2 025 (28 Jan Shift 1) JEE Main 2025 January

Q1. Let *O* be the origin, the point *A* be $z1=\sqrt{3}+2\sqrt{2}i$, the point B(z2) be such that $\sqrt{3}|z2|=|z1|$ and arg $(z2)=arg(z)+\frac{\pi}{4}$ 6. Then (1)area of triangle ABO is 11 (3)area of triangle ABO is 11 (4)ABO is a scalene triangle

 Q2. Let f: $R \rightarrow R$ be a function defined by fx ()=(2+3
 $a)x2+(+2i-1)x+b, a \neq 1$. If

 f(x+y)=f(x)+f(y)+1-2y, then the yalue of $28\sum 5$ i=1|f(i)| is

 (1) 545
 (2) 715

 (3) 735
 (4) 675

Q3. Let *ABCD* be a trapezium whose vertices lie on the parabola *y*2=4*x*. Let the sides *AD* and *BC* of the trapezium be parallel to y -axis. If the diagonal AC is of length 25 4 and it passes through the point (1,0), then the area of *ABCD* is

- (1) 7_45 (3) 1_225 (2) = 25(4) 7_5 (4) 7_5
- Q4. The sum of all local minimum values of the function

$$f(x) = \begin{cases} 1 - 2x, & x < -1 \\ 1 & -1 \le x \le 2 \\ 3 & (7 + 2|x|), & -1 \le x \le 2 \\ 18 & (x - 4)(x - 5), & x > 2 \end{cases}$$

is

 $\begin{array}{c} (1) & \frac{157}{171} \\ (3) & \frac{171}{72} \end{array} \qquad \qquad \begin{array}{c} (2) & \frac{131}{167} \\ & 167 \\ & 72 \end{array}$

Q5. Let ${}^{n}C_{r-1} = 28, nC_{r} = 56$ and nCr+1=70. Let A(4cost,4sint),B(2sint,-2cost) and C(3r-n,r2-n-1) be the vertices of a triangle ABC, where t is a parameter. If $(3x-1)2+(3y)2 = \alpha$, is the locus of the centroid of triangle ABC, then α equals

(1) 6	(2) 18
(3) 8	(4) 20

Let the equation of the circle, which touches x-axis at the point (a,0),a>0 and cuts off an intercept of length b on y-axis be $x^2+y^2-ax+\beta y+y=0$. If the circle lies below x-axis, then the ordered pair $(2a,b^2)$ is equal to

(1) $(\gamma,\beta 2 - 4\alpha)$ (3) $(\gamma,\beta 2 + 4\alpha)$	(2) (α,β2 +4γ) (4) (α,β2 -4γ)
If $f(x) = 2^{x}$, $x \in \mathbb{R}$, then $\sum 81 f(k)$ s equal to	
(1) 1.81√2	(2) 41
(3) 82	(4) 81

Q8. Two number k1 and k2 are randomly chosen from the set of natural numbers. Then, the probability that the value of ik1+ik2,(i=v-1) is non-zero, equals

