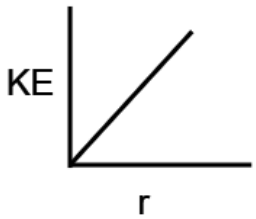
JEE-Main-04-04-2024 (Memory Based)
[MORNING SHIFT]

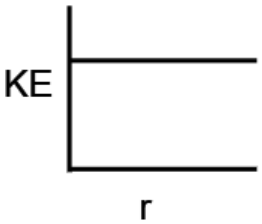
Physics

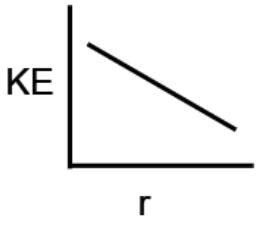
Question: If 5 identical convex lenses are kept close to each other so that the equivalent power of the system is 25D, then find the focal length of each lens
Options:
(a) 10 cm
(b) 20 cm
(c) 30 cm
(d) 40 cm
Answer: (b)

Question: An electron is revolving around an infinite wire. Which graph correctly shows the relation between KE of electron and the distance from the wire
Options:

(a)


(b)


(c)


(d)


Answer: (c)

Question: Change of 40 degree in Celsius scale is equivalent to What degree in Fahrenheit scale?

Options:
(a) 52°F
(b) 72°F
(c) 17°F
(d) 50°F
Answer: (b)

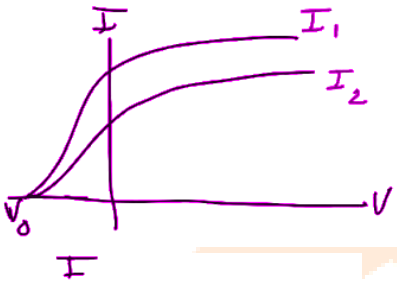
Question: Elongation caused by a load of 3N in a wire is ‘a’. When 2N force is applied on the same wire the elongation is ‘b’. What load will be required for the elongation of 3a - 2b:
Options:
(a) 4
(b) 5
(c) 9
(d) 10
Answer: (b)

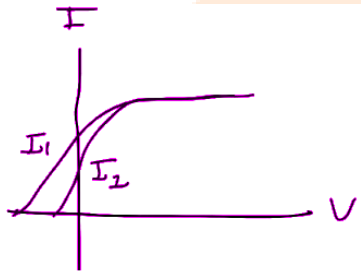
Question: A rod of length ‘L’ and mass ‘M’ is bent in the form of a semicircle. Now a particle of mass ‘m’ is kept at the center. Find the force experienced by the particle
Options:
(a) $\frac{2GMm\pi}{L^2}$
(b) $\frac{GMm\pi}{2L^2}$
(c) $\frac{GMm\pi}{L^2}$
(d) $\frac{4GMm\pi}{L^2}$
Answer: (a)

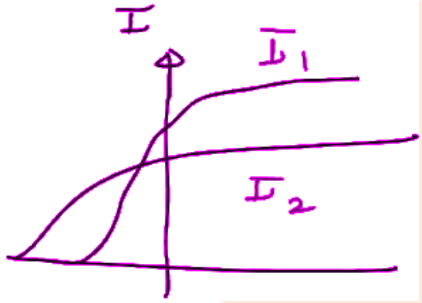
Question: A mass ‘m’ is dropped on a ground from height ‘h’ it rebounds to a height of h/2 after hitting the ground for the first time. Find the loss in energy during the first time it hits the ground and also the speed with which it will hit the ground for the second time
Options:
(a) $\frac{mgh}{2}, \sqrt{gh}$
(b) $mgh, \sqrt{2hg}$
(c) $\frac{mgh}{4}, \sqrt{\frac{gh}{2}}$
(d) $\frac{mgh}{8}, \sqrt{gh}$
Answer: (a)

Question: For the 4th orbit of hydrogen atom the debroglie wavelength of electron is $n\pi a_0$ where a_0 is bohr radius. The value of n
Options:
Answer: (8)

