TECHNO INDIA GROUP PUBLIC SCHOOL

Dt. 06-05-2025

JEE (ADVANCED) – 2025

Mock Test - I

Time Allowed: **3 hours** Maximum Marks: **180**

General Instructions:

1. All questions are of objective type having four answer options for each.
2. Follow the instructions given in each section accordingly.
3. Questions must be answered on OMR sheet by darkening the appropriate bubble marked A, B, C or D.
4. Use only **Black/Blue ink ball point pen** to mark the answer by filling up of the respective bubbles completely.
5. Write your name (in block letter), name of examination center and put your signature (as is appeared in Admit Card) in appropriate boxes in the **OMR Sheet**.
6. The OMR Sheet is liable to become invalid if there is any mistake in filling the correct bubbles for Question Booklet number/roll number or if there is any discrepancy in the name/signature of the candidate, name of the examination center. The OMR Sheet may also become invalid due to folding or putting stray marks on it or any damage to it. The consequence of such invalidation due to incorrect marking or careless handling by the candidate will be the sole responsibility of candidate.
7. Candidates are not allowed to carry any written or printed material, calculator, pen, log-table, wristwatch, any communication device like mobile phones, bluetooth device etc. inside the examination hall. Any candidate found with such prohibited items will be **reported against** and his/her candidature will be summarily cancelled.
8. Rough work must be done on the Question Booklet itself. Additional blank pages are given in the Question Booklet for rough work.
9. Hand over the OMR Sheet to the invigilator before leaving the Examination Hall.

MATHEMATICS

Paper–II

SECTION–1 (Maximum Marks: 12)

- This section contains **FOUR (04)** questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONLY ONE** of these four options is the correct answer.
- For each question, choose the option corresponding to the correct answer.
- Answer to each question will be evaluated <u>according to the following marking scheme</u>:

Full Marks : +3 If **ONLY** the correct option is chosen;
Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);
Negative Marks : –1 In all other cases.

1. For two data sets each of size 5, the variance are given to be 4 and 5 and the corresponding means are given to be 2 and 4, respectively. The variance of the combined data

Ⓐ $\frac{5}{2}$ Ⓑ $\frac{11}{2}$ Ⓒ 6 Ⓓ $\frac{13}{2}$

2. In a certain test there are n questions. In this test 2^{n-i}, students gave wrong answers to atleast i questions where i = 1, 2, 3, .. n. If the total numbers of wrong answer given is 2047, then n equals.

Ⓐ 11 Ⓑ 10 Ⓒ 12 Ⓓ 13

3. PQ is a chord of the parabola $x^2 + 2x + 12y - 11 = 0$ through (–1, –2) and a circle is drawn on PQ as diameter, then the circle touches the

Ⓐ directrix of the parabola
Ⓑ tangent at the vertex of the parabola
Ⓒ Latus rectum of the parabola
Ⓓ axis of the parabola

4. Let S = {x : sin {x} = cos {x}}, $x \in [0, 2\pi]$, { } → F.P.F} then n(s) = ?

Ⓐ 2 Ⓑ 4 Ⓒ 6 Ⓓ 8

Cont...4

SECTION–2 (Maximum Marks: 12)

- This section contains three (03) questions.
- Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).
- For each question, choose the option(s) corresponding to (all) the correct answer(s).
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Full Marks : +4 **ONLY** if (all) the correct option(s) is(are) chosen;

Partial Marks : +3 If all the four options are correct but **ONLY** three options are chosen;

Partial Marks : +2 If three or more options are correct but **ONLY** two options are chosen, both of which are correct;

Partial Marks : +1 If two or more options are correct but **ONLY** one option is chosen and it is a correct option;

Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);

Negative Marks : –2 In all other cases.

