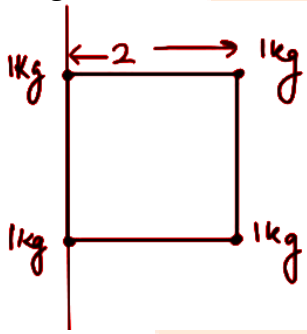
JEE-Mains-27-01-2024 [Memory Based]
[Morning Shift]

Physics

Question: Spherometer cannot measure which of the following quantities?
Options:
(a) Radius of curvature of convex lens
(b) Radius of curvature of concave lens
(c) thickness of thin plates.
(d) specific rotation of liquids
Answer: (d)

Question: Find Moment of Inertia of Massless square frame of side length 2 m with mass of 1 Kg on Each Vertex about axis passing through a side



Options:
(a) 8 kgm^2
(b) 2 kgm^2
(c) 4 kgm^2
(d) 3 kgm^2
Answer: (a)

Question: A particle is moving with initial speed $\left(5\hat{i}+2\hat{j}\right)\frac{m}{s}$ and a constant acceleration of $\left(2\hat{i}+3\hat{j}\right)\frac{m}{s^2}$ starting from origin. After sometime it is observed that it has moved by a distance 84 m along the x-axis. Find the final speed
Options:
(a) $19\hat{i}+23\hat{j}$
(b) $13\hat{i}+23\hat{j}$
(c) $19\hat{i}+13\hat{j}$
(d) $13\hat{i}+13\hat{j}$
Answer: (a)

Question: A beaker is filled with two liquids each of height 6 cm if refractive indices of two liquids are $\mu_1 = 8/3$ and $\mu_2 = 5/3$ then find the apparent depth of a coin kept at the bottom of the container

Options:

(a) 4.85 cm

(b) 5.85 cm

(c) 6.85 cm

(d) 7.85 cm

Answer: (b)

Question: If radius of electron in 3rd stationary orbit is R, radius of electron in 4th stationary orbit is

Options:

(a) $\frac{25}{9}R$

(b) $\frac{16}{9}R$

(c) $\frac{9}{16}R$

(d) $\frac{9}{25}R$

Answer: (b)

Question: A particle executing SHM has amplitude A = 4m and maximum speed of 10 m/s. Find its distance from mean position which its speed is 6m/s.

Options:

(a) 3.0

(b) 3.2

(c) 3.4

(d) 3.6

Answer: (b)

Question: Resistance R having length L is cut into five parts and connected in parallel. The effective resistance now is ?

Options:

(a) R

(b) 5R

(c) R/5

(d) R/25

Answer: (d)

Question: A rectangular loop of length 2.5m and breadth 2m is present in a magnetic field of 5 tesla making an angle of 60° with the plane of the loop. The loop is pulled out from the field slowly in 10 seconds. Find the EMF developed.

Options:

(a) 2.16 volts

(b) 1 volt

(c) 1.16 volt

(d) 3 volts

Answer: (a)

Question: Two parallel infinite wires are carrying current of 10 A in the opposite directions. Distance between the wires is 5 cm. Find the magnetic field at the midpoint between the wires.

Options:

(a) 1.6×10^{-4} T

(b) 4×10^{-4} T

(c) 2×10^{-4} T

(d) 6×10^{-4} T

Answer: (a)

Question: Find percentage volume change of a liquid at depth of 4000m under water as compared to on the surface. Bulk modulus of the liquid is 2×10^{9} Pa.
($g = 10\ m/s^2$)

Options:

(a) ½ %

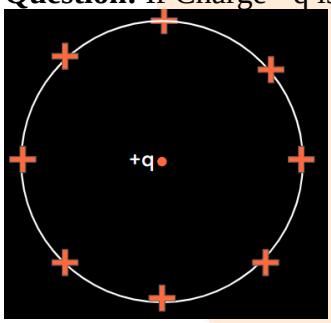
(b) 2%

(c) 1%

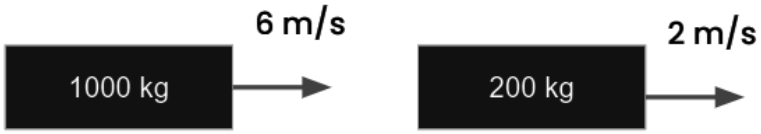
(d) 0.25%

Answer: (b)

