



TECHNO INDIA GROUP PUBLIC SCHOOL

Dt. 12-05-2025

JEE (ADVANCED) – 2025 Mock Test -II (Paper-2)

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 according to the following marking scheme:
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. Number of words of 4 letters that can be formed with the letters of the word IIT JEE.
 (A) 42 (B) 82 (C) 102 (D) 142
2. A mega pizza is to be sliced n times, and S_n denotes maximum possible number of pieces. Relation between S_n & S_{n-1} .
 (A) $S_n = S_{n-1} + n + 3$ (B) $S_n = S_{n-1} + n + 2$ (C) $S_n = S_{n-1} + n + 2$ (D) $S_n = S_{n-1} + n$
3. If A (A, -1, -3), B (2, 1, -2) and C (-5, 2, -6) are the position vectors of the vertices of ABC. The length of the bisector of its internal angle at A is $\frac{\lambda\sqrt{10}}{4}$ then the value of λ is
 (A) 4 (B) 3 (C) 2 (D) 1
4. Let λ be the number of 3 digit numbers are of the form xyz with $x < y$, $z < y$ and $x \neq 0$, the value of $\frac{\lambda}{30}$ is
 (A) 6 (B) 8 (C) 10 (D) 12

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).
- Answer to each question will be evaluated according to the following marking scheme:
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 $\sum_{r=0}^n \frac{r}{{}^n C_r} = \sum_{r=0}^n \frac{n^2 - 3n + 3}{2 \cdot {}^n C_r}$ then

(A) $n = 1$

(B) $n = 2$

(C) $n = 3$

(D) none of these

6. A bag contains b blue balls and r red balls. If two balls are drawn at random the probability of drawing two red balls is five times the probability of drawing two blue balls. Further more, the probability of drawing one ball of each color is six times the probability of drawing two blue balls. Then

(A) $b + r = 9$

(B) $br = 18$

(C) $|b - r| = 4$

(D) $\frac{b}{r} = 2$

7. Let $f(x,y) = \sqrt{x^2 + y^2} + \sqrt{x^2 + y^2 - 2x + 1} + \sqrt{x^2 + y^2 - 2y + 1} + \sqrt{x^2 + y^2 - 6x - 8y + 25} \quad \forall x,y \in \mathbb{R}$
Then which of the following is/are correct :

(A) Minimum value of $f(x,y) = 5 + \sqrt{2}$

(B) Minimum value of $f(x,y) = 5 - \sqrt{2}$

(C) Minimum value occurs at (x,y) for $x = \frac{3}{7}$

(D) Minimum value occurs at (x,y) for $y = \frac{4}{7}$

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 according to the following marking scheme:

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

Zero Marks : 0 In all other cases.

8. The slope of one of lines given by $ax^2 + 2hxy + by^2 = 0$ be the square of the slope of the other if $ab(a+b) + \alpha abh + \beta h^3 = 0$ then $(\alpha + \beta)$ is equal to _____.

9. The remainder, when $(1690^{2608} + 2608^{1690})$ is divided by 7 is _____ .
10. The value of $\sec^{-1} \left(\frac{1}{4} \left(\sum_{k=0}^{10} \sec \left(\frac{7\pi}{12} + \frac{k\pi}{2} \right) \cdot \sec \left(\frac{7\pi}{12} + \frac{(k+1)\pi}{2} \right) \right) \right)$ is _____ .
11. Let e denote the base of the natural logarithm. The value of the real number a for which $\lim_{x \rightarrow 0^+} \frac{(1-x)^{\frac{1}{x}} - e^{-1}}{x^a}$ is equal to non zero real number, is _____ .
12. If $\{x\} = \frac{2}{3}$ & $[x + \{x + [x + \{x + \dots 1000 \text{ times}]\}] = 5$, then $3x =$ _____. ($[\cdot] \rightarrow$ GIF)
13. A function f , defined for all $x, y \in \mathbb{R}$ is such that $f(1) = 2$; $f(2) = 8$ & $f(x+y) - kxy = f(x) + 2y^2$, where k is some constant. Find the value of $f(x+y) \cdot f\left(\frac{1}{x+y}\right)$.