- For example, in a question, if (A), (B) and (D) are the **ONLY** three options corresponding to correct answers, then

choosing **ONLY** (A), (B) and (D) will get +4 marks;
choosing **ONLY** (A) and (B) will get +2 marks;
choosing **ONLY** (A) and (D) will get +2 marks;
choosing **ONLY** (B) and (D) will get +2 marks;
choosing **ONLY** (A) will get +1 mark;
choosing **ONLY** (B) will get +1 mark
choosing **ONLY** (D) will get +1 mark;
choosing no option (i.e the question is unanswered) will get 0 marks; and
choosing any other combination of options will get –2 marks.

5. If $f(x) = \begin{vmatrix} 3 & 3x & 3x^2+2a^2 \\ 3x & 3x^2+2a^2 & 3x^3+6a^2x \\ 3x^2+2a^2 & 3x^3+6a^2x & 3x^4+12a^2x^2+2a^2 \end{vmatrix}$ then

Ⓐ $f'(x) = 0$ Ⓑ $y = f(x)$ is a straight line parallel to X axis

Ⓒ $\int_0^2 f(x)dx = 32a^4$ Ⓓ none of the above.

6. The number of points of non-differentiability of function $f(x) = \max\left\{\sin^{-1}|\sin x|, \cos^{-1}|\sin x|\right\}$, where $0 < x < 2\pi$ is

Ⓐ 7 Ⓑ ${}^7C_1$ Ⓒ 8 Ⓓ positive root of $t^2 = 8t$

7. Let $S_n = \sum_{k=1}^{4n} (-1)^{\frac{k(k+1)}{2}} . k^2$. Then, S_n can take values

① 1056 Ⓑ 1088 Ⓒ 1120 Ⓓ 1332

SECTION–3 (Maximum Marks: 24)

- This section contains **SIX (06)** questions.
- The answer to each question is a **NON-NEGATIVE INTEGER**.
- For each question, enter the correct integer corresponding to the answer using the mouse and the onscreen virtual numeric keypad in the place designated to enter the answer.
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8. If the bi-quadratic $x^4 + ax^3 + bx^2 + cx + d = 0$ (a, b, c, d $\in$R) has 4 non real roots, two with sum 3 + 4i and the other two with product (13 + i). Find the sum of digit(s) of b is

9. Find the area enclosed between the curves : $y = \log_e(x+e)$, $x = \log_e\left(\frac{1}{y}\right)$ & the x – axis.

10. Let, $I = \int_0^1 \frac{2+3x+4x^2}{2\sqrt{1+x+x^2}}\,dx$. Find the value of I^2.

11. Let f(x) be a cubic polynomial which has local maximum at x = –1 and f′(x) has a local minimum at x = 1. If f(–1) = 10 and f(3) = –22, if 4k is the distance between its two horizontal tangents then find k.

12. Given that $x^2 + y^2 = 14x + 6y + 6$ & if the largest possible value of the expression E = 3x + 4y. is $\alpha\beta$ where α and β are tens and units place digit. Find $\alpha - \beta$

13. How many ordered pair (m, n) satisfy the equation $3 \times 2^m + 1 = n^2$ where m and n are natural numbers.

SECTION–4 (Maximum Marks: 12)

- This section contains **TWO (02)** paragraphs.
- Based on each paragraph, there are **TWO (02)** questions.
- The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value of the answer using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer.
- If the numerical value has more than two decimal places, **truncate/round-off** the value to **TWO** decimal places.
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Paragraph – I

The circle $x^2 + y^2 - 8x = 0$ and hyperbola $\frac{x^2}{9} - \frac{y^2}{4} = 1$ intersect at the points A and B.

14. If the equation of a common tangent with positive slope to the circle as well as to the hyperbola is $ax - \sqrt{5}y + b = 0$ then $\frac{b}{a}$ is_____.

Cont...6

15. If the equation of the circle with AB as its diameter is $ax^2 + by^2 - cx + d = 0$ then $(a + b + c + d)$ is _____.

Paragraph – II

Let, $h(n) = \int_0^a f(x)g(nx)dx$

16. Let $f(x) = 2$, $g(x) = |\sin \pi x|$, and $n = \frac{1}{N}$ where $N = \{1, 2, 3, \ldots\}$. If $\frac{h(n)}{a}$ is independent of n for N = 1, 2, 3, 4 then minimum value of a is _____ .