Question: If Charge +q is Kept at the centre, find the Tension in the Ring



Question: After Collision Blocks stick. Find there Common Velocity



(a) 4/3 m/s

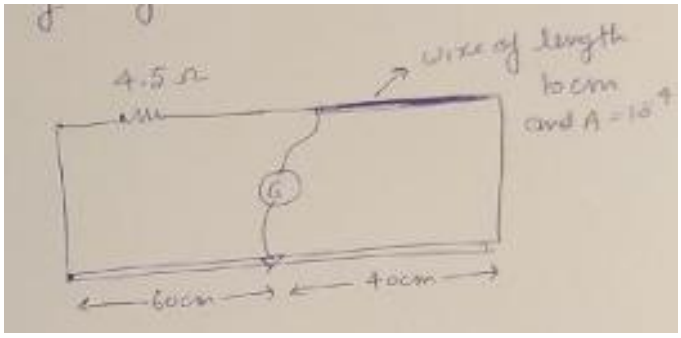
(b) 16/3 m/s

(c) 5 m/s

(d) 9/5 m/s

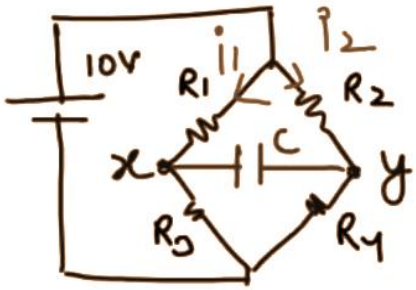
Answer: (c)

Question: In a meter bridge experiment when a wire of length 10 cm and cross section area $10^{-4}\ m^2$ is used in place of unknown resistor, then the balancing length is forced to be 60 cm. Find the resistivity of the wire



Options:
(a) 3×10^{-3} Ω - m
(b) 4×10^{-3} Ω - m
(c) 10^{-3} Ω - m
(d) 2×10^{-3} Ω - m
Answer: (a)

Options: In the following circuit, find the charge on the positive plate of the capacitor after long time given $R_1 = 1$ Ω, $R_2 = 6$Ω, $R_3 = 2$Ω, $R_4 = 4$Ω C = 150 μF, V = 10V



(a) 200 μF
(b) 300 μF
(c) 400 μF
(d) 500 μF
Answer: (c)

Question: If the displacement of a particle is given by $\vec{S} = 2t^2\hat{i} + 5\hat{j}$, then find the velocity of t = 1 second
Options:
(a) $4\hat{i} + 5\hat{j}$
(b) $2\hat{i} + 5\hat{j}$
(c) $4\hat{i}$
(d) $5\hat{j}$
Answer: (c)

Question: Find the intensity of an electromagnetic wave with equation its electric field component as E = 200 sin(1.5 × 107 t - 0.05x) N/C
(a) 53
(b) 67
(c) 84
(d) 43

Answer: (a)

Question: If a monoatomic gas molecule has a KE of 414 eV, then find the temperature of the gas if $K_B = 1.3 \times 10^{-23}$
Options:
(a) 340 K
(b) 3400 K
(c) 3400 °C
(d) 340 °C
Answer: (b)

Question: If diameter of earth's becomes half without changing its mass the value of acc due to gravity on surface become
(a) 2g
(b) g/2
(c) g/4
(d) 4g
Answer: (d)

Question: A charged particle moves in a region with constant velocity which combination of electric field and magnetic field is possible
(i) E ≠ 0 B ≠ 0
(ii) E = 0 B = 0
(iii) E = 0 B ≠ 0
(iv) E ≠ 0 B = 0
Options:
(a) (i), (ii) and (iii) only
(b) (i) and (ii) only
(c) (i) and (iii) only
(d) (ii) and (iii) only
Answer: (a)

Question: In an isothermal expansion initial pressure is P = 800 KPa and initial volume is 30 dm^3 if the final volume is 45 dm^3, find the heat absorbed in the process
[ln(3) = 1.099, ln(2) = 0.693]
(a) 8790
(b) 4350
(c) 2088
(d) 9731
Answer: (d)

Question: A Convex Lens of Focal length 40 cm focus a distant light on electrochemical cell and current I is produced as a results. If a convex lens of focal length 20 cm is used current will change to [assuming both lenses have same diameter]
Options:
(a) I
(b) 2I
(c) I/2
(d) I/4
Answer: (a)

