JEE-MAINS-2020-JAN-8-SHIFT-1

PHYSICS

Question 1: Consider a uniform rod of mass M=4m and length l pivoted about its centre. A mass m moving with velocity v making angle $\theta = \frac{\pi}{4}$ to the rod's long axis collides with one end of the rod and sticks to it. The angular speed of the rod - mass system just after the collision is:

Options:

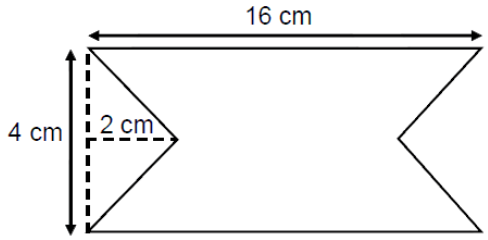
(a) $\frac{4}{7}\frac{v}{l}$

(b) $\frac{3\sqrt{2}}{7}\frac{v}{l}$

(c) $\frac{3}{7}\frac{v}{l}$

(d) $\frac{3}{7\sqrt{2}}\frac{v}{l}$

Question 2: At time t = 0 magnetic field of 1000 Gauss is passing perpendicularly through the area defined by the closed loop shown in the figure. If the magnetic field reduces linearly to 500 Gauss, in the next 5 s, then induced EMF in the loop is



Options:

(a) 28 μV

(b) 36 μV

(c) 48 μV

(d) 56 μV

Question 3: Proton with kinetic energy of 1 MeV moves from south to north. It gets an acceleration of 10^{12} m/s^2 by an applied magnetic field (west to east). The value of magnetic field: (Rest mass of proton is 1.6 x 10^{-27} kg)

Options:

(a) 7.1 mT

(b) 71 mT

(c) 0.71 mT

(d) 0.071 mT

Question 4: In finding the electric field using Gauss law the formula $\left|\vec{E}\right| = \frac{Q_{in}}{\varepsilon_0 \left|A\right|}$ is applicable. In the formula $\in_0$ is permittivity of free space, A is the area of Gaussian surface and qenc is charge enclosed by the Gaussian surface. This equation can be used in which of the following situation?

Options:

(a) Only when the Gaussian surface is an equipotential surface.

(b) Only when = constant on the surface.

(c) Only when the Gaussian surface is an equipotential surface and is constant of the surface

(d) For any choice of Gaussian surface

Question 5: Effective capacitance of parallel combination of two capacitors C_1 and C_2 is 10 μF. When these capacitors are individually connected to a voltage source of 1 V, the energy stored in the capacitor C_2 is 4 times that of C_1. If these capacitors are connected in series, their effective capacitance will be

Options:

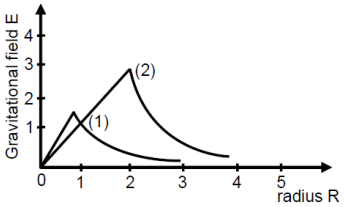
(a) 4.2 μF

(b) 8.4 μF

(c) 3.2 μF

(d) 1.6 μF

Question 6: Consider two solid spheres of radii R_1 = 1m R_2 = 2m and masses M_1 and M_2, respectively. The gravitational field due to sphere 1 and 2 are shown. The value of M^1/M_2 is



Options:

(a) $\frac{2}{3}$

(b) $\frac{1}{3}$

(c) $\frac{1}{2}$

(d) $\frac{1}{6}$

Question 7: A leak proof cylinder of length 1 m, made of a metal which has very low coefficient of expansion is floating vertically in water at 0^oC such that its height above the water surface is 20 cm. When the temperature of water is increased to 4^0C, the height of the

cylinder above the water surface becomes 21 cm. The density of water at T = 4°C, relative to the density at T = 0°C is close to

Options:

(a) 1.03

(b) 1.04

(c) 1.26

(d) 1.01

Question 8: The magnifying power of a telescope with tube length 60 cm is 5. What is the focal length of its eye piece?