17. If $f(x) = \sin^2 x$, $g(x) = |\cos x|$ then $\lim_{a \to \infty} \frac{3\pi h(1)}{a}$ is _____.

PHYSICS

Paper–II

SECTION–1 (Maximum Marks: 12)

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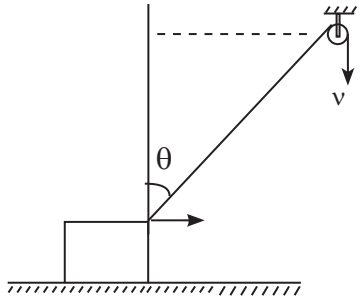
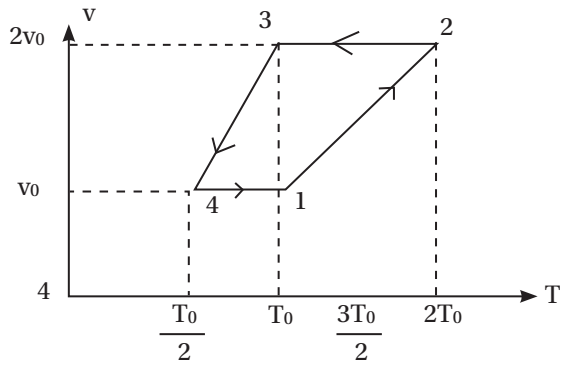
Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);
Negative Marks : –1 In all other cases.

18. A block is dragged on a smooth plane with the help of a rope which is pulled with velocity v as shown in the figure. Then the horizontal velocity of the block.



Ⓐ $v \cos \theta$ Ⓑ $v \sin \theta$ Ⓒ $v / \cos \theta$ Ⓓ $v / \sin \theta$

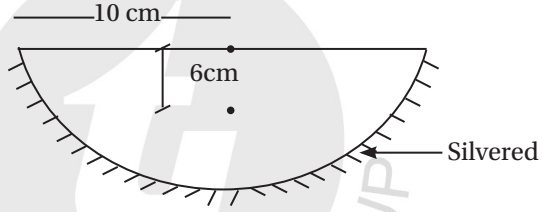
19. One mole of monoatomic ideal gas goes through a thermodynamic cycle as shown in V–T diagram.



Work done in this thermodynamic cycle (1 ⟶ 2 ⟶ 3 ⟶ 4 ⟶ 1) is $|W| =$

Ⓐ $\frac{1}{2}$ RT_0 Ⓑ RT_0 Ⓒ $2\,RT_0$ Ⓓ $1.5\,RT_0$

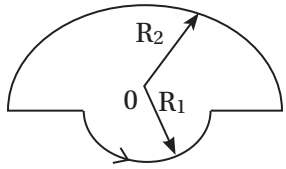
20. A hemispherical glass body of radius 10cm and refractive index 1.5 is silvered on its curved surface. A small air bubble is 6 cm below the flat surface inside it along the axis. The position of the image of the air bubble made by the mirror is seen.



Ⓐ 14 cm below flat surface Ⓑ 20 cm below flat surface

Ⓒ 16 cm below flat surface Ⓓ 30 cm below flat surface

21. The magnetic field at the centre of a wire loop formed by two semicircular wires of radii $R_1 = 2\pi$m and Rs = 4πm, carrying current I = 4A as per figure given below is (centre 0 is common for all segments) .



Ⓐ 2×10^{-7} T Ⓑ 3×10^{-7} T Ⓒ 1.5×10^{-7} T Ⓓ 4×10^{-7} T

SECTION–2 (Maximum Marks: 12)

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22.

