JEE Main 2026 Question Paper January 24 Shift 2 with Solutions

Time Allowed :3 Hours	Maximum Marks :300	Total Questions :90

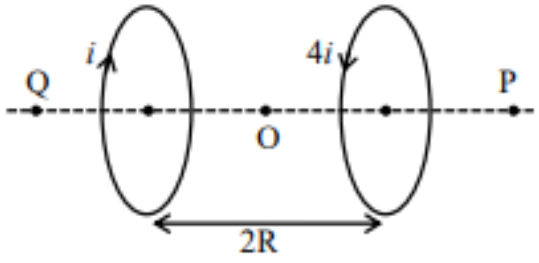
General Instructions

Read the following instructions very carefully and strictly follow them:

1. The test is of 3 hours duration.
2. This test paper consists of 75 questions. Each subject (PCM) has 25 questions. The maximum marks are 300.
3. This question paper contains Three Parts. Part-A is Physics, Part-B is Chemistry and Part-C is Mathematics. Each part has only two sections: Section-A and Section-B.
4. Section - A : Attempt all questions.
5. Section - B : Attempt all questions.
6. Section - A (01 – 20) contains 20 multiple choice questions which have only one correct answer. Each question carries +4 marks for correct answer and –1 mark for wrong answer.
7. Section - B (21 – 25) contains 5 Numerical value based questions. The answer to each question should be rounded off to the nearest integer. Each question carries +4 marks for correct answer and –1 mark for wrong answer.

PHYSICS
SECTION-A

1. Find magnetic field at midpoint O. Rings have radius R and direction of current is in opposite sense.



(1) $\frac{3\mu_0 i}{4\sqrt{2}R}$ Towards P

(2) $\frac{3\mu_0 i}{4\sqrt{2}R}$ Towards Q

(3) $\frac{3\mu_0 i}{2\sqrt{2}R}$ Towards P

(4) $\frac{3\mu_0 i}{2\sqrt{2}R}$ Towards Q

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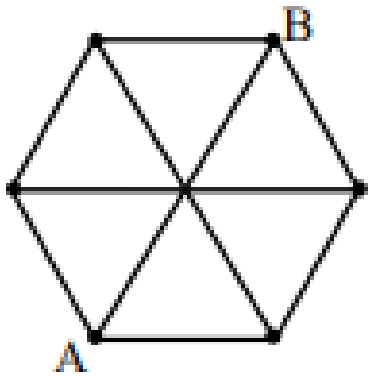
2. Resistance of each side is R. Find equivalent resistance between two opposite points as shown in the figure.



(1) $\frac{4}{5}R$
(2) $\frac{8}{5}R$
(3) $\frac{8}{10}R$
(4) $\frac{2}{5}R$

---

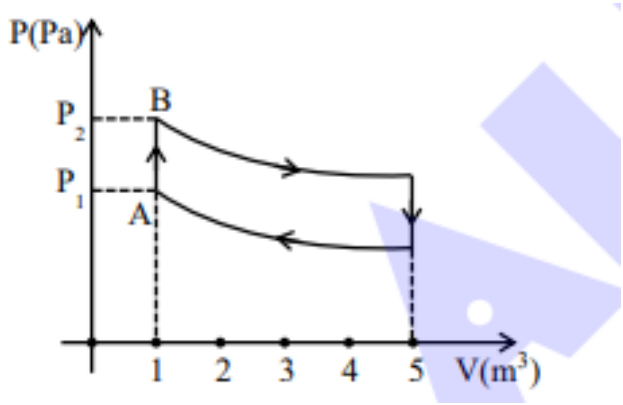
3. In case of meter bridge experiment balance length for 2Ω and 3Ω is ℓ and for $x\Omega$ and 3Ω is $(\ell + 10)$ cm. Find x.

---

4. 5th harmonic of a closed organ pipe matches with 1st harmonic of an open organ pipe. Find ratio of their lengths.