Question: If the current is given by $i = 6 + \sqrt{56} \sin(\omega t)$ then what will be the RMS current
Options:
(a) 64
(b) 8
(c) 32
(d) $\sqrt{28}$
Answer: (b)

Question: Which of the following graph of correctly represent effect of increase in intensity ($I_2 > I_1$) of light falling on a metal in photoelectric effect.
Options:
(a)


(b)


(c)


(d)


Answer: (d)

Question: An electron is thrown inside the solenoid, parallel to the axis of the solenoid, with some velocity. Then the velocity of electron will
Options:
(a) Increase
(b) Decrease
(c) Remains unchanged
(d) Path will be circular with uniform speed

Answer: (c)

Question: Magnitude of current is zero when voltage is maximum when the load has
A. Pure inductor
B. Pure capacitor
C. Pure resistance
D. Combination of inductor and capacitor
Options:
(a) A, B, C
(b) A, B, D
(c) A, C D
(d) B C D
Answer: (b)

Question: For a particle in motion in a plane, x and y coordinates can be expressed as $\begin{bmatrix} x = 2 + 4t \\ y = 3 + 8t^2 \end{bmatrix}$ Where x, y is in meter and t is in second which of the following is false
Options:
(a) Uniform accelerated motion
(b) Constant velocity along x
(c) Parabolic trajectory
(d) Particle will pass through origin
Answer: (d)

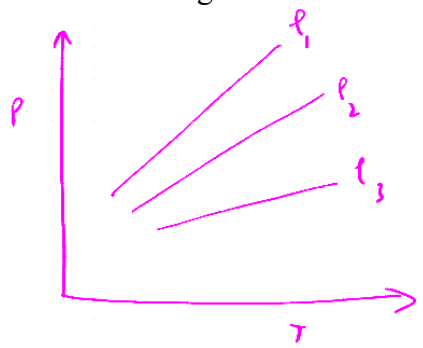
Question: Find out the electric field at the centre of a hollow hemisphere with the surface charge density σ on the sphere
Options:
(a) $\frac{\sigma}{\varepsilon_0}$
(b) $\frac{\sigma}{2\varepsilon_0}$
(c) $\frac{\sigma}{3\varepsilon_0}$
(d) $\frac{\sigma}{4\varepsilon_0}$
Answer: (d)

Question: A solid Sphere and Solid Cylinder are rolled on an inclined plane with same initial speed v. Find the ratio of their respective vertical heights they will reach
Options:
(a) 15/14
(b) 14/15
(c) 7/15
(d) 15/7
Answer: (b)

Question: If a bubble of radius 7 cm requires 36960 ergs of work to increase its size then find the new radius surface tension is s = 40 dynes / cm & $\pi = \frac{22}{7}$

Options:
(a) 9.3 cm
(b) 12.3 cm
(c) 14.3 cm
(d) 17.3 cm
Answer: (a)

Question: Pressure versus temperature graphs of ideal gases having equal volume and moles is as shown in figure. Which relation of densities of the gases will be correct?



Options:
(a) $\rho_1 > \rho_2$
(b) $\rho_3 > \rho_2$
(c) $\rho_2 > \rho_1$
(d) $\rho_1 = \rho_2 = \rho_3$
Answer: (a)

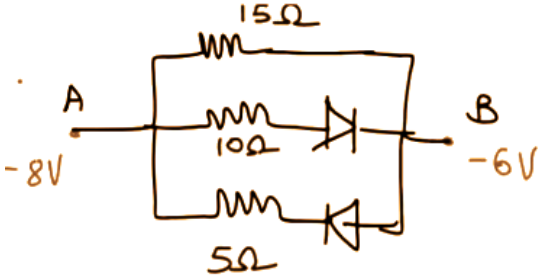
Question: If the electric field vector at a point in an electromagnetic wave is given by $\vec{E} = 40 \cos \omega\left(t - \frac{Z}{C}\right)\hat{i}$, Then corresponding $\vec{B}$ will be