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

Let $1, \alpha_1, \alpha_2, \alpha_3, \dots, \alpha_{n-1}$ are the n^{th} root of unity, then

14. Find the value of $(1 + \alpha_1)(1 + \alpha_2)(1 + \alpha_3) \dots (1 + \alpha_{n-1}) = ?$
for $n = 2k + 1$ where $k \in \mathbb{N}$
15. Find the value of $(\alpha_1)^{2n} + (\alpha_2)^{2n} + (\alpha_3)^{2n} + \dots + (\alpha_{n-1})^{2n}$ when $n = 2025$.

Paragraph - II

Function f, g, h are differentiable on some open interval around 0 and satisfy the equations and initial conditions $f' = 2f^2gh + \frac{1}{gh}, f(0) = 1, g' = fg^2h + \frac{4}{fh}, g(0) = 1, h' = 3fgh^2 + \frac{1}{fg}; n(0) = 1$.

16. Find the value of $\lim_{x \rightarrow \frac{-\pi}{72}} 18(f(x))^{12}$.
17. Find the value of $16(g(0))^{12}$.

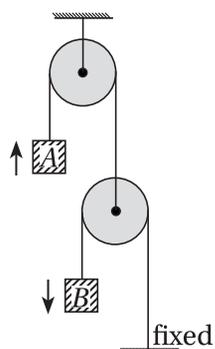
Physics

Paper-II

SECTION-1 (Maximum Marks: 12)

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18.



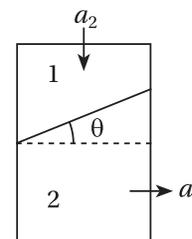
acceleration of B =

- (A) $a_A/2$ (B) $2a_A$ (C) a_A (D) 0

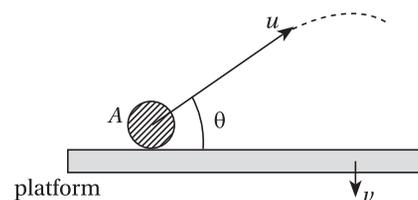
19. The relation between the accelerations of wedges 1 and 2.

$$\frac{a_1}{a_2}$$

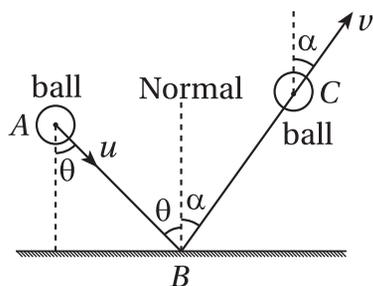
- (A) $\tan \theta$ (B) $\sin \theta$
 (C) $\cos \theta$ (D) $\cot \theta$

20. A ball is projected upwards from a downward moving platform with velocity v . The velocity of projection of ball A is u with respect to platform, at an angle of θ with the plane of platform. Then

- (A) The initial horizontal component of ball's velocity is $u \cos \theta$
 (B) Vertical component of ball's velocity (initial) is $u \sin \theta - v$
 (C) Vertical component of ball's velocity (initial) is $u \sin \theta + v$
 (D) Both (A) and (B) are correct



21.



$e =$ coefficient of resitution

- (A) $u \sin \theta = v \sin \alpha$ (B) $v \cos \alpha = e u \cos \theta$ (C) $v = u \sqrt{(\sin^2 \theta + e^2 \cos^2 \theta)}$ (D) All of the above

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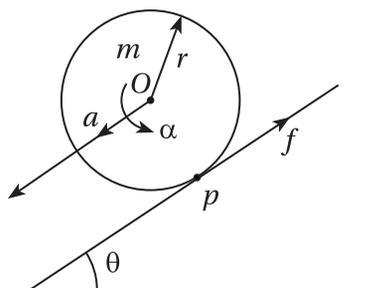
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 - choosing **ONLY** (B) will get +1 mark
 - choosing **ONLY** (D) will get +1 mark;
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22.



