

**JEE-Mains-15-04-2023 [Memory Based]
[Morning Shift]**

Physics

Question: A has half life of 5 years. Find the amount of A left after 15 years.

Options:

- (a) $\frac{1}{8}$ of initial value
- (b) $\frac{7}{8}$ of initial value
- (c) $\frac{1}{4}$ of initial value
- (d) $\frac{3}{4}$ of initial value

Answer: (a)

Question: A variable force $F = 5kx N$ acts on a body moving along x-axis. Find the work done by this force in displacing the body from $x = 2m$ to $x = 5 m$. (k is a constant)

Options:

- (a) $\left(\frac{205}{2}k\right)J$
- (b) $\left(\frac{105}{2}k\right)J$
- (c) $(52k)J$
- (d) $(51k)J$

Answer: (b)

Question: If de-Broglie wavelength is λ when energy is E, find wavelength at $\frac{E}{4}$ (kinetic energy)

Options:

- (a) 2λ
- (b) $\sqrt{2}\lambda$
- (c) λ
- (d) $\frac{\lambda}{\sqrt{2}}$

Answer: (a)

Question: If position of particle is changing with time as $r = t^2 - 2t(m)$. Find the velocity at $t = 2$ second

Options:

- (a) 2 m/s
- (b) 3 m/s
- (c) 0 m/s
- (d) 4 m/s

Answer: (a)

Question: Height of receiving and transmitting antenna in communication of a signal are 245 m and 180 m respectively. Find the maximum distance between the two antenna for proper communication

Options:

- (a) 104 km
- (b) 208 km
- (c) 52 km
- (d) 96 km

Answer: (a)

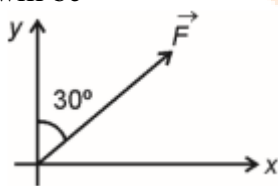
Question: If position vector of a particle is given by $\vec{r}(t) = 8t\hat{i} + 5t^2\hat{j} + 6\hat{k}$, then the correct statement about the acceleration of the particle is

Options:

- (a) It is along positive y-axis
- (b) It is along positive x-axis
- (c) It is equally inclined to x and y-axes
- (d) It is along positive z-axis

Answer: (a)

Question: If y-component of a force acting in x-y plane is $2\sqrt{3}N$. Then the x-component will be

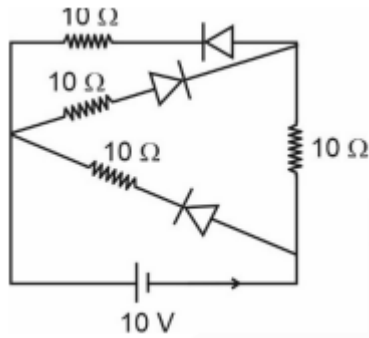


Options:

- (a) $2\sqrt{3}N$
- (b) 2N
- (c) 3N
- (d) $3\sqrt{2}N$

Answer: (b)

Question: Find the value of current passing through battery.



Options:

- (a) 4 A
- (b) 1.5 A
- (c) 0.5 A
- (d) 1 A

Answer: (b)

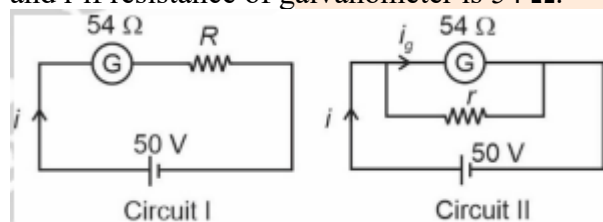
Question: A particle is released from a height equal to radius of earth. Find its velocity when it strikes the ground.

Options:

- (a) \sqrt{gR}
- (b) $\sqrt{\frac{gR}{2}}$
- (c) $\sqrt{2gR}$
- (d) $\sqrt{4gR}$

Answer: (a)

Question: Circuit I is converted to voltmeter after adding resistance R and current in circuit I is 1 mA. Circuit II is converted to ammeter after adding resistance r as shown. If current through battery in circuit II is 10 mA and current through galvanometer is 1 mA, then find R and r if resistance of galvanometer is 54Ω .



Options:

- (a) $R = 49946 \Omega, r = 54 \Omega$
- (b) $R = 6 \Omega, r = 49946 \Omega$
- (c) $R = 49946 \Omega, r = 49946 \Omega$
- (d) $R = 49946 \Omega, r = 6 \Omega$

Answer: (d)

Question: Match the List – I with List – II and choose the correct option.