Q19.	 (1) 3a99 -100 (3) 3a99 +100 The number of different 5 digit numbers greater than 1,2,3,4,5,6,7, such that the sum of their first and la (1) 4608 (3) 5719 	 (2) 3a100 -100 (4) 3a100 +100 50000 that can be formed using the digits 0, st digits should not be more than 8, is (2) 5720 (4) 4607
Q20.	The relation $R = \{(x,y): x, y \in \mathbb{Z} \text{ and } x+y \text{ is even } \}$ is:	
	(1)reflexive and symmetric but not transitive(3)symmetric and transitive but not reflexive	(2)an equivalence relation (4)reflexive and transitive but not symmetric
Q21.	$ \begin{array}{rcl} & & & & & & \\ x & & & & \\ & & & & \\ & & & & \\ & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & & \\ & & & $) $3 2$ where [.] denotes greatest integer function. If α and β , nd is not differentiable, respectively, then α + β equals
	Let M denote the set of all real matrices of order 3×	3 and let S={-3,-2,-1,1,2} . Let
	S1={A=[aij] \in M : A = S2={A=[aij] \in M : A = S3={A=[aij] \in M : $a11$	A ^T and a ij \in S, \forall i, j}, -A ^T and a ij \in S, \forall i,j}, + a 22 + a 33 = 0 and a ij \in S, \forall i, j}.
	If $n $ ($S \cup \bigcup S$)=3125 a , then a equals	
Q23.	If $\alpha = 1 + \sum_{r=1}^{\beta_{r=1}} (-3)^{r-1} = \frac{12}{r} + \frac{1}{r}$, then the dista is	nce of the point (12, $\sqrt{3}$) from the line $\alpha x - \sqrt{3}y + 1 = 0$
Q24.	Let E1: $\sqrt[3]{9}+4=1^{2}$ be an ellipse. Ellipses E1 's are con same as that of <i>E</i> 1, and the length of minor axis of <i>E</i> area of the ellipse <i>E</i> , then 5 $_{\pi}(\Sigma^{\alpha}=1Ai)$, is equal to	structed such that their centres and eccentricities are is the length of major axis of $Ei+1(i\geq 1)$. If Ai is the
Q25.	Let $\rightarrow \alpha = \hat{i}^{+} + \hat{i}^{+} \pm \hat{k}^{+}, b = 2\hat{i}^{+} + 2\hat{i}^{+} + \hat{k}^{+} \rightarrow a \rightarrow $	is a vector such that $a \rightarrow c \overrightarrow{=} c , \overrightarrow{c} \overrightarrow{-2}a 2 \rightarrow =8$ and the

- angle between d and \vec{c} is π_4 then $|10-3 \text{ b} \cdot c|+|d \times c|$ is \vec{e} qual to
- Q26. Three infinitely long wires with linear charge density λ are placed along the *x*-*axis*,*y*-axis and *z* axis respectively. Which of the following denotes an equipotential surface? (1)*xyz*= constant (3)(*x*2+*y*2)(*y*2+*z*2)(*z*2+*x*2)= constant (4)(*x*+*y*)(*y*+*z*)(*z*+*x*)= constant
- Q27. Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason **R** Assertion A: A sound wave has higher speed in solids than gases. Reason R: Gases have higher value of Bulk modulus than solids. In the light of the above statements, choose the correct answer from the options given below

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

explanation of A

C2

>

Two capacitors C1 and C2 are connected in parallel to a battery. Charge-time graph is shown below for the two capacitors. The energy stored with them are U1 and U2, respectively. Which of the given statements is true?



Q29. A thin prism P w ith angle 4 made of glass having refractive index 1.54, is combined with another thin prism P2 made of glass having refractive index 1.72 to get dispersion without deviation. The angle of the prism P2 in degrees is

(1) 3	(2) 16/3
(3) 4	(4) 1.5

A particle of mass 'm' and charge 'q' is fastened to one end 'A' of a massless string having equilibrium length l, whose other end is fixed at point 'O'. The whole system is placed on a frictionless horizontal plane and is initially at rest. If uniform electric field is switched on along the direction as shown in figure, then the



Q31. Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R Assertion A: In a central force field, the work done is independent of the path chosen. Reason R: Every force encountered in mechanics does not have an associated potential energy. In the light of the above statements, choose the most appropriate answer from the options given below

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

Choose the correct nuclear process from the below options [p: proton, n : neutron, e-: electron, e+: positron, v: neutrino, \bar{v}^- : antineutrino]

(1) n \rightarrow p+e+ + \bar{v}		(2) n → p+e+ + v
(3)n→p+e-+	V	$(4)n \rightarrow p+e- +\bar{v}^-$

A hemispherical vessel is completely filled with a liquid of refractive index μ . A small coin is kept at the lowest point (O) of the vessel as shown in figure. The minimum value of the refractive index of the liquid so that a person can see the coin from point E (at the level of the vessel) is



Q34. A Carnot engine (E) is working between two temperatures 473 K and 273 K. In a new system two engines engine *E*1 works between 473 K to 373 K and engine *E*2 works between 373 K to 273 K. If *η*12,*η*1 and *η*2 are the efficiencies of the engines *E*,*E*1 and *E*2, respectively, then