Question: A Pn S_m has a refractive index of $\mu = cot\frac{A}{2}$. Find the minimum deviation if it is kept in air. A is angle of Prism

Options:

(a) $\frac{\pi}{2} - \frac{A}{2}$

(b) π - 2A

(c) π - A

(d) $\frac{\pi}{2} - A$

Answer: (b)

Question 23: If a charge of 1μC is placed at the origin the potential difference between points A(√3, √3) and B(√6, 0) is

Options:

(a) 1μJ

(b) 2μJ

(c) 3μJ

(d) 0

Answer: (d)

Question: Two particles with same KE are having masses of 4 gram and 25 gram respectively. Find the ratio of there linear momentum

Options:

(a) 2:5

(b) 5:2

(c) 4:25

(d) 25:4

Answer: (a)

Question: Read the following statements

S1: Viscosity of gases is more than liquids

S2: Addition of insoluble impurities decreases surface tension

Options:

(a) Both are correct

(b) Only S1 is correct

(c) Only S2 is correct

(d) None is correct

Answer: (c)

Question: Read the following statements

S1: Planck constants and Angular momentum have same dimension

S2: Moment of the force and linear momentum have same dimension

Options:

(a) Both are correct

(b) Only S1 is correct

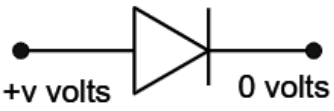
(c) Only S2 is correct

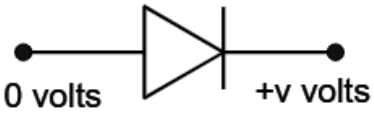
(d) None is correct

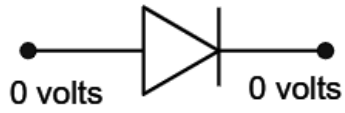
Answer: (b)

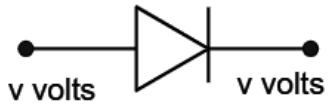
Question: Which of the following option shows the diode in the reverse biased mode

Options:

(a) 

(b) 

(c) 

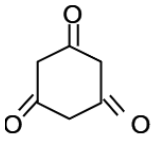
(d) 

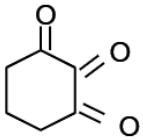
Answer: (b)

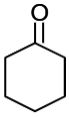
JEE-Main-27-01-2024 (Memory Based)
[MORNING SHIFT]

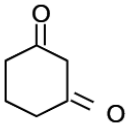
Chemistry

Question: Which of the following has the highest enol content?
Options:

(a) 

(b) 

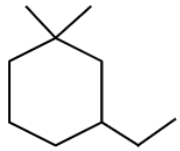
(c) 

(d) 

Answer: (a)
Solution: Option A as enol form will become aromatic in this case

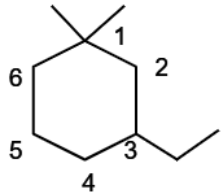
Question: Which of the following can not show variable oxidation state?
Options:
(a) Chlorine
(b) Fluorine
(c) Bromine
(d) Iodine
Answer: (c)
Solution: Variable O.S is not possible in F.

Question: IUPAC name of this compound is?



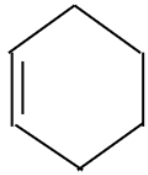
Options:
(a) 1-ethyl-3, 3-dimethyl cyclohexane
(b) 3-ethyl-1, 1-dimethyl cyclohexane
(c) 1-ethyl-3, 3-dimethyl cyclohexene
(d) 3-ethyl-1,1-dimethyl cyclohexene

Answer: (b)
Solution:



Question: Electronic configuration of neodymium is?
Options:
(a) $[Xe]6s^2 5d^2 4f^3$
(b) $[Xe]6s^2 5d^0 4f^4$
(c) $[Xe]6s^1 5d^1 4f^4$
(d)$[Xe]6s^1 5d^0 4f^5$
Answer: (b)

Question: The compound given below is:



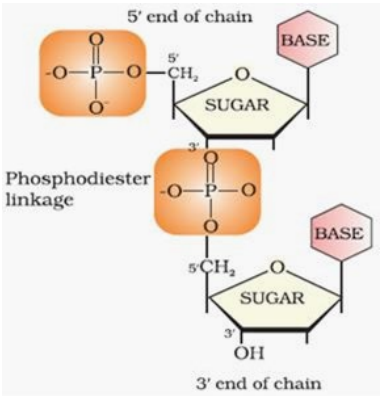
Options:
(a) Alicyclic
(b) Aromatic
(c) Antiaromatic
(d) Acyclic
Answer: (a)
Solution: Alicyclic compounds are organic compounds that are both aliphatic and cyclic. These are the saturated or unsaturated hydrocarbons containing non-aromatic rings of carbon atoms.