	List – I		List – II
A.	Micro-wave	(p)	400 nm – 1 nm
B.	Ultra violet	(q)	1 nm – 1 pm
C.	X-rays	(r)	2.5 μ m – 750 nm
D.	Infrared	(s)	1 mm – 25 μ m

Options:

- (a) $A \rightarrow (s); B \rightarrow (q); C \rightarrow (r); D \rightarrow (p)$
 (b) $A \rightarrow (s); B \rightarrow (p); C \rightarrow (q); D \rightarrow (r)$
 (c) $A \rightarrow (p); B \rightarrow (s); C \rightarrow (q); D \rightarrow (r)$
 (d) $A \rightarrow (r); B \rightarrow (q); C \rightarrow (s); D \rightarrow (p)$

Answer: (b)

Question: In a single slit diffraction experiment $\lambda = 600nm$, if at $\theta = 30^\circ$, first minima is formed then find the value of width of slit (a) in μm .

Options:

- (a) 1.2
 (b) 1.5
 (c) 1
 (d) 1.8

Answer: (a)

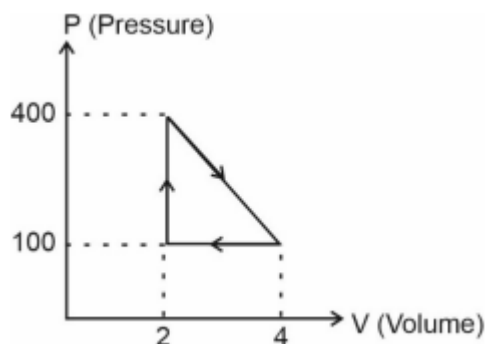
Question: Two identical particles each of mass m , move in circular path due to their own mutual gravitational force. Find the velocity of the particle if the radius of circular path is a .

Options:

- (a) $\sqrt{\frac{4Gm}{a}}$
 (b) $\sqrt{\frac{Gm}{2a}}$
 (c) $\sqrt{\frac{2Gm}{a}}$
 (d) $\sqrt{\frac{Gm}{4a}}$

Answer: (d)

Question: Calculate the work done by the cyclic process given in indicator diagram (Assume all values in S.I. unit)

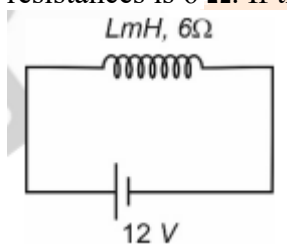


Options:

- (a) 300
- (b) - 300
- (c) 600
- (d) - 600

Answer: (a)

Question: In given L-R circuit connected with a D.C source of 12V, inductance is L mH and resistances is $6\ \Omega$. If the emf induced in the inductor at $t = 1$ mS is 10V, value of L is



Options:

- (a) $\frac{3}{\ln(1.2)}$
- (b) $\frac{6}{\ln(1.2)}$
- (c) $\frac{3}{\ln(1.8)}$
- (d) $\frac{6}{\ln(2.4)}$

Answer: (b)

Question: In a linear SHM,

- A. acceleration is maximum at mean position,
- B. velocity is maximum at extreme position,
- C. acceleration is maximum at extreme position,
- D. velocity is maximum at mean position.

Options:

- (a) B, C and D are correct
- (b) A and D are correct
- (c) A and B are correct
- (d) C and D are correct

Answer: (d)

Question: Statement-I: In a series combination of resistor, equivalent resistance is smaller than the individual resistance.

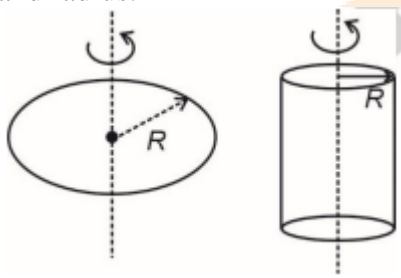
Statement-II: Resistivity of wire depends on the temperature.

Options:

- (a) Statement-I is true, statement-II is false
- (b) Statement-I is false, statement-II is true
- (c) Both statement-I and statement-II are true
- (d) Both statement-I and statement-II are false

Answer: (b)

Question: Find radius of gyration of solid sphere and solid cylinder, both having same mass and radius.



Options:

- (a) $\frac{2}{\sqrt{5}}$
- (b) $\frac{\sqrt{5}}{2}$
- (c) $\frac{\sqrt{2}}{\sqrt{5}}$
- (d) $\frac{2}{\sqrt{3}}$

Answer: (a)

Question: In sonometer experiment, string of mass 18 g having linear mass density 20 g/m oscillates in fundamental mode of frequency 50 Hz. Find the velocity of transverse waves in the string.