(1) $\eta 12 = \eta 1 \eta 2$	(2) $\eta 12 \ge \eta 1 + \eta 2$
(3) $\eta 12 = \eta 1 + \eta 2$	(4) η12 < η1 +η2

Q35. Consider a long thin conducting wire carrying a uniform current I. A particle having mass " M " and charge " q

" is released at a distance " a " from the wire with a speed v0 along the direction of current in the wire. The particle gets attracted to the wire due to magnetic force. The particle turns round when it is at distance x from the wire. The value of x is [μ 0 is vacuum permeability]

(1) $ae^{-4\pi m_{01}}$	$(2) q^{1}$	_{mv₀} L] 2qµo
$(3)a \begin{bmatrix} 1 & qI \\ 1 & \mu \\ 0 \end{bmatrix}$		

Q36. A wire of resistance R is bent into an equilateral triangle and an identical wire is bent into *a* square. The ratio of resistance between the two end points of an edge of the triangle to that of the square is Options
(1) 8/9
(2) 27/32

(1) 8/9	(2) 27/3
(3) 32/27	(4) 9/8

Q37. In the experiment for measurement of viscosity ' η' of given liquid with a ball having radius *R*, consider following statements. A. Graph between terminal velocity V and R will be a parabola. B. The terminal velocities of different diameter balls are constant for a given liquid. C. Measurement of terminal velocity is dependent on the temperature. D. This experiment can be utilized to assess the density of a given liquid. E. If

balls are dropped with some initial speed, the value of η will change. Choose the correct answer from the options given below:

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

Q38. Due to presence of an em-wave whose electric component is given by E=100sin(ωt-kx)NC-1, a cylinder of length 200 cm holds certain amount of em-energy inside it. If another cylinder of same length but half diameter than previous one holds same amount of em-energy, the magnitude of the electric field of the corresponding em-wave should be modified as

- (1) 400sin(ωt-kx)NC-1
- (3) 50sin(ωt-kx)NC-1

- (2) 200sin(ωt-kx)NC-1
 (4) 25sin(ωt-kx)NC-1
- Q39. A bead of mass '*m*' slides without friction on the wall of a vertical circular hoop of radius '*R*' as shown in figure. The bead moves under the combined action of gravity and a massless spring (k) attached to the bottom of the hoop. The equilibrium length of the spring is '*R*'. If the bead is released from top of the hoop with (negligible) zero initial speed, velocity of bead, when the length of spring becomes '*R*', would be (spring



constant is 'k', g is accleration due to gravity)

- (1) ∛ 3Rg+ m^{kR2}
- (3) $2Rg + m^{kR2}$

Q40. Find the equivalent resistance between two ends of the following circuit



Q41. Consider following statements: A. Surface tension arises due to extra energy of the molecules at the interior as compared to the molecules at the surface, of a liquid. B. As the temperature of liquid rises, the coefficient of viscosity increases. C. As the temperature of gas increases, the coefficient of viscosity increases D. The onset of turbulence is determined by Reynold's number. E. In a steady flow two stream lines never intersect. Choose the correct answer from the options given below:

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

The center of mass of a thin rectangular plate (fig - x) with sides of length a



(3) (13a, b) (4)(2 3a, 3b)

Q43. Which of the following circuits has the same outpur as that of the given circuit?



Q44. For a particular ideal gas which of the following graphs represents the variation of mean squared velocity of the gas molecules with temperature?

(1)Statement I is false but Statement II is true(3)Both Statement I and Statement II are true

(2)Both Statement I and Statement II are false(4)Statement I is true but Statement II is false

Both acetaldehyde and acetone (individually) undergo which of the following reactions? A. Iodoform Reaction B. Cannizaro Reaction C. Aldol Condensation D. Tollen's Test E. Clemmensen Reduction Choose the correct answer from the options given below:

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

Which of the following oxidation reactions are carried out by both K2Cr2O7 and KMnO4 in acidic medium? A. $\Gamma \rightarrow I B. 2 - S \rightarrow S C. Fe^{2+} \rightarrow Fe \square + \Gamma \rightarrow IO3 E. 23 - SO2 \rightarrow SO4^{2-}$ Choose the correct answer from the options given below: (1)C, D and E Only (3)A, D and E Only (4)A, B and C Only

Q54. A molecule (" P ") on treatment with acid undergoes rearrangement and gives ("Q"). ("Q") on ozonolysis followed by reflux under alkaline condition gives (" R "). The structure of (" R ") is given below.