Question: Which of the following is polar molecule
Options:
(a) $CH_2 = CH_2$
(b) $CHCl_3$
(c) CCL_4
(d) CH_4
Answer: (b)
Solution: In $CHCl_3$ dipole moment is not equal to zero

Question: Bond order sum of NO^+ and CO is ?
Solution: NO^+ & CO bond order sum = 3+ 3 = 6.

Question: Nucleotides are joined by?
Options:
(a) Glycosidic Link
(b) Peptide Link
(c) Phosphodiester Link

(d) O-O Link
Answer: (c)
Solution:



Question: Which of the following has yellow color ?
Options:
(a) $K_2Cr_2O_7$
(b) K_2CrO_4
(c) $KMnO_4$
(d) none of these
Answer: (b)
Solution: K_2CrO_4 is yellow in colour whereas $K_2Cr_2O_7$ is orange coloured, $KMnO_4$ colour is purple

Question: How many compounds have S in +4 O.S.
SO_3, $BaSO_4$, $H_2S_2O_7$, $SOCl_2$, SF_4, $H_2S_2O_3$
Solution: 3 compounds have S in +4 O.S.
SO_3 - +6
$BaSO_4$- +6
$H_2S_2O_7$ - +6
$SOCl_2$- +4
SF_4 - +4
$H_2S_2O_3$ - +4

Question: I - Ethanol given Lucas test
S II - Para nitrophenol is more acidic than meta and ortho nitro phenol.
Options:
(a) Statement I is incorrect but statement II is correct
(b) Both statement I and II are correct
(c) Both statement I and II are incorrect
(d) Statement I is correct but statement II is incorrect
Answer: (b)
Solution: Both statement I and II are correct

Question: n = 4 and s = +1/2
How many electrons in all the subshell with this configuration.
Solution: n = 4 there are 16 orbital and 16 electrons with +1/2.

Question: Which of the following reaction is correct with enzyme.

Options:
(a) Sucrose → Glucose + fructose ,Invertase
(b) Glucose → CO_2 + Ethanol, Maltase
(c) Protein → Amino Acid, zymase
(d) Starch → Maltose ,Pepsin
Answer: (a)
Solution: Invertase enzyme catalyzes the hydrolysis of the disaccharide sucrose into glucose and fructose

Question: Order of Magnetic moment of the following compound is $[FeF_6]^{3-}$, Q = $[V(H_2O)_6]^{2+}$, R = $[Fe(H_2O)_6]^{2+}$
Options:
(a) R > P > Q
(b) Q > P > R
(c) P > Q > R
(d) P > R > Q
Answer: (d)
Solution: More the number of unpaired electron, more will be the magnetic moment
$[FeF_6]^{3-}$ - 5 unpaired electron - P
$[V(H_2O)_6]^{2+}$- 3 unpaired electron - Q
$[Fe(H_2O)_6]^{2+}$- 4 unpaired electron - R

Question: Which of the following has highest magnetic moment
Options:
(a) d^7
(b) d^8
(c) d^3
(d) d^6
Answer: (d)
Solution:
Magnetic moment increases with the increase in number of unpaired electrons.
d^3 has 3 unpaired electrons .
d^6 has 4 unpaired electrons
d^7 has 3 unpaired electrons
d^8 has 2 unpaired electrons.