Options:

(a) 40 cm

(b) 20 cm

(c) 10 cm

(d) 30 cm

Question 9: A particle of mass m is fixed to one end of a light spring having force constant k and unstretched length *l*. The other ends is fixed. The system is given an angular speed ω about the fixed end of the spring such that it rotates in a circle in gravity free space. Then the stretch in the spring is

Options:

(a) $\frac{ml\omega^2}{k+m\omega}$

(b) $\frac{ml\omega^2}{k+m\omega^2}$

(c) $\frac{ml\omega^2}{k-m\omega^2}$

(d) $\frac{ml\omega^2}{k-\omega m}$

Question 10: The graph which depicts and results of Rutherford gold foil experiment with α-particles is

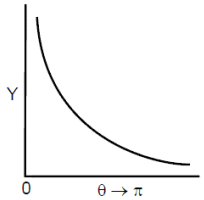
θ - Scattering angle

Y: Number of scattered α-particles detected

(Plots are schematic and not to scale)

Options:

(a)



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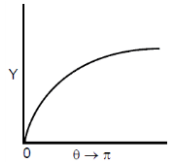

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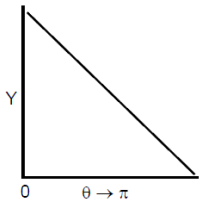
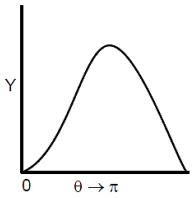
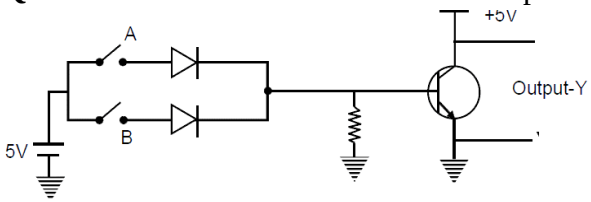


(d)



Question 11: Boolean relation at the output stage-Y for the following circuit is



Options:

(a) $\overline{A}+\overline{B}$

(b) $\overline{A}.\overline{B}$

(c) A.B

(d) A + B

Question 12: When photon of energy 4.0 eV strikes the surface of a metal A, the ejected photoelectrons have maximum kinetic energy T_A eV and de-Broglie wavelength λ_A. The maximum kinetic energy of photoelectrons liberated from another metal B by photon of energy 4.50 eV is $T_B = (T_A - 1.5)$eV. If the de-Broglie wavelength of these photoelectrons $\lambda_B = 2\lambda_A$, then the work function of metal B is

Options:

(a) 2 eV

(b) 3 eV

(c) 1.5 eV

(d) 4 eV

Question 13: The critical angle of a medium for a specific wavelength, if the medium has relative permittivity 3 and relative permeability 4/3 for this wavelength, will be

Options:

(a) 15°
(b) 30°
(c) 60°
(d) 45°

Question 14: Consider a solid sphere of radius R and mass density $\rho(r)\rho_0\left(1-\frac{r^2}{R^2}\right), 0 < r \le R.$ The minimum density of a liquid in which it will float is

Options:

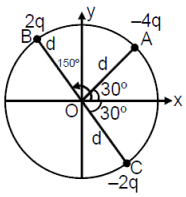
(a) $\frac{\rho_0}{3}$

(b) $\frac{2\rho_0}{3}$

(c) $\frac{\rho_0}{5}$

(d) $\frac{2\rho_0}{5}$

Question 15: Three charged particles A, B and C with charges –4q, 2q and –2q are present on the circumference of a circle of radius d. The charged particles A, C and centre O of the circle formed an equilateral triangle as shown in figure. Electric field at O along x-direction is:



Options:

(a) $\frac{\sqrt{3}q}{\pi\varepsilon_0 d^2}$

(b) $\frac{\sqrt{3}q}{4\pi\varepsilon_0 d^2}$

(c) $\frac{3\sqrt{3}q}{4\pi\varepsilon_0 d^2}$

(d) $\frac{2\sqrt{3}q}{\pi\varepsilon_0 d^2}$

Question 16: The dimension of stopping potential V_0 in photoelectric effect in units of Planck's constant 'h', speed of light 'c' and Gravitational constant 'G' and ampere A is