0 CH₂ CH3 ("R")

The structure of (" \mathbf{P} ") is

(1) CH3 CH3





Q55. The correct order of stability of following carbocations is :



056.

A and B in the following reactions, respectively are AgCN A⇔CH3-CH2-CH2-Br →B (1) CH 3-CH2-CH2-NO2,CH -CH 3-CH -GN 2 (2) CH₃CH2-CH2-ONO,CH-CH-3CH-NC 2 (3) CH 3 CH2-CH2-ONO,CH -CH -3CH -CN 2

(4) CH₃CH2-CH2-NO,CH₂CH-₃CH-N₂ 2

Q57. In a multielectron atom, which of the following orbitals described by three quantum numbers will have same

energy in absence of electric and magnetic fields? A. n=1,l=0, m1=0 B. n=2,l=0, m1=0 C. n=2,l=1, m1=1 D. n=3,l=2, m1=1 E. n=3,l=2, m1=0 Choose the correct answer from the options given below: (1)B and C Only (2) A and B Only (3)C and D Only (4)D and E Only

A weak acid HA has degree of dissociation x . Which option gives the correct expression of (pH pKa)?

(1) 0	(2) log(1+2x)
(3) $\log(1-x)$	(4) $\log(x_{x})$
~	1-
Q59. The molecules having square pyramidal g	eometry are
(1) BrF5&PCl5	(2) SbF5&PCl5

(3) SbF5&XeOF4 (4) BrF5&XeOF4

O60. Consider the following elements In,Tl,Al,Pb,Sn and Ge. The most stable oxidation states of elements with highest and lowest first ionisation enthalpies, respectively, are

(1)+4 and +1	(2)+1 and +4
(3)+4 and +3	(4)+2 and +3

Q61.

[A] ₀ /molL ⁻	$t_{\frac{1}{2}/\min}$
0.100	200
0.025	100

For a given reaction $R \rightarrow P,t1/2$ is related to [A]0 as given in table. Given: log2=0.30 Which of the following is true? A. The order of the reaction is 1/2. B. If [A]0 is 1 M, then t1/2 is 200 \vee 10 min C. The order of the reaction changes to 1 if the concentration of reactant changes from 0.100 M to 0.500 M. D. t1/2 is 800 min for [A]0=1.6M Choose the correct answer from the options given below: Options

(1)A and C Only (3)C and D Only

Match the LIST-I with LIST-II

(2)A, B and D Only (4)A and B Only

Q62.

LIST-I (Redox Reaction)			LIST-II (Type of Redox Reaction)		
A.	$\begin{array}{c} CH_{4(g)} + 2O_{2(g)} \xrightarrow{\Delta} CO_{2(g)} \\ + 2H_2O_{(l)} \end{array}$	I.	Disproportionation reaction		
B.	$2\mathrm{NaH}_{(\mathrm{s})} \xrightarrow{\Delta} 2\mathrm{Na}_{(\mathrm{s})} + \mathrm{H}_{2(\mathrm{g})}$	II.	Combination reaction		
C.	$\begin{array}{c} V_2 O_{5(s)} + 5Ca_{(s)} \xrightarrow{\Delta} 2V_{(s)} \\ + 5CaO_{(s)} \end{array}$	III.	Decomposition reaction		
D.	$2H_2O_{2(aq)} \xrightarrow{\Delta} 2H_2O_{(l)} + O_{2(g)}$	IV.	Displacement reaction		

Choose the correct answer from the options given below:(1)A-II, B-III, C-I, D-IV(2)A-III, B-IV, C-I, D-II(3)A-IV, B-I, C-II, D-III(4)A-II, B-III, C-IV, D-I