Question: CrO_2Cl_2 + 4 NaOH → A + B + C
A, B, C is ?
Options:
(a) A = Na_2CrO_4 , B = NaCl, C =H_2O
(b) A = Na_2CrO_4 , B = NaOH, C =H_2O
(c) A = $K_2Cr_2O_7$, B = NaCl, C =H_2O
(d) None of the above
Answer: (a)
Solution: CrO_2Cl_2 + 4 NaOH → Na_2CrO_4 + 2 NaCl + H_2O

Question: Statement-1: Boron have high melting point in the group (2453k)
Statement-2: Boron have extremely high crystalline lattice.
Options:
(a) Statement I is incorrect but statement II is correct

(b) Both statement I and II are correct
(c) Both statement I and II are incorrect
(d) Statement I is correct but statement II is incorrect
Answer: (b)
Solution: Boron has very high melting point because of its small atomic size and very strong crystalline lattice.
It forms strong covalent bonds with the neighbouring atoms. Thus boron atom are closely packed in its solid state, so a large amount of heat is needed to break the bonds between atoms.

JEE-Advanced-27-01-2024 (Memory Based)
[Morning Shift]

Maths

Question: The points on the line in the first quadrant 4x+5y=20 which trisect the section of the line in the first quadrant, what is the tan of the angle between them?
Options:
(a) 25/41
(b) 3/5
(c) 4/5
(d) 30/41
Answer: (d)

Question: S={1, 2,.....10}
M are all the subsets of S
X={A, B ; A intersection B= null set and A, B belongs to X}
Options:
(a) X is symmetric
(b) X is transitive and symmetric
(c) X is reflexive
(d) X is symmetric and reflexive
Answer: (a)

Question:

$$8=\frac{1}{4}(3+P)+\frac{1}{4^2}(3+2p)+\frac{1}{4^3}(3+3p)+....$$

Value of P??

Answer: 9

$$8=3+\frac{1}{4}(3+P)+\frac{1}{4^2}(3+2P)+\frac{1}{y^3}(3+3P)+$$

$$8\times y=\frac{1}{4}\times 3+\frac{1}{y^2}\times(3+P)+\frac{1}{y^3}(3+2P)+...$$

$$6=3+\frac{1}{4}(P)+\frac{1}{y^2}(P)+\frac{1}{y^3}(P)+....$$

$$3=\frac{P/4}{1-\frac{1}{4}}=\frac{P}{3}\rightarrow P=9$$

Question: Find the length of the chord of the ellipse

$\frac{x^2}{25}+\frac{y^2}{16}=1$ whose midpoint is $\left(1,\frac{2}{5}\right)$

Answer: $\frac{\sqrt{1691}}{10}$

Question:
$\vec{a}.\vec{c}=3$

$\vec{a}=\hat{i}-2\hat{j}+\hat{k}\ \vec{b}=3\left(\hat{i}-\hat{j}+\hat{k}\right)\vec{a}\times\vec{c}=\vec{b}$

$\vec{a}.\left(\vec{b}\times\vec{c}\right)-\vec{a}.\vec{b}-\vec{a}.\vec{c}$

Find
Answer: 42

Question: Circle passing through (0,0), (0,1), (1,0) and(2k, 3k). Find the value of k
Answer:

$\Rightarrow K=\frac{5}{13}\text{as}\ K\neq 0$

Question:

$\int_0^1 \frac{1}{\sqrt{3+x}+\sqrt{1+x}}dx=a+b\sqrt{2}+c\sqrt{3},$

then 2a- 3b - 4c is equal to
Options:
(a) 10
(b) 0
(c) 12
(d) 20
Answer: 12

Question: AP_1 : 4, 9, 14 …. Upto 25 terms
AP_2 : 3, 6, 9 …. Upto 37 terms
No. of common terms
Answer: 7

Question: $\sum^{a_1,a_2.....a_{10}} a_i = 50 \sum_{i<i} a_i a_j = 1100$ Find $S.D$

Answer: $\sqrt{5}$

Question: $\lim_{x\to 0}\frac{\sqrt{1+\sqrt{1+x^4}}-\sqrt{2}}{x^4}=a$

Answer: 32

Question: These least positive integral value of ‘a’ such that the vectors ai -2j +2k and ai+ 2aj -2k are having acute angle between them
Answer: 5

Question:

$$f(x) = \begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$S_1 \Rightarrow f(x)f(y) = f(x+y)$

$S_2 \Rightarrow f(-x)$ is inverse of $f(x)$

Answer: S1 and S2 both are true.

Question: If f(x) = x^3 +x^2f'(1) +xf'' (2)+ f'''(3), then find f'(10).
Answer: 202