A round shape body of a mass m , radius r and moment of inertia $I = Zmr^2$ about the axis of rotation as shown. Z is a constant which depends on shape.

- (A) for rolling without slipping $a = \alpha r$ (B) for translatory motion: $mg \sin \theta - f = ma$
 (C) for rotatory motion: $f \cdot r = I\alpha$ (D) None of the above

23. The path of a satellite of the earth depends upon its velocity of projection v_p in relation to v_0 (orbital speed) and v_e (escape speed)

- (A) If $v_p = v_0$, then projectile moves in circular orbit around earth
 (B) If $v_0 < v_p < v_e$, then body moves in elliptical orbit
 (C) If $v_p = v_e$, then the body escapes moving along parabolic path
 (D) If $v_p > v_e$, then the body escapes moving along the hyperbolic path

24.



Consider a wire of uniform mass M and length L being pulled by a force F as shown

- (A) The acceleration of wire is F/M
 (B) Tension (T) in the wire at a distance x from one end $T = \left(\frac{F}{L}\right)x$
 (C) Total elongation is $\frac{FL}{2AY}$
 (D) None of the above

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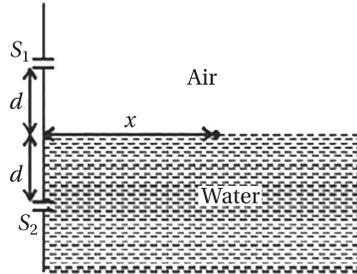
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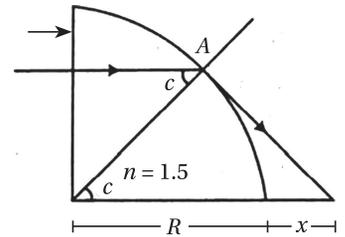
25. In YDSE, S_1 slit is in air and S_2 slit is immersed in water ($r \cdot i = 4/3$) as in figure given below. The positions of maxima on the surface of water are given by

$$x^2 = p^2 m^2 \lambda^2 - a^2$$

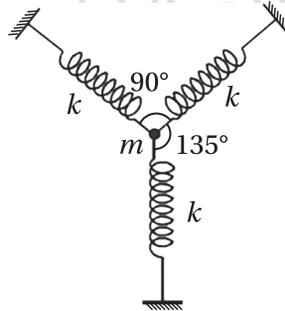
where λ is the wave length of light in air, $2d$ is the separation between the slits and m is an integer. The value of p is _____.



26. A parallel beam of light is incident on a glass prism in the shape of quarter cylinder of radius $R = 0.05$ m and refractive index $n = 1.5$, placed on a horizontal table as shown in the figure. Beyond the cylinder, a patch of light is found whose nearest distance x from the cylinder is $(3\sqrt{n} - 5) \times 10^{-2}$ m. Then n is _____.



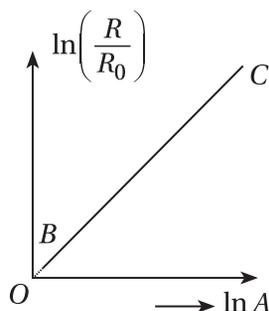
27. A proton (mass m) accelerated by a potential difference V flies through a uniform transverse magnetic field B . The field occupies a region of space by width d . If α is the angle of deviation of proton from initial direction of motion. Now if $\sin \alpha = B \cdot d \cdot \sqrt{\frac{q}{nmV}}$, then $n =$ _____.
28. A particle of mass m is attached to three identical massless springs of spring constant k as shown in the figure. The time period of vertical oscillation of the particle is $T = 2\pi \sqrt{\frac{m}{nk}}$, then $n =$ _____.



- 29.

A current I flows through a straight wire AB of finite length. The ends of the wire make an angle 60° and 30° with P as shown in figure. The magnetic field at a distance r from the wire is $10^{-7} \times \left(\frac{I}{r}\right) \left(\frac{\sqrt{3}+1}{n}\right)$. Then n is _____.