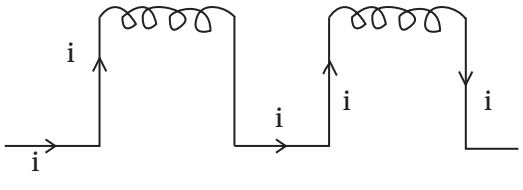


figure (a)

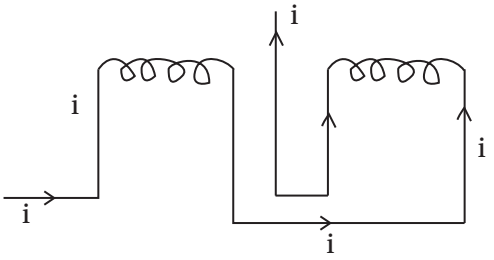


figure (b)

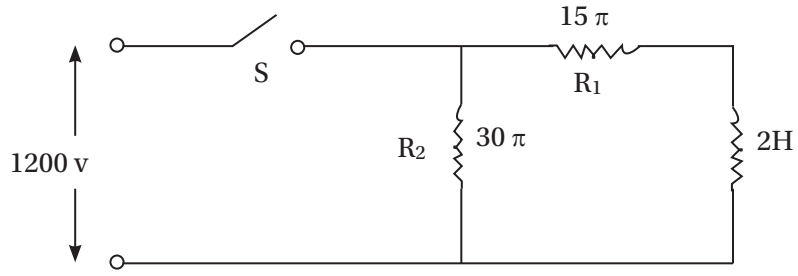
Ⓐ In figure (a), if L_1 = 1200 mH and L_2 = 800 mH and equivalent inductance 2500 mH, then mutual inductance M = 250 mH.

Ⓑ In figure (b), if L_1 = 800 mH and L_2 = 1200 mH and M = 250 mH, equivalent inductance is 1500 mH.

Ⓒ Only (a) is correct.

Ⓓ here, Leq = $L_1 + L_2$

23.



Ⓐ At the instant of switch on, there is no current through inductor arm.

Ⓑ At the instant of switch on the $\frac{di}{dt}$ across inductor is 60A/s.

Ⓒ When switch has been closed for a sufficiently long time, current through R1 is 8 A .

Ⓓ None of the above.

24. A body of mass m is thrown with a velocity u at an angle θ with horizontal.

Ⓐ Power delivered by gravity during the time t from instant of projection is –mg [u sin θ – gt]

Ⓑ average power delivered by gravity during time t is –mg (u sinθ – $\frac{gt}{2}$)

Ⓒ The average power is zero.

Ⓓ The average power is –mg u sin θ.

SECTION–3 (Maximum Marks: 24)

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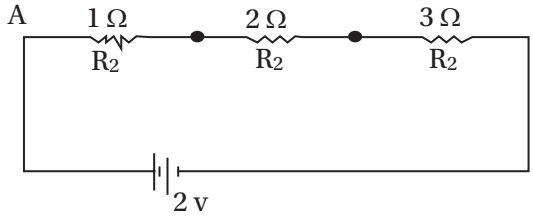
25.



If both 2Ω and 3Ω resistors have been shorted out of the circuit, then circuit current becomes x times the normal value. Then x is _____ .

26. Force of attraction (F) between oppositely – charged parallel metal plates is given by $nF = A\xi_0E^2$ newtons. (with standard terms). The n is _____ .

27. Two long straight parallel wires, standing in air 2m apart, carry current I_1, and I_2 in the same direction. If the force on each wire per unit length is 2.4×10^{-4} N then $\frac{I_1 \times I_2}{100}$ = _____ .

28. The time variation of the flux linked with a coil of 500 turns during a complete cycle is as follows

$\phi = 0.04\ (1 - {}^{4t}/_{T})$ Weber $0 < t < {}^{T}/_{2}$

$= 0.04\ (4t/T - 3)$ Weber $\frac{T}{2} < t < T$

where T represents time period and equals 0.04s. From t = 0 to t = $\frac{T}{2}$, the induced emf e↓ (volt) is _____.

29. A heavy nucleus Q of half-life 20 minutes undergoes alpha – decay with probability of 60% and beta decay with probability of 40% . Initially, the number of Q nuclei is 1000. The number of alpha decays of Q in the first one hour is _____ .