Options:

- (a) 70 m/s
- (b) 60 m/s
- (c) 90 m/s
- (d) 110 m/s

Answer: (c)

Question: Velocity of is defined as $v = \lambda^a g^b \rho^c$, where ρ is density of water, λ is wavelength and g is acceleration due to gravity.

Find the value of a, b and c in order (a, b, c)

Options:

(a) $\left(\frac{1}{2}, \frac{1}{2}, 0\right)$

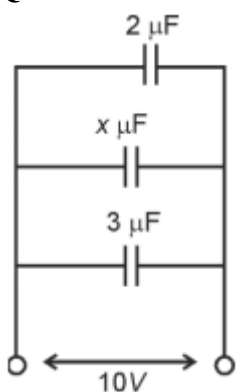
(b) $\left(1, \frac{1}{2}, 0\right)$

(c) $\left(\frac{1}{2}, 1, 0\right)$

(d) $(1, 1, 0)$

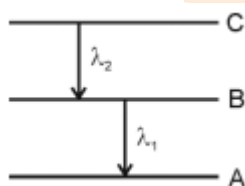
Answer: (a)

Question: If total charge stored in capacitors is equal to $50\mu C$, then $x = ?$



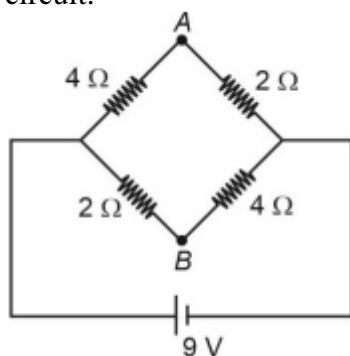
Answer: ($x = 0$)

Question: In the given transition states, A, B and C are first, second and third excited states respectively then $\frac{\lambda_1}{\lambda_2} = \frac{7}{4n}$, find the value of n



Answer: 5.00

Question: Find the magnitude of potential difference in volt between A and B in given circuit.



Answer: 3.00

Question: The refractive index of equilateral prism is $\mu = \sqrt{2}$, then find its minimum angle of deviation in degree.

Answer: 30.00

Question: Electric field due to a dipole at an equatorial point depends upon r^{-n} . Value of n is

Answer: 3.00



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Chemistry

Question: In which of the following cities, photochemical smog formed is minimum?

Options:

- (a) Kashmir
- (b) New Delhi
- (c) Hyderabad
- (d) Kolkata

Answer: (a)

Question: Number of P – O – P bonds in H_3PO_4 , P_4O_{10} and $(HPO_3)_3$ are (respectively)

Options:

- (a) 0, 6, 3
- (b) 6, 3, 0
- (c) 1, 4, 3
- (d) 0, 5, 4

Answer: (a)

Question: S-1: According to Bohr's model, angular momentum is quantised for stationary orbits.

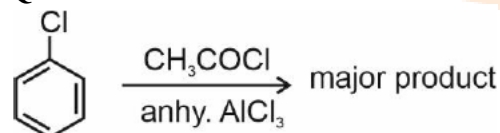
S-2: Bohr's Model doesn't follow Heisenberg's uncertainty principle.

Options:

- (a) Both S-1 and S-2 are true
- (b) S-1 is true and S-2 is false
- (c) S-1 is false and S-2 is true
- (d) Both S-1 and S-2 are false

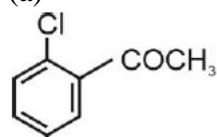
Answer: (a)

Question: Consider the reaction :

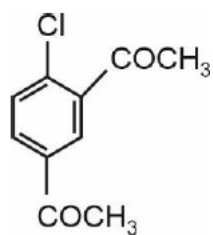


Options:

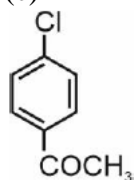
(a)



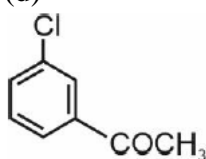
(b)



(c)



(d)



Answer: (c)

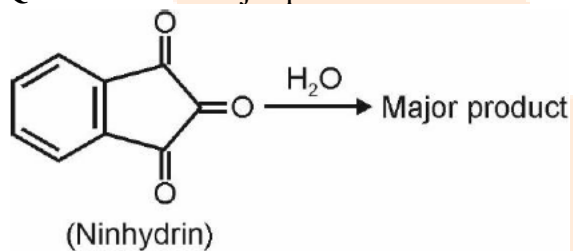
Question: Calculate ratio of radii of 2nd & 3rd Bohr's orbit of H-atom.