(1) 5
(2) 2
(3) $\frac{5}{2}$
(4) $\frac{2}{5}$

5. Find heat given to gas to take it from A to B. (Given: $C_v = 21$ S.I. units, $P_2 = 30$ Pa, $P_1 = 21.7$ Pa, $R = 8.3$ S.I. units, $n = 10$ moles)



(1) 30 J
(2) 21 J
(3) 42 J
(4) 50 J

---

6. A cylindrical object of density $600\,\text{kg/m}^3$ and height 8 cm is floating in a liquid of density $900\,\text{kg/m}^3$. Find height of cylinder inside liquid.

(1) $\frac{16}{3}$ cm
(2) $\frac{20}{3}$ cm
(3) $\frac{5}{3}$ cm
(4) $\frac{25}{3}$ cm

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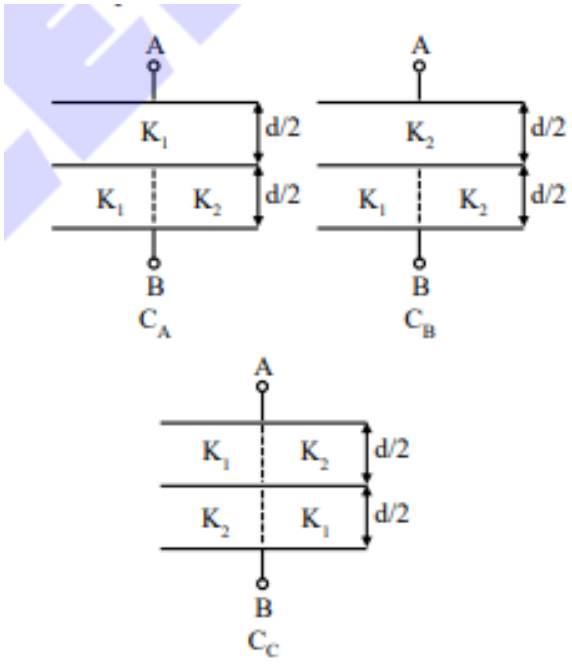
7. Diagram shows three arrangements of dielectric in a capacitor. Arrange the capacitors in increasing order of capacitance between A and B if $K_1 > K_2$.



(1) $C_A < C_B < C_C$
(2) $C_A < C_C < C_B$
(3) $C_B < C_C < C_A$
(4) $C_B < C_A < C_C$

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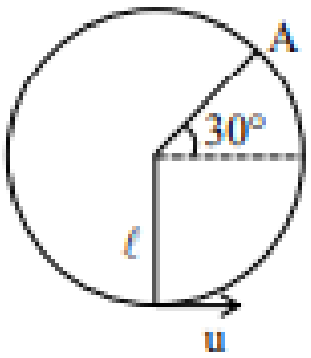
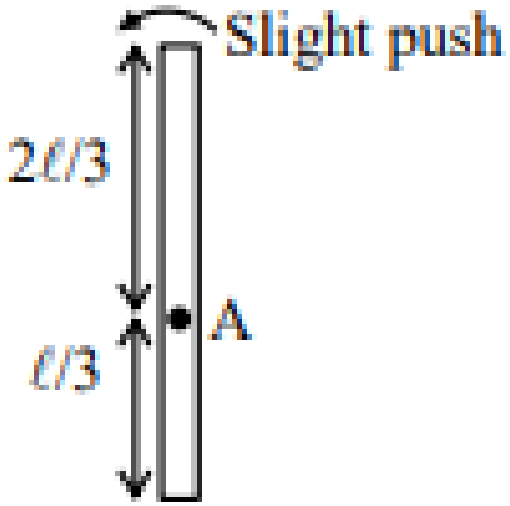
8. Find speed given to particle at lowest point so that tension in string at point A becomes zero.