Options:

(a) $h^{-2/3}c^{-1/3}G^{4/3}A^{-1}$

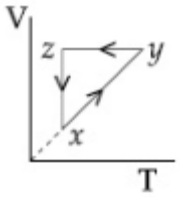
(b) $h^{2/3} G^{5/3} c^{1/3} A^{-1}$
(c) $h^{1/3} G^{2/3} c^{1/3} A^{-1}$
(d) $h^{2/3} G^{3/2} c^{1/3} A^{-1}$

Question 17: The length of a potentiometer wire is 1200 cm and it carries a current of 60 mA. For a cell of emf 5 V and internal resistance of 20 Ω, the null point on it is found to be at 1000 cm. The resistance of whole wire is

Options:

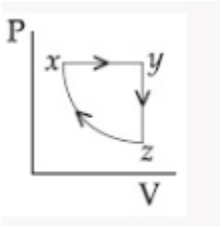
(a) 60 Ω
(b) 120 Ω
(c) 100 Ω
(d) 80 Ω

Question 18: The thermodynamic cycle *xyzx* is shown on a V-T diagram.
The P-V diagram that best describes this cycle is : (Diagrams are schematic and not to scale

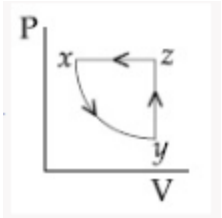


Options:

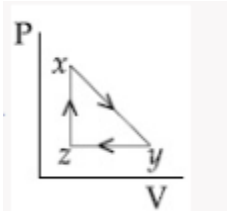
(a)



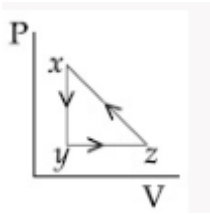
(b)



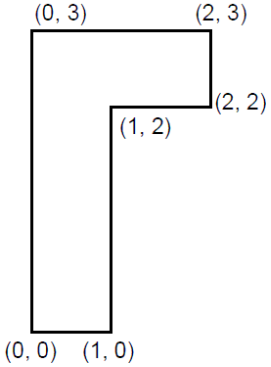
(c)



(d)



Question 19: The coordinates of centre of mass of a uniform flag shaped lamina (thin flat plate) of mass 4 kg. (The coordinates of the same are shown in figure) are



Options:

(a) (1.25 m, 1.50 m)

(b) (0.75 m, 0.75 m)

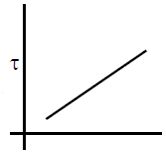
(c) (0.75 m, 1.75 m)

(d) (1 m, 1.75 m)

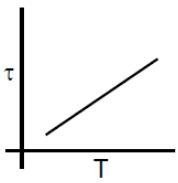
Question 20: The plot that depicts the behaviour of the mean free time (τ) (time between two successive collisions for the molecules of an ideal gas, as a function of temperature (T), qualitatively, is : (Graphs are schematic and not drawn to scale)

Options:

(a)



(b)



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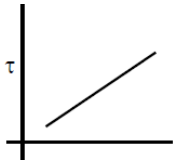
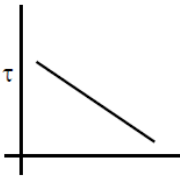


(d)



Question 21: A body A, mass m=0.1 kg has an initial velocity of $3\hat{i}\,ms^{-1}$. It collides elastically with another body, B of the same mass which has an initial velocity of $5\hat{i}\,ms^{-1}$. The energy of B after collision is written as x/10 J The value of x is _____

Question 22: A particle is moving along the x-axis with its coordinates with time 't' given by $x(t) = 10+8t-3t^2$. Another particle is moving along the y-axis with its coordinate as a function of time given by $y(t) = 5-8t^3$. At t = 1 s, the speed of the second particle measured in the frame of the first particle is given as $\sqrt{v}$ The v (in m/s) is _____

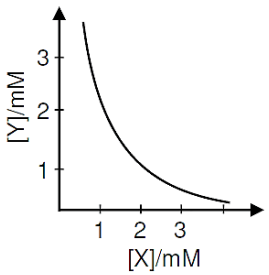
Question 23: A one metre long (both ends open) organ pipe is kept in a gas that has double the density of air at STP. Assuming the speed of sound in air at STP is 300 m/s, the frequency difference between the fundamental and second harmonic of this pipe is _____Hz.