Options:
(a) $\vec{B} = \frac{40}{3} \times 10^{-8} \cos\omega\left(t - \frac{Z}{C}\right)\hat{j}$
(b) $\vec{B} = \frac{40}{3} \times 10^{-8} \cos\omega\left(t - \frac{Z}{C}\right)\hat{k}$
(c) $\vec{B} = \frac{40}{3} \times 10^{-8} \cos\omega\left(t - \frac{Z}{C}\right)\left(\hat{j} + \hat{k}\right)$
(d) $\vec{B} = \frac{40}{3} \times 10^{-8} \cos\omega\left(t - \frac{Z}{C}\right)\left(\hat{j} - \hat{k}\right)$
Answer: (a)

Question: Two Forces F_1 and F_2 having relation in magnitude as $F_1 = 3F_2$ the resultant of F_1 & F_2 has magnitude equal to F_1 Find the angle between the forces $\theta = \cos^{-1}(-1/n)$
Options:
Answer: (6)

Question: If the m^{th} maximum of $\lambda_1 = 450$ nm coincides with n^{th} maximum of $\lambda_2 = 650$ nm, then find the minimum possible value of m ($m \neq 0$)
Options:
(a) 9
(b) 13
(c) 7
(d) 11
Answer: (b)

Question: From given circuit diagram, find equivalent resistance between AB.



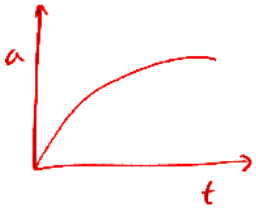
Options:
(a) 0.75 Ω
(b) 4 Ω
(c) 2.5 Ω
(d) 3.75 Ω
Answer: (d)

Question: An infinite charged sheet in kept in X - Y plane where surface charge density is + σ & an infinite long changed wire with linear changed density + λ is kept at Z = 4. The ratio of the electric field due to sheet and wire at (0, 0, 2) in form nπ. Find n given ,
$|\sigma| = 2|\lambda|$
Options:
(a) 1
(b) 2
(c) 3
(d) 4
Answer: (d)

Question: If a particle moving at constant acceleration travels 102.5 m in n^{th} second and 115m in $(n + 2)^{th}$ second, then its acceleration is:
Options:
(a) 6.25
(b) 12.5
(c) 25
(d) 3.12
Answer: (a)

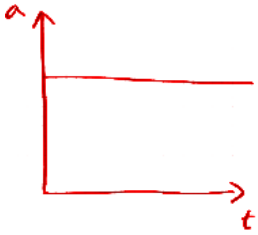
Question: If body initially at rest was pushed with a force which increase linearly with time what is acceleration vs time graph
Options:

(a)

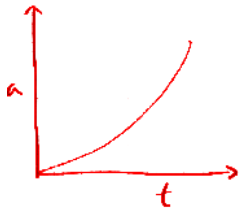


(b)

(c)



(d)



Answer: (b)

Question: Resistance of a platinum wire at ice point and steam point is 8Ω and 10Ω respectively. Find its resistance when the temperature of wire is raised to 400°C

Options:

(a) 10 Ω

(b) 16 Ω

(c) 20 Ω

(d) 30 Ω

Answer: (b)

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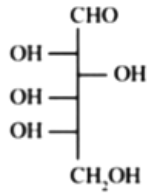
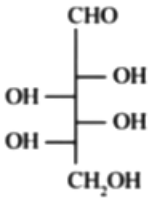
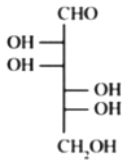
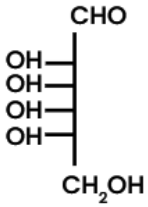
Chemistry

Question: Which of the following is the correct structure for L - Glucose
Options:

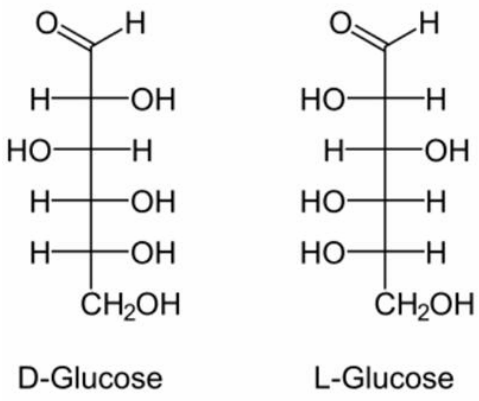
(a) 