30. The variation of $\ln\left(\frac{R}{R_0}\right)$ with $\ln A$ (if R = radius of a nucleus and A = its mass number) is



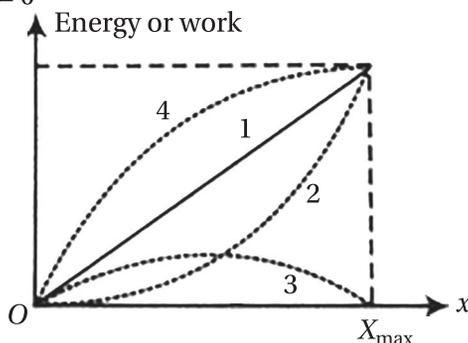
Then $\left(\frac{1}{\text{slope}}\right)$ of line BC is _____.

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Passage—1

A spring lies along an x axis attached to a wall at one end and a block at the other end. The block rests on a frictionless surface at $x = 0$



A force of constant magnitude F is applied to the block that begins to compress the spring, until the block comes to a maximum displacement x_{\max} .

31. During the displacement, which of the curves shown in the graph best represents the kinetic energy of the block?

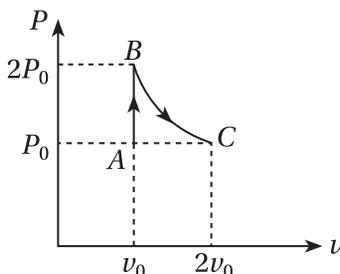
- (A) 1 (B) 2 (C) 3 (D) 4

32. During displacement, which of the curves shown in the graph best represents the work done on the spring block system by the applied force?

- (A) 1 (B) 2 (C) 3 (D) E

Passage—2

A diatomic ideal gas undergoes a thermodynamic change according to the P - v diagram shown in the figure.



33. The heat given from A to B is

- (A) $2.5P_0v_0$ (B) $2P_0v_0$ (C) P_0v_0 (D) $1.5P_0v_0$

34. The total heat given to the gas is nearly

- (A) $3P_0v_0$ (B) $3.9P_0v_0$ (C) $2.75P_0v_0$ (D) $5P_0v_0$

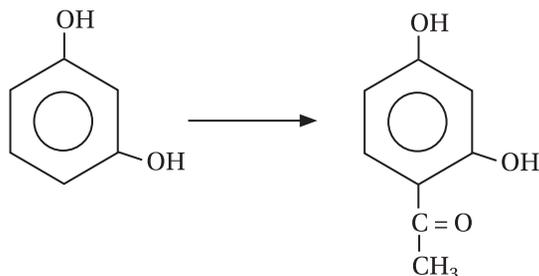
CHEMISTRY

Paper-II

SECTION-1 (Maximum Marks: 12)

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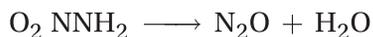
35. In the given reaction:



The best conversion can be done by:

- (A) Vilsmeier - Haack reaction (B) Houben Hoesch reaction
(C) Fries rearrangement (D) Friedel - Craft reaction

36. Nitramide O_2NNH_2 decomposes slowly in aqueous solution according to the reaction



The experimental rate law is:

$$\frac{d[N_2O]}{dt} = K \frac{[O_2NNH_2]}{[H^+]}$$

which of the following mechanism seems to be most appropriate?

- (A) $O_2NNH_2 \xrightarrow{K_1} N_2O + H_2O$
 (B) $O_2NNH_2 \xrightleftharpoons[K_{-1}]{K_1} O_2NNH^\ominus + H^\oplus$ (Fast equilibrium)
 $O_2NNH^\ominus \xrightarrow{K_2} N_2O + OH^\ominus$ (Slow)
 $H^+ + OH^\ominus \xrightarrow{K_3} H_2O$ (Fast)
 (C) $O_2NNH_2 + H^+ \xrightleftharpoons[K_{-1}]{K_1} O_2NNH_3^\oplus$ (Fast)
 $O_2NNH_3^\oplus \longrightarrow N_2O + H_3O^+$
 (D) All of these

37. A transition metal 'A' has spin only magnetic moment value of 1.8 B.M. When it is reacted with dilute H_2SO_4 in presence of air, its compound 'B' is formed. 'B' reacts with compound 'C' to give compound 'D' with liberation of iodine. Then, the metal 'A', compounds B, C and D are respectively.