(1) $\sqrt{\frac{7g\ell}{2}}$
(2) $\sqrt{3g\ell}$
(3) $\sqrt{\frac{9g\ell}{4}}$
(4) $\sqrt{\frac{g\ell}{2}}$

9. When rod becomes horizontal find its angular velocity. It is pivoted at point A as shown.



(1) $\sqrt{\frac{3g}{\ell}}$
(2) $\sqrt{\frac{2g}{\ell}}$
(3) $\sqrt{\frac{g}{\ell}}$
(4) $\sqrt{\frac{5g}{\ell}}$

---

10. A soap bubble of diameter 7 cm, its diameter is increased to 14 cm. If change in its surface energy is $(15000 - x)\,\mu$J, find x. (Given surface tension $= 0.04$ N/m)

(1) 208
(2) 216
(3) 432
(4) 512

---

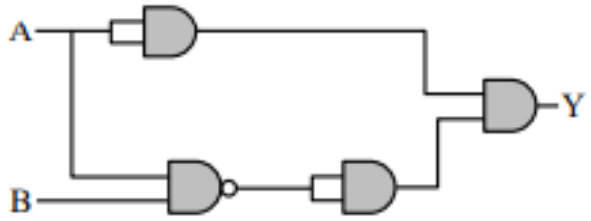
11. A rod has uniformly distributed charge $24\,\mu$C and length 10 cm. Find force on $1\,\mu$C particle placed at a distance 2 cm from one end of the rod.

(1) 70 N
(2) 10.5 N

(3) 90 N
(4) 25 N

---

12. Select correct truth table.



(1)

A	B	Y
0	0	0
0	1	0
1	0	1
1	1	1

(2)

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	0

(3)

A	B	Y
0	0	1
0	1	0
1	0	0
1	1	1

(4)

A	B	Y
0	0	0
0	1	0
1	0	1
1	1	0

13. On a surface, if photon of wavelength λ is incident, the stopping potential is 3.2 V. If the wavelength incident is 2λ, stopping potential is 0.7 V. Find λ.

(1) 4.96×10^{-7} m
(2) 3.62×10^{-7} m
(3) 7.24×10^{-7} m
(4) 2.48×10^{-7} m

---

14. 300 J of energy is given to a gas at constant volume which increases its temperature from $20°$C to $50°$C. If $R = 8.3$ S.I. units and $C_v = \frac{5R}{2}$, find mass of gas.

---

15. An electron makes transition from higher energy orbit to lower energy orbit in Li^{2+} ion such that $n_1 + n_2 = 4$ and $n_2 - n_1 = 2$. Determine the wavelength of emitted photon in transition (in cm).

(1) 1.14×10^{-6} cm
(2) 3.28×10^{-6} cm
(3) 5.76×10^{-6} cm
(4) 8.23×10^{-6} cm

---

16. In a vernier calipers 50 VSD are equal to 48 MSD. 1 MSD is equal to 0.05 mm. Find least count of this vernier calipers.

(1) 0.005 mm
(2) 0.004 mm
(3) 0.001 mm
(4) 0.002 mm

---

17. Power of convex lens is 5 D. Four students measure object and image distances as shown.

	u(in cm)	v(in cm)
A	35	37
B	30	60
C	60	30
D	25	100

(1) Students A & B are correct
(2) All are correct
(3) Student A is wrong
(4) Students C & D are wrong

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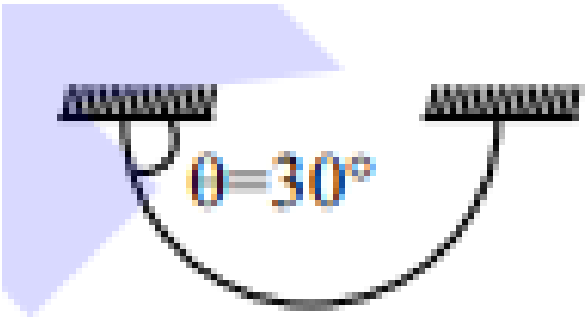
18. A flexible chain of mass m is hanging as shown. Find tension at the lowest point.



(1) $\frac{\sqrt{3}}{2}mg$
(2) $\frac{1}{2}mg$
(3) $\frac{\sqrt{2}}{3}mg$
(4) $\sqrt{2}mg$

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19. In YDSE, slit separation $d = 2$ mm, distance between slits and screen $D = 10$ m. Wavelength of light is $\lambda = 6000$Å. If intensity of light through each slit is I_0, find intensity at point directly in front of one of the slits.