(b) 

(c) 

(d) 

Answer: (a)



Question: Which of the following have the maximum dipole moment
Options:
(a) NH_3
(b) NF_3
(c) PF_5
(d) CH_4
Answer: (a)
Maximum dipole moment in NH_3

Question: Which shows one oxidation state other than its elemental state
Options:
(a) Ti
(b) Sc
(c) Co
(d) Ni
Answer: (b)
Sc show one oxidation state other than it's elemental state +3

Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn
	+2	+2	+2	**+2**	**+2**	**+2**	**+2**	+1	**+2**
+3	+3	+3	**+3**	+3	**+3**	**+3**	+3	**+2**	
	+4	+4	+4	+4	+4	+4	+4		
		+5	+5	+5					
			+6	+6	+6				
				+7					

Question: No. of complexes from the following with even number of unpaired 'd' electrons is ____ $[V(H_2O)_6]^{3+}$, $[Fe(H_2O)_6]^{3+}$, $[Ni(H_2O)_6]^{3+}$,$[Cu(H_2O)_6)]^{2+}$, $[Cu(H_2O)_6]^{2+}$
Options:
(a) 1
(b) 5
(c) 2
(d) 3
Answer: (c)
$[V(H_2O)_6]^{3+}$, $[Cu(H_2O)_6]^{2+}$ Even number of unpaired 'd' electrons.

Question: Central atom is involved in Sp^3 hybridization NO^-_3 ,BCl_3 ,ClO^-_2 ,ClO^-_3
Options:
(a) NO^-_3 and ClO^-_2
(b) ClO^-_2 and BCl_3
(c) ClO^-_3 and ClO^-_2
(d) NO^-_3 and BCl_3
Answer: (c)

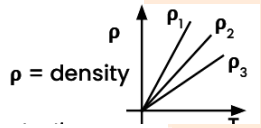
Question: Statement 1 : Acidity of alpha H is the reason for aldol reaction.
Statement 2 : Benzaldehyde and ethanal won't give cross aldol product
Options:
(a) S1 is correct and S2 is correct

(b) S1 is correct and S2 is incorrect
(c) S1 is incorrect and S2 is correct
(d) S1 is incorrect and S2 is incorrect
Answer: (b)
S1 is correct and S2 is incorrect

Question: If emf of hydrogen electrode at 25°C is zero in pure water, then pressure of H_2 in bar
Options:
(a) 10^{-14}
(b) 10^{-7}
(c) 1
(d) 0.5
Answer: (a)

Question: Among the following, decreasing order of basic strength will be :
OH^-, H^-, $HCOO^-$, CH_3COO^-, ^-OR
(I) (II) (III) (IV) (V)
Options:
(a) II > V > III > I > IV
(b) II > V > I > IV > III
(c) III > IV > I > V > II
(d) V > I > IV > II > III
Answer: (b)

Question: We are given with the following graph between P and T



Choose the correct option
Options:
(a) $\rho_1 > \rho_2 > \rho_3$
(b) $\rho_1 < \rho_2 < \rho_3$
(c) $\rho_1 = \rho_2 = \rho_3$
(d) $\rho_2 > \rho_1 > \rho_3$
Answer: (a)

Question: Which of the following is the correct order of first ionization enthalpy ?
Options:
(a) Be < B < O < F < N
(b) B < Be < O < N < F
(c) B < Be < N < F < O
(d) Be < B < N < F < O
Answer: (b)

Question: The number of different chain isomers C_7H_{16}
Options:
(a) 7
(b) 8
(c) 5

(d) 9
Answer: (D)

Question: What is the wavelength of hydrogen atom in term of a_0 for n = 4 ?