Options:

- (a) 2 : 3
- (b) 3 : 2
- (c) 4 : 9
- (d) 9 : 4

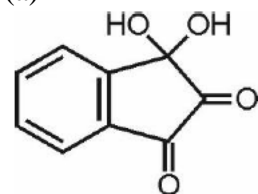
Answer: (c)

Question: The major product formed in the following reaction is

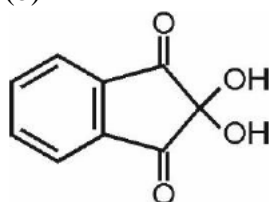


Options:

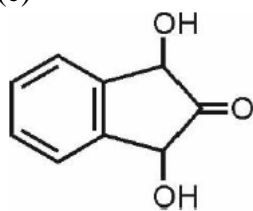
(a)



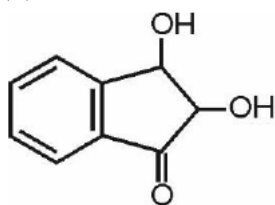
(b)



(c)

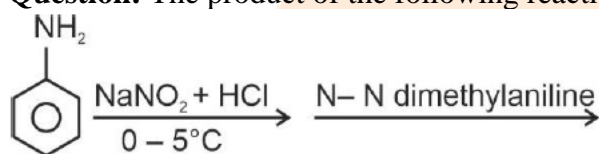


(d)



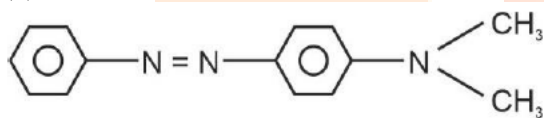
Answer: (b)

Question: The product of the following reaction is:

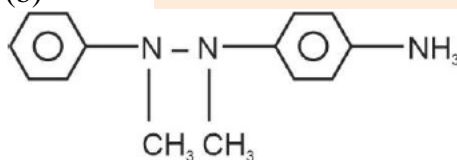


Options:

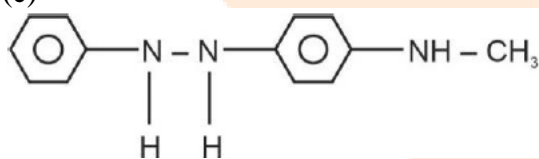
(a)



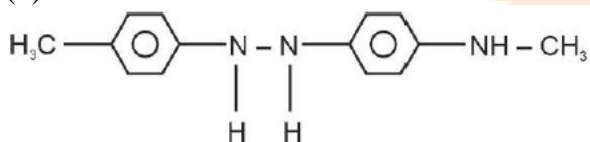
(b)



(c)

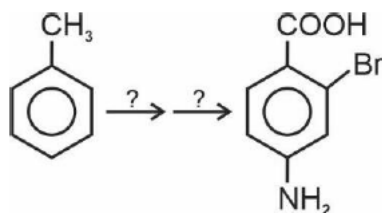


(d)



Answer: (a)

Question:



Options:

- (a) (i) $\text{HNO}_3/\text{H}_2\text{SO}_4$, (ii) $\text{Br}_2/\text{AlCl}_3$, (iii) KMnO_4/H^+
 (b) (i) $\text{HNO}_3/\text{H}_2\text{SO}_4$, (ii) $\text{Br}_2/\text{AlCl}_3$, (iii) $\text{Fe}/\text{steam} + \text{HCl}$, (iv) KMnO_4/H^+
 (c) (i) $\text{Br}_2/\text{AlCl}_3$, (ii) $\text{HNO}_3/\text{H}_2\text{SO}_4$, (iii) KMnO_4/H^+ , (iv) $\text{Fe}/\text{steam} + \text{HCl}$
 (d) (i) $\text{HNO}_3/\text{H}_2\text{SO}_4$, (ii) $\text{Br}_2/\text{AlCl}_3$, (iii) KMnO_4/H^+ , (iv) $\text{Fe}/\text{steam} + \text{HCl}$

Answer: (d)

Question: Out of the following which has maximum CFSE? (Consider with sign)

Options:

- (a) $\text{Fe}(\text{H}_2\text{O})_6^{3+}$
 (b) $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$
 (c) $[\text{Mn}(\text{H}_2\text{O})_6]^{3+}$
 (d) $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$

Answer: (a)

Question: In CsCl crystal, which of the following relations is true?

Options:

- (a) $r_{\text{Cs}^{\oplus}} + r_{\text{Cl}^{\ominus}} = \frac{\sqrt{3}a}{2}$
 (b) $r_{\text{Cs}^{\oplus}} + r_{\text{Cl}^{\ominus}} = \frac{a}{\sqrt{2}}$
 (c) $r_{\text{Cs}^{\oplus}} + r_{\text{Cl}^{\ominus}} = \frac{a}{2}$
 (d) $r_{\text{Cs}^{\oplus}} + r_{\text{Cl}^{\ominus}} = \frac{\sqrt{3}}{\sqrt{2}}a$

Answer: (a)

Question: Match the following.