30. The ratio of radii of curvature at the highest point to the point of projection for maximum horizontal range is n. The n^2 = _____ .

SECTION–4 (Maximum Marks: 12)

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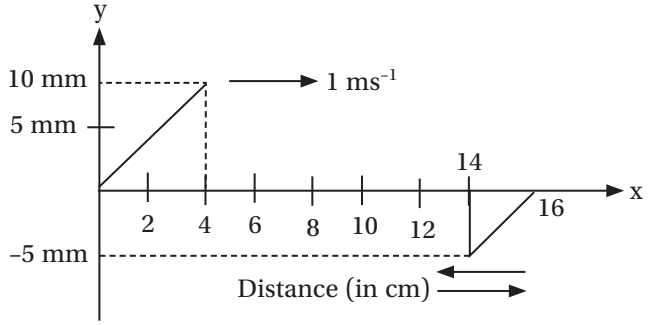
Paragraph – I

Two wave pulses are travelling in opposite direction with speed 1 ms^{-1}. Figure shows the shape of pulse at t = 0. Based on the above facts, answer the following questions.

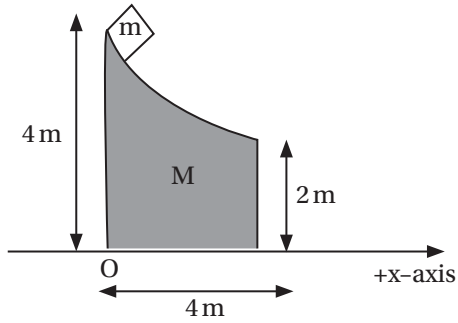


31. The speed of a particle (in m/s) at x = 2 cm and t = 0 is _____.

32. The displacement of a particle (in mm) at x = 8 cm and t = 0.06 sec is _____.

Paragraph – II

A small block of mass m = 1 kg is placed over a wedge of mass M = 4 kg as shown in figure. Mass m is released from rest. All surfaces are smooth and the origin O is fixed on the ground shown. Based on above information, answer the following questions. $\left(\text{use}: \frac{8}{\sqrt{5}} = 3.577\right)$



33. Final velocity of the wedge is (in m/s) _____.

34. The block strikes the x-axis at (in m) _____.

CHEMISTRY

Paper–II

SECTION–1 (Maximum Marks: 12)

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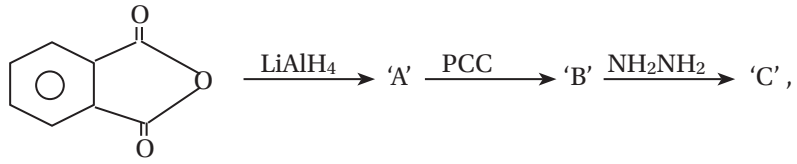
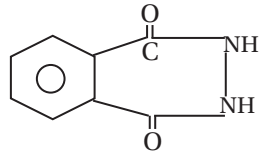
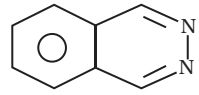
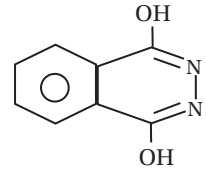
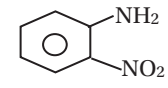
35. 

Product 'C' is :

Ⓐ 

Ⓑ 

Ⓒ 

Ⓓ 

36. The graph is plotted between $\frac{1}{Y_A}$ Vs $\frac{1}{X_A}$ a for a solution (where Y_A – molefraction in vapour phase and X_A is mole fraction in solution). Then slope will be :

Ⓐ $\frac{P^o_A}{P^o_B}$ Ⓑ $\frac{P^o_B}{P^o_A}$ Ⓒ $\frac{P^o_A - P^o_B}{P^o_A}$ Ⓓ $\frac{P^o_A}{P^o_A - P^o_B}$