Question: Which of the following nitrogen containing Compounds to not give Lassaigne's test
Options:
(a) Hydrazine
(b) Phenyl Hydrazine
(c) Glycine
(d) Urea
Answer: (A)

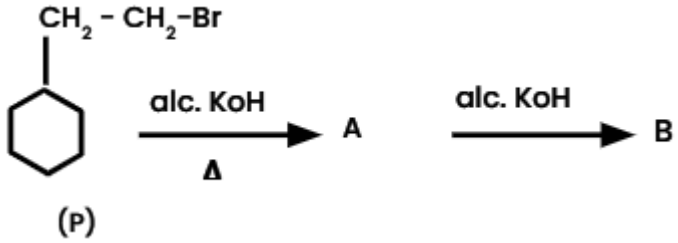
Question: In the precipitation of the iron group III in qualitative analysis ammonium chloride added before adding ammonium hydroxide to !
Options:
(a) Prevent interference by phosphate ions
(b) Increase conc. of Cl^- ions
(c) Decrease conc. of OH^- ions
(d) Increase conc. of NH^+_4 ions
Answer: (c)

Question: Calculate the molarity of NaCl if mass is 5.85 g and the volume of solution is 500 mL.
Options:
(a) 0.02 m
(b) 0.2 m
(c) 0.01 m
(d) 0.002 m
Answer: (b)

Question: Which of the following species has only one unpaired electrons ?O_2 , O^-_2 , O^{2-}_2 , CN^-, NO
Options:
(a) O_2 and O^-_2
(b) O^{2-}_2 and O^-_2
(c) CN^- and NO
(d) O^-_2 and NO
Answer: (d)

Question: Decreasing order of the field strength of the following ligands will be :
CO, CN^-, Cl^-, H_2O
Options:
(a) $CO > CN^- > H_2O > Cl^-$
(b) $CO > CN^- > Cl^- H_2O$
(c) $CN^- > CO > H_2O > Cl^-$
(d) $CN^- > CO > Cl^- > H_2O$
Answer: (a)

Question: For the given reaction,



Relation between molecule P and B is :

Options:
(a) Enantiomer
(b) Diastereomers
(c) Positional isomers
(d) None of the above
Answer: (c)

Question: From the given date, find the enthalpy of hydrogenation of ethene in kJ/mol.
(1) B. E. of C - C = 350 kJ/mol
(2) B. E. of C = C = 600 kJ/mol
(3) B. E. of H - H = 400 kJ/mol
(4) B. E. of C - H = 410 kJ/mol

Options:
(a) -170
(b) -580
(c) +170
(d) +580
Answer: (a)

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Maths

Question: In a triangle ABC, side AB has 5 points P_1, P_2,.....P_5 excluding a dnd b, 6 points on side BC and 7 points on side AC then total number of triangle that can be formed without using the points A,B,C

Options:

(a)

(b)

(c)

(d)

Answer: ()

Question: $f(x)\begin{cases} -2 & x \in (-2,0) \\ x-2 & x \in (0,2) \end{cases}$ h(x) = f(|x|) + |f(x)|. Find value $\int_{-2}^{2} h(x)dx$

Question: $(\bar{z})^2 + |z| = 0$ Sum of the non zero solutions is α and product is β. Find $4(\alpha^2+\beta^2)$ = ?

Question: Find the number of rational numbers in the expansion of $\left(2^{\frac{1}{5}} + 5^{\frac{1}{3}}\right)^{15}$.

Question: $f(x)\begin{cases} \frac{1-\cos 2x}{x^2} & x < 0 \\ \propto & x = 0 \\ \frac{\beta\sqrt{1-\cos x}}{x} & x > 0 \end{cases}$ Continuous at x = 0, find $\alpha^2 + \beta^2$

Question: Urns A,B,C with 5 red ,7 black; 5 black, 7 red; and 6 red, 6 black respectively. A ball is drawn randomly and is found to be black. Then probability of Black ball drawn from A is

Question: If 2 and 6 are the roots of the equation $ax^2 + bx + 1 = 0$ have roots 2 and 6. Find quadratic whose roots are $\frac{1}{2a+b}$ and $\frac{1}{6a+b}$ is