(1) $4I_0$
(2) Zero
(3) I_0
(4) $2I_0$

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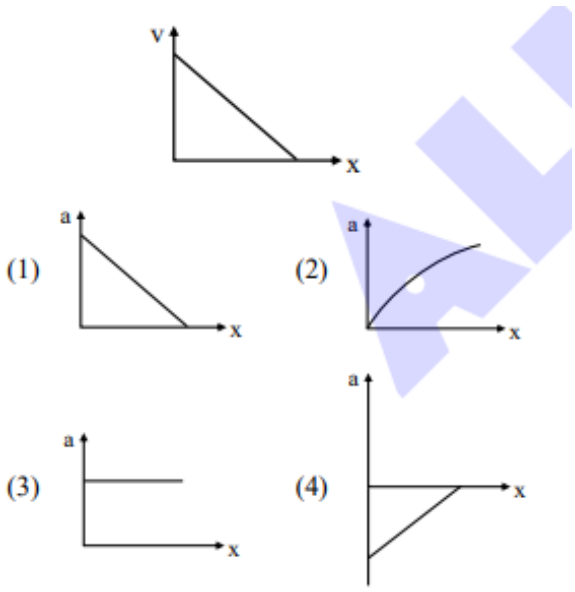
20. Velocity of particle varies with position as shown in figure. Find the correct variation of acceleration with position.



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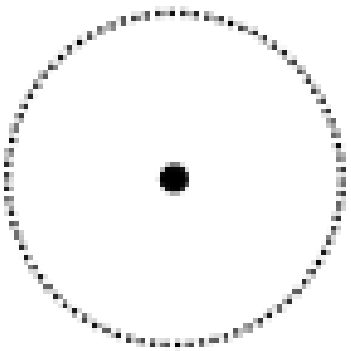
21. The intensity at spherical surface due to an isotropic point source placed at its center is I_0. If its volume is increased by 8 times, what will be intensity at the spherical surface?



(1) Increase by 128 times
(2) Increase by 8 times

(3) Decrease by 4 times
(4) Decrease by 8 times

---

22. There is a galvanometer of resistance 100Ω and full scale current $I_g = 1$ mA. Find shunt resistance required to increase its range to 5 mA.

(1) 25Ω
(2) 0.25Ω
(3) 0.5Ω
(4) 1Ω

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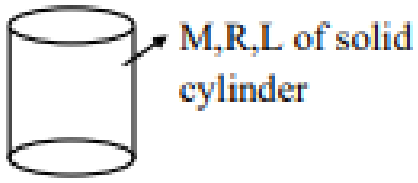
23. A solid cylinder of radius $\frac{R}{3}$ and length $\frac{L}{2}$ is removed along the central axis. Find ratio of initial moment of inertia and moment of inertia of removed cylinder.



(1) 162
(2) 158
(3) 138
(4) 178

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24. For given nuclear reactions:

$$^4_2\text{He} + ^1_0\text{n} \rightarrow ^3_2\text{He} + 20\,\text{MeV}$$
$$^4_2\text{He} + ^1_0\text{n} \rightarrow ^4_2\text{He} - 0.9\,\text{MeV}$$

X_3 represents stability of $^3_2$He, X_4 represents stability of $^4_2$He and X_5 represents stability of $^5_2$He. Compare the stabilities.

(1) $X_4 > X_3 > X_5$
(2) $X_4 < X_3 > X_5$

(3) $X_3 > X_4 > X_5$
(4) $X_4 > X_5 > X_3$

CHEMISTRY

1. A complex $Cr(H_2O)_6Cl_3$ shows conductance similar to a 1 : 2 electrolyte in aqueous solution. 9.3 g of this complex is passed through a cation exchanger and excess $AgNO_3$ is added. Find the mass of AgCl precipitated in grams.
[Molar mass of Cr = 52 g/mol]

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2. 0.18 M HQ solution has molar conductivity $\frac{1}{30}$ times the molar conductivity of 0.02 M HZ solution. Find the value of pK_a(HQ) $-$ pK_a(HZ).
[Given that α is very less than 1]

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3. For the reaction:

$$Cl_2 + KOH \rightarrow KCl + KClO + H_2O$$

1 mole of Cl_2 is passed into 2 litre, 2 M KOH solution. Determine the molarity of Cl^-, ClO^- and OH^- respectively.