- (A) Ti, $TiSO_4$, KI and TiI_2 (B) Zn, $ZnSO_4$, KI and ZnI_2
 (C) Cu, $CuSO_4$, KI and Cu_2I_2 (D) Cu, $CuSO_4$, KI and CuI_2

38. Graph between $\log\left(\frac{x}{m}\right)$ and $\log P$ is a straight line inclined at an angle, $\theta = 45^\circ$, when pressure of 0.5 atm and $\log K = 0.699$, the amount of solute absorbed per gram of absorbent will be:

- (A) 1 g (B) 1.5 g (C) 2.5 g (D) 0.25 g

SECTION-2 (Maximum Marks: 12)

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choosing **ONLY** (B) and (D) will get +2 marks;

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

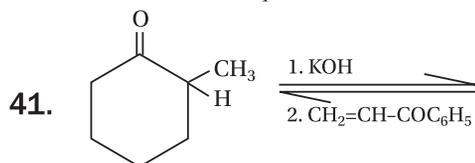
choosing **ONLY** (B) will get +1 mark

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

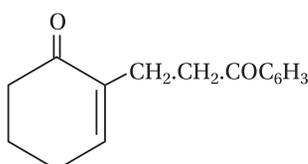
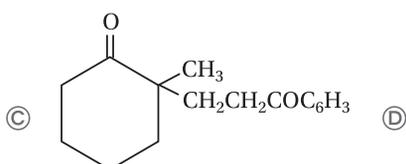
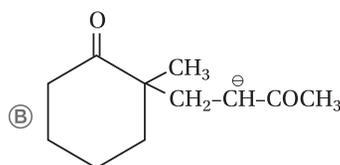
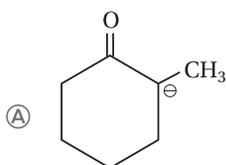
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choosing any other combination of options will get -2 marks.

39. Nitrogen and phosphorous forms a number of oxides. Which of the following is correct about their oxides?
- (A) Nitrogen sesquioxide exists in two different forms, which may be interconverted by irradiation with light
- (B) NO_2 is obtained as brown liquid and on cooling becomes colourless solid due to dimerisation
- (C) Order of bond angle $\text{NO}_2^- > \text{NO}_2 > \text{NO}_2^+$
- (D) In P_4O_{10} terminal P - O bond is much shorter than P - O bonds
40. An aqueous solution having pH value greater than 7 are:
- (A) solution after electrolysis of NaCl
- (B) $10^{-3} \text{ M CH}_3\text{COONa}$
- (C) $0.1 \text{ M NH}_4\text{Cl}$
- (D) $0.1 \text{ M NH}_4\text{OH}$



which of the following is/are either intermediate or product of the above reaction (Michael addition)?



SECTION-3 (Maximum Marks: 24)

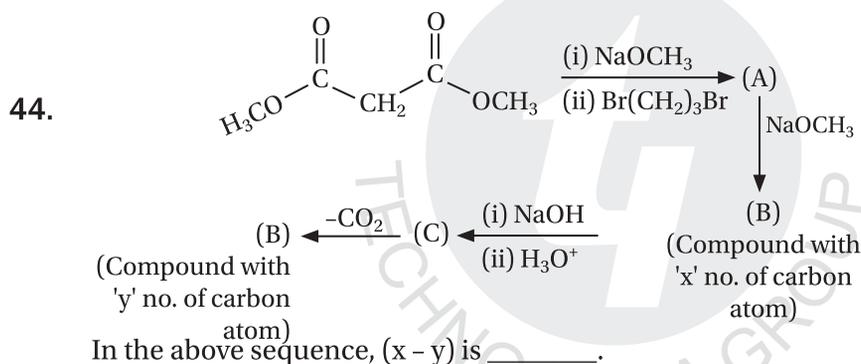
- This section contains **SIX (06)** questions.
- The answer to each question is a **NON-NEGATIVE INTEGER**.
- For each question, enter the correct integer corresponding to the answer using the mouse and the onscreen virtual numeric keypad in the place designated to enter the answer.
- Answer to each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