Options:

(a) $4x^2 + 14x + 12 = 0$

(b) $2x^2 + 11x + 12 = 0$

(c) $x^2 + 10x + 16 = 0$

(d) $x^2 + 8x + 12 = 0$

Answer: ()

Question: $f(x) = \frac{2x^2-3x+8}{2x^2+3x+8}$ if GCD(m.n) = 1 and $\frac{f_{min}}{f_{max}} = \frac{m}{n}$ Find (m+n)

Question: $f(x) = x^5 + 2e^{\frac{x}{4}}$ if gof(x) = x for all x, find 8g'(2).

Question: A square is inscribed in the circle $x^2 + y^2 - 10x - 6y + 30 = 0$. One side of this square is parallel to y = x + 3. If (x_1. y_1) are the vertices of the Square, then

$\sum(x_i^2 + y_i^2)$ is equal to:

Options:

(a) 148

(b) 156

(c) 152

(d) 160

Answer: ()

Question: Let $\alpha, \beta \in R$. Let the mean and the variance of 6 observations -3, 4, 7, -6 α, β be 2 and 23 respectively. The mean deviation about the means of these 6 observations is

Options:

(a) $\frac{11}{3}$

(b) $\frac{16}{3}$

(c) $\frac{13}{3}$

(d) $\frac{14}{3}$

Answer: ()

Question: If the domain of the function $\sin^{-1}\left(\frac{3x-22}{2x-19}\right) + \log\left(\frac{3x^2-8x+5}{x^2-3x-10}\right)$ is $[\alpha, \beta]$ then $3\alpha + 10\beta$ is equal to

Options:

(a) 100

(b) 95

(c) 97

(d) 98

Answer: ()

Question: Find $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{\sin^2 x}{1 + 2^x}\, dx$

Question: The coefficient of x^7 in $(1 - x - x^2 + x^3)^6$

Question: If the length of focal chord of $y^2 = 12x$ is 15 and if the distance of the focal chord from origin is p then $10p^2$ is equal to

Question: If $\lim_{x\to 1} \frac{(5x+1)^{\frac{1}{3}} - (x+5)^{\frac{1}{3}}}{(2x+3)^{\frac{1}{2}} - (x+4)^{\frac{1}{2}}} - \frac{m\sqrt{5}}{n(2n)^{\frac{2}{3}}}$ where gcd(m, n) = 1 then 8m + 12n is equal to

Question: Let a unit vector which makes an angle 60° with $2\hat{i} + 2\hat{j} - \hat{k}$ and an angle of 45° with $\hat{i} - \hat{k}$ be $\vec{c}$.Then $\vec{c} + \left[-\frac{1}{2}\hat{i} + \frac{1}{3\sqrt{2}}\hat{i} - \frac{\sqrt{2}}{3}\hat{k}\right]$

Options:

(a)

$\frac{\sqrt{2}}{3}\hat{i} - \frac{1}{2}\hat{k}$

(b)

$\frac{\sqrt{2}}{3}\hat{i} + \frac{1}{3\sqrt{2}}\hat{j} - \frac{1}{2}\hat{k}$

(c)

$-\frac{c_2}{3}\hat{i} + \frac{\sqrt{2}}{3}\hat{j} + \left(\frac{1}{2} + \frac{2\sqrt{2}}{3}\right)\hat{k}$

(d)

$\left(\frac{1}{\sqrt{3}}+\frac{1}{2}\right)\hat{i}+\left(\frac{1}{\sqrt{3}}-\frac{1}{3\sqrt{2}}\right)\hat{j}+\left(\frac{1}{\sqrt{3}}+\frac{\sqrt{2}}{3}\right]\hat{k}$

Question: In a G.P., $T_1 = 2$, $T_2 = P$, $T_3 = Q$. These are also terms of an A.P. (7^{th}, 8^{th}, & 13^{th} terms). If 5th term of G.P. = n^{th} term of A.P., then find n.