Question 24: A point object air is in front of the curved surface of a plano-convex lens. The radius of curvature of the curved surface is 30 cm and the refractive index of the lens material is 1.5, then the focal length of the lens (in cm) is _____

Question 25: Four resistance of 15Ω, 12Ω, 4Ω and 10Ω respectively in cyclic order to form Wheatstone's network. The resistance that is to be connected in parallel with the resistance of 10Ω to balance the network is _____ Ω

CHEMISTRY

Question 26: The stoichiometry and solubility product of a salt with the solubility curve given below is, respectively



Options:

(a) X_2Y, $2 \times 10^{-9}\ M^3$

(b) XY, $2 \times 10^{-6}\ M^3$

(c) XY_2, $4 \times 10^{-9}\ M^3$

(d) XY_2, 1×10^{-9} M^3

Question 27: A graph of vapour pressure and temperature for three different liquids X, Y and Z is shown below

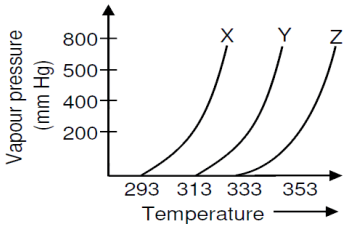
The following inferences are made

(1) X has higher intermolecular interactions compared to Y.

(2) X has lower intermolecular interactions compared to Y.

(3) Z has lower intermolecular interactions compared to Y.

The correct inference(s) is/are



Options:

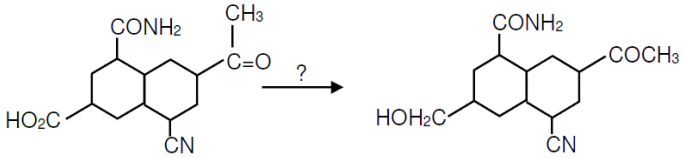
(a) (C)

(b) (B)

(c) (A) and (C)

(d) (A)

Question 28: The most suitable reagent for the given conversion is



Options:

(a) H_2/Pd

(b) $NaBH_4$

(c) $LiAlH_4$

(d) B_2H_6

Question 29: The complex that can show fac– and mer– isomers is

Options:

(a) $[CoCl_2(en)_2]$

(b) $[Pt(NH_3)_2Cl_2]$

(c) $[Co(NH_3)_4Cl_2]+$

(d) $[Co(NH_3)_3(NO_2)_3]$

Question 30: The rate of a certain biochemical reaction at physiological temperature (T) occurs 10^6 times faster with enzyme than without. The change in the activation energy upon adding enzyme is

Options:

(a) + 6(2. 303)RT

(b) + 6RT

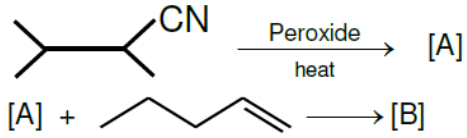
(c) – 6RT
(d) – 6(2. 303) RT

Question 31: The first ionization energy (in kJ/mol) of Na, Mg, Al and Si respectively, are
Options:
(a) 496, 577, 737, 786
(b) 786, 737, 577, 496
(c) 496, 577, 786, 737
(d) 496, 737, 577, 786

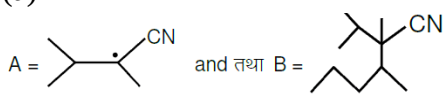
Question 32: The third ionization enthalpy is minimum for
Options:
(a) Ni
(b) Co
(c) Mn
(d) Fe

Question 33: Among the gases (a) – (e), the gases that cause greenhouse effect are
(a) CO_2 (b) H_2O (c) CFCs (d) O_2 (e) O_3
Options:
(a) (a), (c), (d) and (e)
(b) (a), (b), (c) and (e)
(c) (a), (b), (c) and (d)
(d) (a) and (d)

Question 34: The major products A and B in the following reactions are



Options:
(a)