(1) 1 M, 0.5 M, 0.5 M
(2) 0.5 M, 0.5 M, 1 M
(3) 1 M, 1 M, 0.5 M
(4) 0.5 M, 1 M, 0.5 M

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4. The half-life of radioactive isotope Zn^{65} is 245 days. Find the time after which activity of Zn sample remains 75% of its initial value.

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5. If pure liquids A and B have vapour pressures of 55 kPa and 15 kPa respectively. If in a solution of A and B, mole fraction of A in vapour is 0.8, then find mole

fraction of A in liquid phase.

(1) 0.813
(2) 0.5217
(3) 0.407
(4) 0.363

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6. Two moles each of the gases P_2, Q_2 and PQ are present in a vessel at equilibrium. If 1 mole each of P_2 and Q_2 is added at equilibrium, then determine the composition (in mole) of each species at the new equilibrium.

(1) $n_{P_2} = 0.5,\ n_{Q_2} = 0.5,\ n_{PQ} = 1$
(2) $n_{P_2} = 1.33,\ n_{Q_2} = 1.33,\ n_{PQ} = 1.67$
(3) $n_{P_2} = 2.67,\ n_{Q_2} = 2.67,\ n_{PQ} = 2.33$
(4) $n_{P_2} = 2.67,\ n_{Q_2} = 2.67,\ n_{PQ} = 2.67$

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7. Heat of atomisation of CH_4(g) and C_2H_6(g) are x kJ/mol and y kJ/mol respectively. Find the maximum wavelength of photon required to dissociate C–C bond in C_2H_6.

(1) $\dfrac{hcN_A}{y - \frac{3x}{2}}$
(2) $\dfrac{hcN_A}{\frac{4x-6y}{4}}$
(3) $\dfrac{hcN_A}{250\left(\frac{3x}{2} - y\right)}$
(4) $\dfrac{hcN_A}{500(2y - 3x)}$

---

8. If for Li^{2+} ion, electron is in transition between energy levels such that sum of principal quantum numbers is 4 and difference is 2, then find the wavelength (in cm) emitted for transition between these energy levels.
[Given: $R = 1.1 \times 10^5$ **cm**$^{-1}$]

(1) 114×10^{-8} cm
(2) 1026×10^{-8} cm

(3) 12.66×10^{-8} cm
(4) 10^{-8} cm

---

9. If percentage of N_2 above a liquid solution is 80% at a total pressure of 10 atm, then find the mole fraction of N_2 gas dissolved in solution.
[Given that Henry's constant for N_2 is 7.6×10^7 mm Hg]

(1) 10^{-4}
(2) 8×10^{-5}
(3) 10^{-7}
(4) 10^{-6}

---

10. An organic compound contains C, H and O. 0.25 g of organic compound on combustion produces CO_2(g) and H_2O(l). When residual gases pass through KOH solution, its mass increases by 0.18 g and when passed through anhydrous $CaCl_2$, the increase in mass of $CaCl_2$ is 0.15 g. Find the mass % of oxygen in the organic compound.

---

11. Correct order of 2^{nd} ionisation energy is:

(1) O ¡ C ¡ N ¡ F
(2) C ¡ N ¡ O ¡ F
(3) O ¡ C ¡ N ¡ F
(4) C ¡ O ¡ N ¡ F

---

12. Among the species O_2^+, N_2^-, N_2^{2-} and O_2^- which have same bond order as well as paramagnetic in nature.

(1) O_2^+, N_2^-
(2) O_2^-, N_2^-
(3) O_2^+, O_2
(4) O_2^-, N_2

13. Consider the following complexes:
(A) $[Co(CN)_6]^{3-}$ (B) $[Co(NH_3)_5H_2O]^{3+}$
(C) $[Co(H_2O)_6]^{3+}$ (D) $[CoF_6]^{3-}$
The wavelength absorbed by the above complexes are in the order:

(1) A ¿ B ¿ C ¿ D
(2) A ¡ B ¡ C ¡ D
(3) B ¡ A ¡ C ¡ D
(4) C ¿ A ¿ B ¿ D

---

14. Element X is the lightest element of group 7 of periodic table which forms oxo-anion in +6 oxidation state. The colour of potassium salt of the oxo-anion is:

(1) Green
(2) Orange
(3) Yellow
(4) Brown

---

15. In general tests of Ba^{2+} and Ca^{2+} give the respective tests as:

(1) Chromate, Sulphate
(2) Sulphite, Sulphate
(3) Hydroxide, Carbonate
(4) Carbonate, Carbonate

---

16. Select incorrect option:

(1) Carbon can have negative oxidation state in its compounds.
(2) CO_2 is most acidic oxide among oxides of group-14 elements.
(3) Maximum valency of carbon is four.
(4) Carbon has least catenation property in group 14.

17. Statement-I: Two different aldehydes on cross aldol condensation always give four products.
Statement-II: Among benzaldehyde and acetophenone, only acetophenone reacts with semicarbazide.

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

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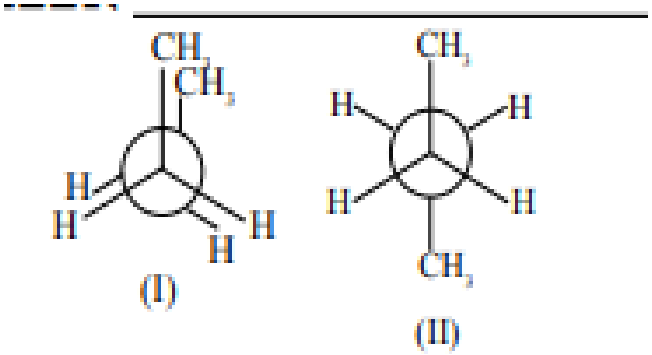
18. Consider the following conformations:



Statement-I: I^{nd} is more stable than I^{st}.
Statement-II: As dihedral angle increases, stability decreases.

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

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19. Statement-I: RMgX reacts with CO_2 followed by acidification to form product, which reacts with NH_3/ and then reacts with NaOCl to form product which further reacts with $CHCl_3$/NaOH and final product is R–NC.
Statement-II: R–NC on hydrolysis gives RCOOH.

(1) Statement-I and Statement-II both are correct
(2) Statement-I is incorrect, Statement-II is correct

(3) Statement-I is correct, Statement-II is incorrect
(4) Statement-I and Statement-II both are incorrect

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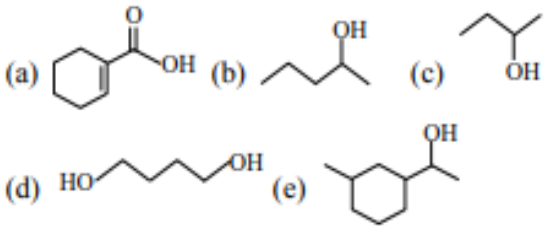
20. How many molecules are secondary alcohol?



(1) 2
(2) 3
(3) 4
(4) 5

---

21. Aniline (9.3 g) on reaction with acetic anhydride forms X (11 g). Find the percentage yield of the reaction.

(1) 82
(2) 90
(3) 81.48
(4) 93.2

---

22. How many tripeptides are possible when following three amino acids make tripeptide? (No amino acid should repeat twice)
(A) Glycine (B) Alanine (C) Valine

(1) 4
(2) 6
(3) 8
(4) 9

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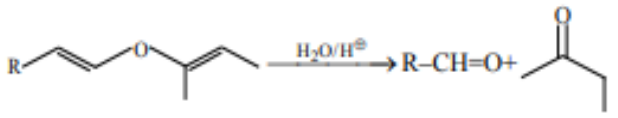
23. Observe the following reaction and same reaction is carried out with the following compound:



X and Y can be differentiated by:

(1) Fehling's test
(2) 2,4-DNP
(3) $NaHSO_3$
(4) Lucas test

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24. Statement (A): Resonating structure with more σ-bonds charges far apart are more stable.
Statement (B): Unsaturated hydrocarbon shows +I or –I depending upon the group they are attached with.
Statement (C): Carbanion with more % s character are more stable.
Statement (D): In nucleophilic addition to carbonyl group –E (electron-withdrawing) effect is responsible while in electrophilic additions +E is responsible.
Statement (E): Alkene having more alkyl groups have more heat of hydrogenation.