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

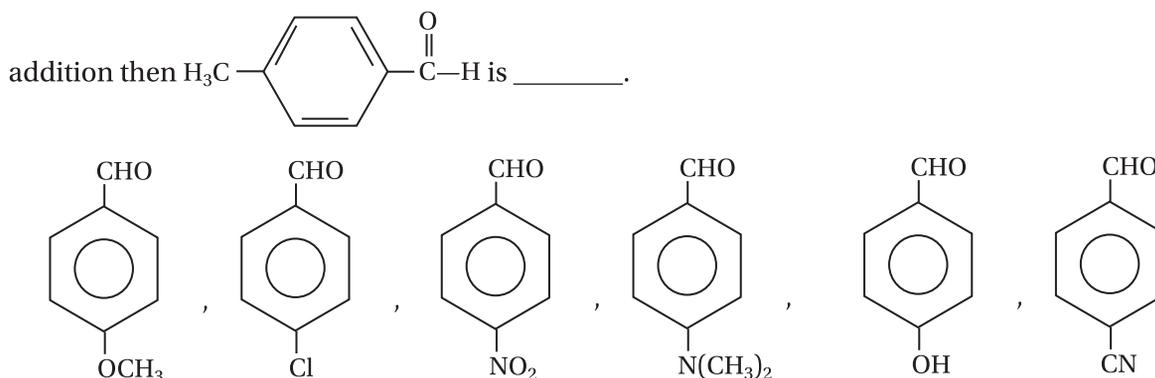
Zero Marks : 0 In all other cases.

42. A mixture of water and nitrobenzene boils at 99°C . In the vapours of mixture partial vapour pressures of water and nitrobenzene are 733 mm of Hg and 27 mm of Hg respectively. The $W_{\text{H}_2\text{O}} / W_{\text{C}_6\text{H}_5\text{NO}_2}$ is _____.

43. Temperature of 1 mole of a gas is increased by 1° at constant pressure work done in $\text{cal} (\text{mole})^{-1} (\text{K})^{-1}$ is _____



45. From the following compounds, the number of compounds which show(s) higher rate of nucleophilic addition then $\text{H}_3\text{C}-\text{C}_6\text{H}_4-\text{C}(=\text{O})-\text{H}$ is _____.



46. In 200 ml of 0.1 M CH_3COOH , 100 ml of 0.1(M) NaOH solution was mixed and volume of mixture is increased upto 750 ml, pH of resulting solution is 'x': The volume of 'x' is _____.

(pK_a of $\text{CH}_3\text{COOH} = 5$)

47. A flask contains 4 g of 'A' at 27°C . Pressure exerted by gas is 2 atm. If 6 g of 'B' is added in same container pressure becomes 3 atm. What is the ratio of vapour density of B and A? _____

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 according to the following marking scheme:
Full Marks : +3 If **ONLY** the correct numerical value is entered in the designated place;
Zero Marks : 0 In all other cases.

Paragraph - I

Assume that impure copper contains only Fe, Au and Ag as impurities – After passage of 140 ampere for 482.5 sec the mass of anode decreased by 22.260 g and the cathode increased in mass by 22.011 g.

48. Weight of Fe dissolved at anode is _____ g.
49. Percentage of copper originally present is _____ %.

Paragraph - II

A univalent metal forms a binary compound x. 1.422 g of 'X' reacts completely with 0.321 g sulphur to give 1.743 g of a white crystalline solid Y. Y forms a hydrated double salt with aluminum sulphate.

50. The metal forms the binary compound with element having _____ atomic mass.
51. The hydrated double salt of Y has _____ no. of univalent metal per molecule.