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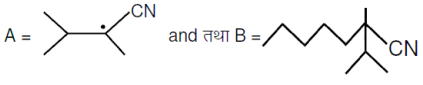

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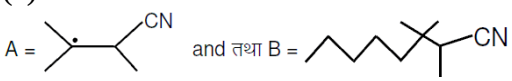
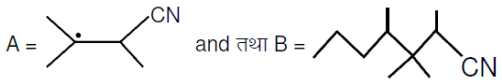


(d)



Question 35: The predominant intermolecular forces present in ethyl acetate, a liquid, are
Options:
(a) Dipole-dipole and hydrogen bonding
(b) London dispersion, dipole-dipole and hydrogen bonding
(c) London dispersion and dipole-dipole
(d) Hydrogen bonding and London dispersion

Question 36: Arrange the following compounds in increasing order of C–OH bond length
Methanol, phenol, p-ethoxyphenol
Options:
(a) methanol < phenol < p-ethoxyphenol
(b) phenol < methanol < p-ethoxyphenol
(c) phenol < p-ethoxyphenol < methanol
(d) methanol < p-ethoxyphenol < phenol

Question 37: A flask contains a mixture of isohexane and 3-methylpentane. One of the liquids boils at 63ºC while the other boils at 60ºC. What is the best way to separate the two liquids and which one will be distilled out first?
Options:
(a) simple distillation, isohexane
(b) simple distillation, 3-methylpentane
(c) fractional distillation, 3-methylpentane
(d) fractional distillation, isohexane

Question 38: For the Balmer series in the spectrum of H atom, $\bar{v} = R_H \left[\frac{1}{n_1^2} - \frac{1}{n_2^2} \right]$ the correct statements among (I) to (IV) are
(I) As wavelength decreases, the lines in the series converge
(II) The integer n1 is equal to 2
(III) The lines of longest wavelength correspond to n2 = 3
(IV) The ionization energy of hydrogen can be calculated from wave number of these lines
Options:
(a) (I), (III), (IV)
(b) (I), (II), (IV)
(c) (II), (III), (IV)
(d) (I), (II), (III)

Question 39: The number of bonds between sulphur and oxygen atoms in $S_2O_8^{2-}$ and the number of bonds between sulphur and sulphur atoms in rhombic sulphur, respectively, are
Options:
(a) 8 and 8
(b) 8 and 6
(c) 4 and 6
(d) 4 and 8

Question 40: The strength of an aqueous NaOH solution is most accurately determined by titrating (Note consider that an appropriate indicator is used)

Options:

(a) Aq. NaOH in a volumetric flask and concentrated H_2SO_4 in a conical flask

(b) Aq. NaOH in a burette and aqueous oxalic acid in a conical flask

(c) Aq. NaOH in a pipette and aqueous oxalic acid in a burette

(d) Aq. NaOH in a burette and concentrated H_2SO_4 oxalic in a conical flask

Question 41: As per Hardy–Schulze formulation, the flocculation values of the following for ferric hydroxide sol are in the order

Options:

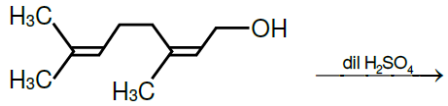
(a) $K_3[Fe(CN)_6] < K_2CrO_4 < KBr = KNO_3 = AlCl_3$

(b) $K_3[Fe(CN)_6] < K_2CrO_4 < AlCl_3 < KBr < KNO_3$

(c) $K_3[Fe(CN)_6] > AlCl_3 > K2CrO_4 > KBr > KNO_3$

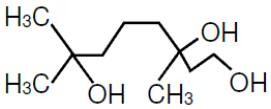
(d) $AlCl_3 > K_3[Fe(CN)_6] > K_2CrO_4 > KBr = KNO_3$

Question 42: The major product of the following reaction is



Options:

(a)



