional to charge on electron

144. **Question 144**

An ideal gas expands adiabatically. ($\gamma = 1.5$) To reduce the r.m.s. velocity of the molecules 3 times, the gas has to be expanded

Options:

- A. 81 times
- B. 27 times
- C. 9 times
- D. 3 times

145. **Question 145**

A metal surface of work function 1.3 eV is irradiated with light of wavelength 310 nm . The retarding potential required to stop the escape of photoelectrons is [Take $\frac{hc}{e} = 1240 \times 10^{-9} \text{ SI units}$]

Options:

- A. 1.13 V
- B. 2.87 V
- C. 3.97 V
- D. 4.23 V

146. **Question 146**

Two cars A and B start from a point at the same time in a straight line and their positions are represented by $R_A(t) = at + bt^2$ and $R_B(t) = xt - t^2$. At what time do the cars have same velocity?

Options:

- A. $\frac{x-a}{2(b+1)}$
- B. $\frac{x+a}{2(b-1)}$

C. $\frac{x-a}{(b+1)}$

D. $\frac{x+a}{(b-1)}$

147. **Question 147**

The a.c. source of e.m.f. with instantaneous value 'e' is given by $e = 200 \sin(50t)$ volt. The r.m.s. value of current in a circuit of resistance 50Ω is

Options:

A. 0.2828 A

B. 2.828 A

C. 28.28 A

D. 282.8 A

148. **Question 148**

In the digital circuit the inputs are as shown in figure. The Boolean expression for output Y is

Options:

A. $\overline{A + B + C}$

B. $\overline{A \cdot B \cdot C}$

C. $\overline{A \cdot B} + \overline{C}$

D. $\overline{A + B \cdot C}$

149. **Question 149**

A double convex lens of focal length 'F' is cut into two equal parts along the vertical axis. The focal length of each part will be

Options:

A. 2 F

B. F

C. $\frac{F}{2}$

D. 4 F

150. **Question 150**

Two progressive waves are travelling towards each other with velocity 50 m/s and frequency 200 Hz. The distance between the two consecutive antinodes is

Options:

A. 0.125 m

B. 0.150 m

- C. 0.175 m
- D. 0.200 m