Q63. Given below are two statements: Statement I: In the oxalic acid vs KMnO4 (in the presence of dil H2SO4) titration the solution needs to be heated initially to 60°C, but no heating is required in Ferrous ammonium sulphate (FAS) vs KMnO4 titration (in the presence of dil H2SO4) Statement II: In oxalic acid vs KMnO4 titration, the initial formation of MnSO4 takes place at high temperature, which then acts as catalyst for further reaction. In the case of FAS vs KMnO, heatin g oxidizes Fe²⁺ into e³⁺ by oxygen of air and error may be introduced in the experiment. In the light of the above statements, choose the correct answer from the options given below

(1)Both Statement I and Statement II are false

(2)Both Statement I and Statement II are true (4)Statement I is true but Statement II is false

(3)Statement I is false but Statement II is true

- Q64. The metal ion whose electronic configuration is not affected by the nature of the ligand and which gives a violet colour in non-luminous flame under hot condition in borax bead test is
 - (1) Mn2+
 - (3) Ni2+

(2) Cr3+ (4) Ti3+

Q65.



The compounds that produce CO 2 with aqueous NaHCO 3 solution are: A.



Choose the correct answer from the options given below:

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

What is the freezing point depression constant of a solvent, 50 g of which contain 1 g non volatile solute (molar mass 256 g mol-1) and the decrease in freezing point is 0.40 K?

(1) 3.72 K kg mol-1	(2) 1.86 K kg mol–1
(3) 4.43 K kg mol-1	(4) 5.12 K kg mol-1

Q67. Given below are two statements:



Q72. The molarity of a 70% (mass / mass) aqueous solution of a monobasic acid (X) is _____ ×10−1 M(Nearest integer) [Given: Density of aqueous solution of (X) is 1.25 g mL−1 Molar mass of the acid is 70 g mol−1]

Q73. Consider the following sequence of reactions:



Chlorobenzene

11.25 mg of chlorobenzene will produce _____ \times 10–1mg of product B . (Consider the reactions result in complete conversion.) [Given molar mass of C,H,O,N and Cl as 12,1,16,14 and 35.5 g mol–1 respectively]

074. Quantitative analysis of an organic compound (X) shows following \% composition. C : 14.5% Cl : 64.46\%

H: 1.8 \% (Empirical formula mass of the compound (X) is _____ ×10-1 (Given molar mass in gmol $^{-1}$ of C:12,H:1,O:16,Cl:35.5)

075. Given below is the plot of the molar conductivity vs V concentration for KCl in aqueous solution.



If, for the higher concentration of KCl solution, the resistance of the conductivity cell is 100Ω , then the resistance of the same cell with the dilute solution is 'x' Ω The value of x is _____ (Nearest integer)

.

1. (2)	2.(4)	3.(1)	4.(1)	5.(4)	6.(4)	7.(4)	8.(2)
9.(1)	10 (2) (2)	11.(3)	12 (2)	13 (3)	14 (2)	15 (1)	16 (1)
17 (4)	. (3)	19.(4)	. (2)	. (5)	. (1613)	. (5)	. (54)
. (6)	18 (4)	27.(2)	20 (4)	21 (1)	22 (2)	23 (2)	24 (4)
25 (4)	. (1)	35.(1)	. (3)	. (3)	. (2)	. (1)	. (1)
. (1)	26 (4)	43.(2)	28 (2)	29 (4)	30 (11)	31 (0)	32 (3)
33 (16)	. (4)	51.(1)	. (3)	. (4)	. (4)	. (4)	. (4)
· (4)	34 (4)	59.(4)	36 (3)	37 (2)	38 (4)	39 (2)	40 (3)
41 (1)	· (1655)	67.(3)	· (2)	· (2)	· (2)	· (466)	· (125)
. (93)	42	75.(150)	44	45	46	47	48
49							
•	50		52	53	54	55	56
57				•		•	
	58		60	61	62	63	64
65							
•	66		68	69	70	71	72
73	•		•	•	•	•	•
	74						