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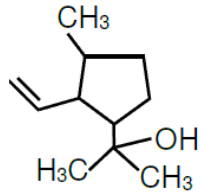
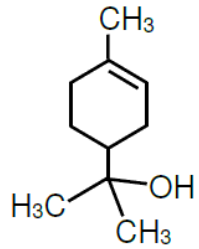
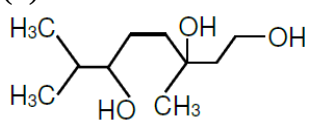


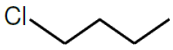
(c)

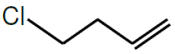


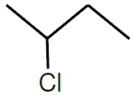
(d)

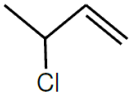


Question 43: The decreasing order of reactivity towards dehydrohalogenation (E1) reaction of the following compounds is

(A) 

(B) 

(C) 

(D) 

Options:

(a) B > D > C > A

(b) D > B > C > A

(c) B > A > D > C

(d) B > D > A > C

Question 44: When gypsum is heated to 393 K, it forms

Options:

(a) Anhydrous $CaSO_4$

(b) $CaSO_4 \cdot 0.5\ H_2O$

(c) $CaSO_4 \cdot 5\ H_2O$

(d) Dead burnt plaster

Question 45: Which of the following statement is not true for glucose

Options:

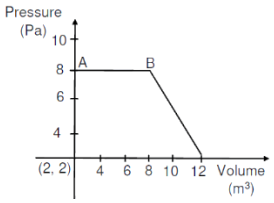
(a) Glucose exists in two crystalline forms α and β

(b) Glucose reacts with hydroxylamine to form oxime

(c) Glucose gives Schiff's test for aldehyde

(d) The pentaacetate of glucose does not react with hydroxylamine to give oxime

Question 46: The magnitude of work done by a gas that undergoes a reversible expansion along the path ABC shown in the figure is _____



Question 47: The volume (in mL) of 0.125 M $AgNO_3$ required to quantitatively precipitate chloride ions in 0.3 g of $[Co(NH_3)_6]Cl_3$ is _____.

$M[Co(NH_3)_6]Cl_3 = 267.46$ g/mol

$MAgNO_3 = 169.87$ g/mol

Question 48: Ferrous sulphate heptahydrate is used to fortify foods with iron. The amount (in grams) of the salt required to achieve 10 ppm of iron in 100 kg of wheat is _____.

Atomic weight Fe = 55.85 S = 32.00 O = 16.00

Question 49: What would be the electrode potential for the given half-cell reaction at pH = 5 $2H_2O \rightarrow O_2 + 4H^+ + 4e^-$ E_0^{red} = 1. 23 V (R = 8. 314 J mol^{-1} K^{-1} Temp = 298 K oxygen under std. pressure of 1 bar)

Question 50: The number of chiral centres in penicillin is

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Question 51: $\lim_{x\to 0}\left(\frac{3x^2+2}{7x^2+2}\right)^{\frac{1}{x^2}}$ is equal to

Options:
(a) 1/e2
(b) e
(c) e^2
(d) 1/e

Question 52: Let two points be A(1, –1) and B(0, 2). If a point P(x', y') be such that the area of ΔPAB = 5 square. units and it lies on the line, 3x + y – 4λ = 0, then a value of λ is :

Options:
(a) 3
(b) -3
(c) 1
(d) 4

Question 53: The mean and the standard deviation (s, d) of 10 observations are 20 and 2 respectively. Each of these 10 observations is multiplied by p and then reduced by q, where $p \neq 0$ and $q \neq 0$. If the new mean and new s.d. become half of their original values, then q is equal to :

Options:
(a) -20
(b) 10
(c) -10
(d) -5

Question 54: The shortest distance between the lines
$\frac{x-3}{3}=\frac{y-8}{-1}=\frac{z-8}{1}$ and $\frac{x+3}{-3}=\frac{y+7}{2}=\frac{z-6}{4}$ is

Options:
(a) $2\sqrt{30}$

(b) 3

(c) $\frac{7}{2}\sqrt{30}$

(d) $3\sqrt{30}$

Question 55: If a, b and c are the greatest values of ${}^{p}19_{C}$, ${}^{q}20_{C}$ and ${}^{r}21_{C}$ respectively, then :

Options:

(a) $\frac{a}{10}=\frac{b}{11}=\frac{c}{42}$

(b) $\frac{a}{10}=\frac{b}{11}=\frac{c}{21}$

(c) $\frac{a}{11}=\frac{b}{22}=\frac{c}{42}$

(d) $\frac{a}{11}=\frac{b}{22}=\frac{c}{21}$

Question 56: Let the volume of a parallelopiped whose coterminous edges are given by $\vec{u}=\hat{i}+\hat{j}+\lambda\hat{k},\vec{v}=\hat{i}+\hat{j}+3\hat{k}$ and $\vec{w}=2\hat{i}+\hat{j}+\hat{k}$ be 1 cu. unit. If be the angle between the edges $\vec{u}$ and $\vec{\omega}$ then cosθ can be

Options:

(a) $\frac{5}{3\sqrt{3}}$

(b) $\frac{7}{6\sqrt{6}}$

(c) $\frac{5}{7}$

(d) $\frac{7}{6\sqrt{3}}$

Question 57: Let f(x) = xcos-1(-sin|x|), x ∈ $\left[-\frac{\pi}{2},\frac{\pi}{2}\right]$, then which of the below is true ?

Options:

(a) f′(0) = $-\frac{\pi}{2}$

(b) f′ is decreasing in $\left(-\frac{\pi}{2},0\right)$ and increasing in $\left(0,\frac{\pi}{2}\right)$

(c) f is not differentiable at x = 0

(d) f′ is increasing in $\left(-\frac{\pi}{2},0\right)$ and decreasing in $\left(0,\frac{\pi}{2}\right)$

Question 58: Let f(x) = $(\sin(\tan^{-1}x) + \sin(\cot^{-1}x))^2 - 1$, |x| > 1. If $\frac{dy}{dx} = \frac{1}{2}\frac{d}{dx}\left(\sin^{-1}\left(f\left(x\right)\right)\right)$ and $y\left(\sqrt{3}\right) = \frac{\pi}{6}$, then $y\left(-\sqrt{3}\right)$ is equal to :

Options:

(a) π/3

(b) 2π/3

(c) -π/6

(d) 5π/6

Question 59: Let A and B be two independent events such that P(A) = $\frac{1}{3}$ and P(B) = $\frac{1}{6}$. Then, which of the following is TRUE?

Options:

(a) P(A'/B') = $\frac{1}{3}$

(b) P(A/B) = $\frac{2}{3}$

(c) P(A/B') = $\frac{1}{3}$

(d) P(A/(A∪B)) = $\frac{1}{4}$

Question 60: The inverse function of $f\left(x\right) = \frac{8^{2x} - 8^{-2x}}{8^{2x} + 8^{-2x}}, x \in \left(-1,1\right)$, is

Options:

(a) $\frac{1}{4}\log_e\left(\frac{1+x}{1-x}\right)$

(b) $\frac{1}{4}\log_e\left(\frac{1-x}{1+x}\right)$

(c) $\frac{1}{4}\left(\log_e e\right)\left(\frac{1+x}{1-x}\right)$

(d) $\frac{1}{4}\left(\log_e e\right)\left(\frac{1-x}{1+x}\right)$

Question 61: If c is a point at which Rolle's theorem holds for the function $f\left(x\right) = \log_e\left(\frac{x^2+\alpha}{7x}\right)$ in the interval [3, 4], where α ∈ R, then f''(c) is equal to :

Options:

(a) $\frac{\sqrt{3}}{7}$

(b) $-\frac{1}{24}$

(c) $-\frac{1}{12}$

(d) $\frac{1}{12}$

Question 62: Let y = y(x) be a solution of the differential equation,

$\sqrt{1-x^2}\frac{dy}{dx}+\sqrt{1-y^2}=0, |x|<1.$

If $y\left(\frac{1}{2}\right)=\frac{\sqrt{3}}{2}$, then $y\left(\frac{-1}{\sqrt{2}}\right)$ is equal to