How many statements are correct?

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

MATHEMATICS

1. If all the letters of the word 'UDAYPUR' are arranged in all possible permutations and these permutations are listed in dictionary order, then the rank of the word 'UDAYPUR' is

1. 1580
2. 1579
3. 1582
4. 1580

---

2. Maximum value of n for which 40^n divides $60!$ is

1. 10
2. 14
3. 20
4. 27

---

3. Let $z = (1+i)(1+2i)(1+3i)\cdots(1+ni)$ and $|z|^2 = 44200$. Find the value of n.

1. 5
2. 6
3. 8
4. 7

---

4. Let $f(x)$ be a differentiable function satisfying the equations $\lim_{t\to x} \frac{t^2 f(x) - x^2 f(t)}{t-x} = 3$ and $f(1) = 2$. Find the value of $2f(2)$.

1. 20
2. 23
3. 25
4. 27

---

5. If $P(h,k)$ is a variable point on $x^2+y^2=4$ and $Q(2h+1,\,3k+3)$ always lies on an ellipse, if eccentricity of the ellipse is e, then $\dfrac{5}{e^2}$ is equal to

1. 9
2. 5
3. 3
4. 6

---

6. Let mirror image of parabola $x^2=4y$ in the line $x-y=1$ be $(y+a)^2=b(x-c)$. Then the value of $(a+b+c)$ is

1. 3
2. 6
3. 9
4. 12

---

7. Let $f(x)$ be a differentiable function satisfying

$$f(x)=e^x+\int_0^1 (y+xe^x)f(y)\,dy$$

Find $f(0)+e$, where e is Napier's constant.

1. 2
2. 4
3. 6
4. 8

---

8. Let 4 integers a_1,a_2,a_3,a_4 are in A.P. with integral common difference d such that $a_1+a_2+a_3+a_4=48$ and $a_1a_2a_3a_4+d^4=361$. Then the greatest term in this A.P. is

1. 24
2. 23
3. 27

4. 21

---

9. If $2(\vec{a}\times\vec{c})+3(\vec{b}\times\vec{c})=0$, where $\vec{a}=2\hat{i}-5\hat{j}+5\hat{k}$, $\vec{b}=\hat{i}-\hat{j}+3\hat{k}$ and $(\vec{a}-\vec{b})\cdot\vec{c}=-97$, find $|\vec{c}\times\vec{k}|^2$.

1. 218
2. 207
3. 165
4. 210

---

10. Evaluate

$$\left(\frac{4}{7}+\frac{1}{3}\right)+\left(\frac{4}{7}+\frac{4}{3}\right)\left(\frac{1}{3}\right)+\left(\frac{4}{7}+\frac{4}{3}\right)^2\left(\frac{1}{3}\right)^2+\cdots$$

1. $\frac{5}{2}$
2. $\frac{5}{7}$
3. $\frac{7}{2}$
4. $\frac{8}{3}$

---

11. Let S has 5 elements and $P(S)$ is the power set of S. Let an ordered pair (A,B) is selected at random from $P(S)\times P(S)$. If the probability that $A\cap B=\varnothing$ is $\frac{3^m}{2^n}$, then the value of $(m+n)$ is

1. 88
2. 96
3. 64
4. 28

---

12. If domain of $f(x)=\sin^{-1}\left(\frac{1}{x^2-2x-2}\right)$ is $(-\infty,\alpha]\cup[\beta,\gamma]\cup[\delta,\infty)$, then $(\alpha+\beta+\gamma+\delta)$ is

1. 0
2. 4
3. 3
4. 1

---

13. Let

$$f(x) = \begin{cases} b^2 \sin\left[\frac{\pi}{2}\left\{\frac{\pi}{2}(\sin x + \cos x)\cos x\right\}\right], & x > 0 \\ \frac{\sin x - \sin 2x}{x^3}, & x < 0 \\ a, & x = 0 \end{cases}$$

be a continuous function at $x = 0$, then the value of $(a^2 + b^2)$ is (where [ ] denotes greatest integer function).