Cont...12

37. In which of the following compound $d\pi - P\pi$ bond is not present ?

Ⓐ H_3SiNCS Ⓑ H_3SiSCN Ⓒ NSF_3 Ⓓ H_3CNCS

38. What should be minimum concentration of Cu^{2+} at which the cell reaction

$Zn + Cu^{2+}(aq) \longrightarrow Zn^{2+}(aq) + Cu$ will be spontaneous, if $(Zn^{2+}) = 1M$? Let $E_{cell} = 1.18$ volt]

Ⓐ 10^{-40} M Ⓑ 10^{-23} M Ⓒ $10^{-11.8}$ M Ⓓ 1.18×10^{-20} M

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choosing **ONLY** (D) will get +1 mark;

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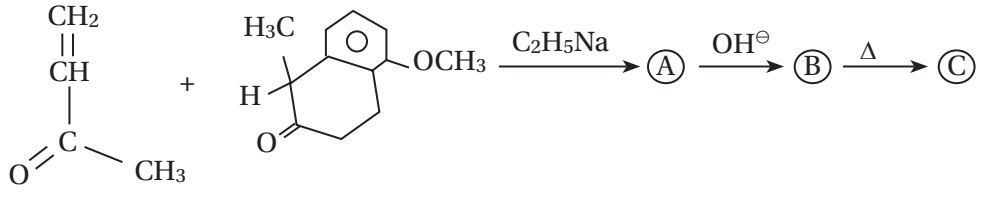
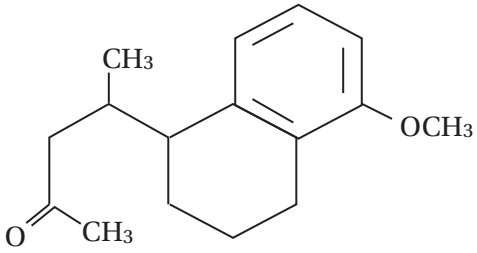
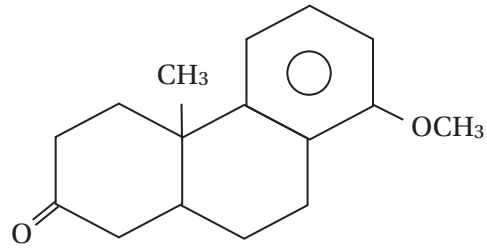
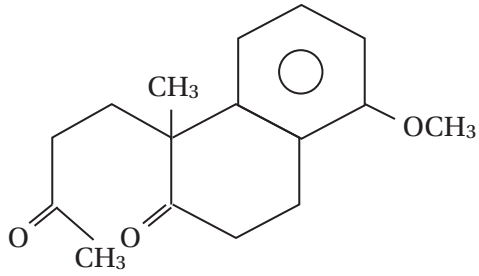
39.

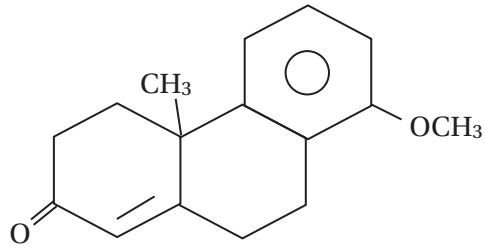


Compound A and C will be

Ⓐ A is 

Ⓑ 'C' is 

Ⓒ A is 

Ⓓ C is 

40. Which of the following process is/are associated with change in hybridization of the underlined compound ?

Ⓐ $Al(OH)_3$ ppt dissolved in NaOH

Ⓑ B_2H_6 is dissolved in THF

Ⓒ SiF_4 vapour is passed through liq. HF

Ⓓ Solidification of PCl_5 vapours .

41. Borazine is called inorganic benzene a ring like structure with alternate BH and NH groups. Which of the following statements is correct about borazine ?