(a) $-\frac{\sqrt{3}}{2}$

(b) $\frac{1}{\sqrt{2}}$

(c) $\frac{\sqrt{3}}{2}$

(d) $-\frac{1}{\sqrt{2}}$

Question 63: If $\int \frac{\cos x\ dx}{\sin^3 x\left(1+\sin^6 x\right)^{2/3}} = f(x)\left(1+\sin^6 x\right)^{1/\lambda}+c$ where c is a constant of integration, then $\lambda f\left(\frac{\pi}{3}\right)$ is equal to :

Options:

(a) 2

(b) $-\frac{9}{8}$

(c) $\frac{9}{8}$

(d) -2

Question 64: Let the line y = mx and the ellipse $2x^2 + y^2 = 1$ intersect at a point P in the first quadrant. If the normal to this ellipse at P meets the co-ordinate axes at $\left(-\frac{1}{3\sqrt{2}}, 0\right)$ and (0, β), then β is equal to :

Options:

(a) $\frac{2}{\sqrt{3}}$

(b) $\frac{\sqrt{2}}{3}$

(c) $\frac{2}{3}$

(d) $\frac{2\sqrt{2}}{3}$

Question 65: The locus of a point which divides the line segment joining the point (0, –1) and a point on the parabola, $x^2 = 4y$, internally in the ratio 1 : 2, is :

Options:

(a) $9x^2 - 12y = 8$

(b) $x^2 - 3y = 2$

(c) $9x^2 - 3y = 2$

(d) $4x^2 - 3y = 2$

Question 66: Which one of the following is a tautology?

Options:

(a) $(P \wedge (P \rightarrow Q)) \rightarrow Q$

(b) (P ∧ (P Q)

(c) $Q \rightarrow (P \wedge (P \rightarrow Q))$

(d) $(P \vee (P \wedge Q)$

Question 67: For a > 0, let the curves C_1: $y^2 = ax$ and C_2 :$x^2 = ay$ intersect at origin O and a point P. Let the line x = b (0 < b < a) intersect the chord OP and the x-axis at points Q and R, respectively. If the line x = b bisects the area bounded by the curves, C_1 and C_2, and the area of ΔOQR = $\frac{1}{2}$, then 'a' satisfies the equation :

Options:

(a) $x^6 - 12x^3 - 4 = 0$

(b) $x^6 - 6x^3 + 4 = 0$

(c) $x^6 - 12x^3 + 4 = 0$

(d) $x^6 + 6x^3 - 4 = 0$

Question 68: If the equation, $x^2 + bx + 45 = 0$ ($b \in R$) has conjugate complex roots and they satisfy $|z+1| = 2\sqrt{10}$, then :

Options:

(a) $b^2 - b = 30$

(b) $b^2 + b = 72$

(c) $b^2 - b = 42$

(d) $b^2 + b = 12$

Question 69: Let f : R R be such that for all x ∈ R ($2^{1+x} + 2^{1-x}$), f(x) and ($3^x + 3^{-x}$) are in A.P., then the minimum value of f(x) is :

Options:
(a) 0
(b) 1
(c) 4
(d) 3

Question 70: For which of the following ordered pairs (μ, δ), the system of linear equations
$x + 2y + 3z = 1$
$3x + 4y + 5z = \mu$
$4x + 4y + 4z = \delta$ is inconsistent ?
Options:
(a) (4, 6)
(b) (3, 4)
(c) (1, 0)
(d) (4, 3)

Question 71: The number of all 3 × 3 matrices A, with entries from the set {–1, 0, 1} such that the sum of the diagonal elements of AA^T is 3, is _____

Question 72: The least positive value of 'a' for which the equation,
$2x^2 + (a - 10)x + \frac{33}{2} = 2a$ has real roots is

Question 73: An urn contains 5 red marbles, 4 black marbles and 3 white marbles. Then the number of ways in which 4 marbles can be drawn so that at the most three of them are red is _____.

Question 74: The sum $\sum_{k=1}^{20}(1+2+3+.....+k)$ is

Question 75: Let the normal at a point P on the curve $y^2 - 3x^2 + y + 10 = 0$ intersect the y-axis at (0, 3/2). If m is the slope of the tangent at P to the curve, then |m| is equal to