1. $\frac{1}{4}$
2. $\frac{1}{2}$
3. $\frac{3}{4}$
4. $\frac{5}{4}$

---

14. If the equation

$$x^4 - ax^2 + 9 = 0$$

has four real and distinct roots, then the least possible integral value of a is

1. 5
2. 6
3. 7
4. 8

---

15. If dataset $A = \{1, 2, 3, \ldots, 19\}$ and dataset $B = \{ax + b;\ x \in A\}$. If mean of B is 30 and variance of B is 750, then sum of possible values of b is

1. 30
2. 90

3. 20
4. 60

---

16. If $f(a)$ is the area bounded in the first quadrant by $x = 0$, $x = 1$, $y = x^2$ and $y = |ax - 5| - |1 - ax| + ax^2$, then find $f(0) + f(1)$.

1. $\frac{11}{3}$
2. $\frac{13}{3}$
3. $\frac{17}{3}$
4. $\frac{23}{3}$

---

17. Let

$$f(x) = \int \frac{7x^{10} + 9x^8}{(1 + x^2 + 2x^9)^2}\, dx$$

and $f(1) = \frac{1}{4}$. Given that

$$A = \begin{pmatrix} 0 & 0 & 1 \\ 4 & f(1) & 1 \\ \alpha^2 & \frac{1}{4} & 1 \end{pmatrix}$$

and $B = \text{adj}(\text{adj}\, A)$, if $|B| = 81$, find the value of α^2 (where $\alpha \in \mathbb{R}$).

1. 2
2. 4
3. 6
4. 8

---

18. Find the number of solutions of the equation

$$\tan(x + 100^\circ) = \tan(x + 50^\circ)\tan(x - 50^\circ)$$

where $x \in (0, \pi)$.

1. 3
2. 4

3. 5
4. 6

---

19. Let P and Q be any two 3×3 matrices where $P = [p_{ij}]_{3\times3}$, $Q = [q_{ij}]_{3\times3}$ such that $q_{ij} = 2^{i+j-1}p_{ij}$. Find $|\operatorname{adj}(\operatorname{adj} P)|$.

1. 32
2. 8
3. 16
4. 64

---

20. Let the ellipse

$$E = \frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

have eccentricity equal to the greatest value of the function

$$f(t) = -\frac{3}{4} + 2t - t^2$$

and the length of its latus rectum is 30. Find the value of $a^2 + b^2$.

1. 496
2. 250
3. 376
4. 175

---

21. If two lines drawn from a point $P(2, 3)$ intersect the line $x + y = 6$ at a distance $\sqrt{\frac{2}{3}}$, then the angle between the lines is

1. $\frac{\pi}{6}$
2. $\frac{\pi}{3}$
3. $\frac{\pi}{12}$
4. $\frac{5\pi}{12}$

22. Let $f(x) = |\log_e x| - |x-1| + 5$. Statement 1: $f(x)$ is differentiable for all $x \in (0, \infty)$
Statement 2: $f(x)$ is increasing in $(1, \infty)$
Statement 3: $f(x)$ is decreasing in $(0, 1)$
Which of the following is correct?

1. All the statements are correct
2. Statement 1 and Statement 3 are correct
3. Statement 1 and Statement 2 are correct
4. Statement 2 and Statement 3 are correct

---

23. If shortest distance between the lines

$$\frac{x+1}{\alpha} = \frac{y-2}{-2} = \frac{z-4}{-2\alpha} \quad \textbf{and} \quad \frac{x}{\alpha} = \frac{y-1}{1} = \frac{z-1}{\alpha}$$

is $\sqrt{2}$, then find the sum of all possible values of α.

1. -6
2. 2
3. -8
4. 4

---

24. Let a function $f(x)$ satisfy

$$3f(x) + 2f\left(\frac{m}{19x}\right) = 5x$$

where $m = \sum_{i=1}^{9} i^2$. Find $f(5) + f(2)$.

1. -1
2. 0
3. -5
4. 6