Ⓐ Each B and N atom is Sp^2 hybridized

Ⓑ Borazine satisfies the $(4n + 2)\pi$ Huckel's rule

Ⓒ Like organic benzene, borazine does not give addition product with HCl

Ⓓ Borazine contains dative $p\pi - p\pi$ bond

SECTION–3 (Maximum Marks: 24)

- This section contains **SIX (06)** questions.
- The answer to each question is a **NON-NEGATIVE INTEGER**.
- For each question, enter the correct integer corresponding to the answer using the mouse and the onscreen virtual numeric keypad in the place designated to enter the answer.
- Answer to each question will be evaluated <u>according to the following marking scheme</u>:

Full Marks : +4 If **ONLY** the correct integer is entered;

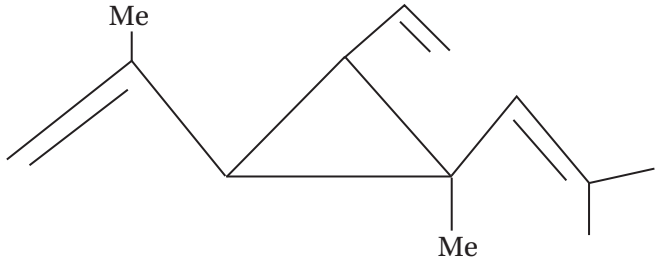
Zero Marks : 0 In all other cases.

42. The pH of an aqueous solution of (0.001 (M)) solution of a weak mono protic acid which is 1% ionised is _____ .

43. In CaF_2 ionic solid what will be co-ordination number of Ca^{2+} ions ? _____.

Cont...14

44. During ozonolysis of following 1 molecule alkene how many moles of (acetone) are formed ?
_____ .



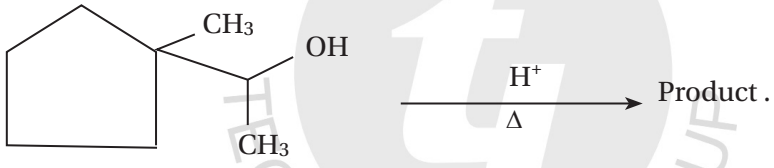
45. In a reaction N_2 is converted into NH_3. $N_2 \longrightarrow NH_3$

Equivalent weight of $N_2 = \frac{MW}{x}$, where x is _____ .

46. Let the wave function ψ for 2S orbital is given by :

$$\psi_{2s} = \frac{1}{\sqrt{y\pi}}\left[\left(\frac{x}{a_0}\right)^{3/2}\right]\left[2-\frac{r}{3a_0}\right]e^{\frac{-r}{2a_0}}$$

Where x and y are constant. If at $r = r_0$, radial node is formed, and value of r_0 in terms of a_0 is na_0. What is the value of n ? _____ .

47. 

What will be the sum number of atoms involved in ring (ie, x membered ring) and number of π – bond (y).

x + y = _____ .

SECTION–4 (Maximum Marks: 12)

- This section contains **TWO (02)** paragraphs.
- Based on each paragraph, there are **TWO (02)** questions.
- The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value of the answer using the mouse and the on-screen virtual numeric keypad in the place designated to enter the answer.
- If the numerical value has more than two decimal places, **truncate/round-off** the value to **TWO** decimal places.
- Answer to each question will be evaluated <u>according to the following marking scheme</u>:
  Full Marks : +3 If **ONLY** the correct numerical value is entered in the designated place;
  Zero Marks : 0 In all other cases.

Paragraph – I

Blood is said to be isotonic with 0.85% NaCl aqueous solution at 40°C. Molecular weight of NaCl is 58.5. Given Kp = 1.86 k kg (mol). Assume complete dissociation of NaCl. Match the columns :

48. The total concentration of various solute in blood is _____ g.ml.

49. Approximate freezing point of blood is _____ °C.

Paragraph – II

A gas bulb of 1 litre capacity contains 2.9×10^{21} molecules of nitrogen, exerting a pressure of 7.57×10^{3} N $m^{-2.}$ The ratio of the most probable speed to the root mean square speed is 0.82.

50. The root mean square speed of the gas molecules is _____ m/s .

51. The temperature of the gas molecules is _____ K.