Column I (Monomer unit)	Column-II (Polymer)
(a) Acrylonitrile	(i) Orlon
(b) Tetra-Fluoroethene	(ii) Natural Rubber
(c) Caprolactam	(iii) Teflon
(d) Isoprene	(iv) Nylon-6

Options:

- (a) a \rightarrow (i); b \rightarrow (ii); c \rightarrow (iii); d \rightarrow (iv)
 (b) a \rightarrow (i); b \rightarrow (iii); c \rightarrow (iv); d \rightarrow (ii)
 (c) a \rightarrow (ii); b \rightarrow (iv); c \rightarrow (iii); d \rightarrow (i)
 (d) a \rightarrow (iii); b \rightarrow (ii); c \rightarrow (iv); d \rightarrow (i)

Answer: (b)

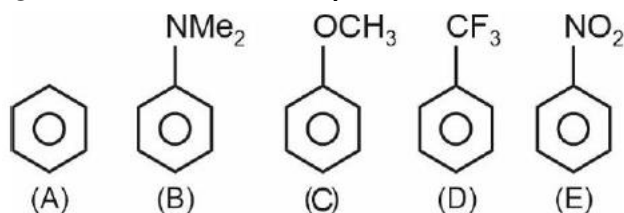
Question: In which of the following is not an example of calcination?

Options:

- (a) $\text{PbS} + \text{O}_2 \rightarrow \text{PbO} + \text{SO}_2$
 (b) $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$
 (c) $\text{MgCO}_3 \xrightarrow{\Delta} \text{MgO} + \text{CO}_2$
 (d) $\text{ZnCO}_3 \rightarrow \text{ZnO} + \text{CO}_2$

Answer: (a)

Question: Rate of electrophilic aromatic substitution.



Options:

- (a) $\text{B} > \text{C} > \text{A} > \text{D} > \text{E}$
 (b) $\text{A} > \text{B} > \text{C} > \text{D} > \text{E}$
 (c) $\text{E} > \text{D} > \text{C} > \text{B} > \text{A}$
 (d) $\text{A} > \text{B} > \text{D} > \text{C} > \text{E}$

Answer: (a)

Question: Identify the stationary phase (S) and mobile phase (M) in paper chromatography.

Options:

- (a) S : Solvent, M : Chromatography paper
 (b) S : Solvent, M : Water
 (c) S : Water, M : Solvent
 (d) S : Chromatography paper, M : Solvent

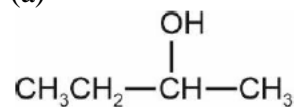
Answer: (d)

Question: $\text{CH}_3\text{CH}=\text{CH}_2 \xrightarrow[\text{(2)PCC, (3)CH}_3\text{MgBr, (4)H}_2\text{O}]{\text{(1)BH}_3/\text{THF, H}_2\text{O}_2/\text{NaOH}}$ Product

The product is

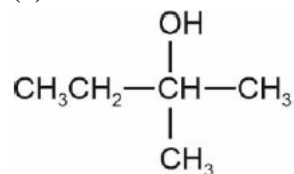
Options:

(a)



(b) $\text{CH}_3\text{CH}_2\text{COOH}$

(c)



(d) $\text{CH}_3-\text{CH}_2\text{CHO}$

Answer: (a)

Question: The ratio of silica to alumina in cement is

Options:

- (a) 5.5
- (b) 2
- (c) 3
- (d) 1.5

Answer: (c)

Question: Statement I: pH of 10^{-8} M HCl is 8 at 25°C

Statement II: Titration of weak acid & strong base at Half equivalence point gives $\text{pH} = \frac{\text{pKa}}{2}$

Options:

- (a) Statement I is correct and Statement II is correct
- (b) Statement I and II both are incorrect
- (c) Statement I is incorrect and Statement II incorrect
- (d) Statement I is correct and Statement II is incorrect

Answer: (b)

Question: Assertion A: MgCl_2 and BeCl_2 gives flame test

Reason R: Ionization energy of Be and Mg is high

Options:

- (a) A is incorrect but R is correct
- (b) A is incorrect and R is also incorrect
- (c) A is correct, R is correct and R is correct explanation of A
- (d) A is correct, R is correct, R is not the correct explanation of A

Answer: (a)

Question: How many of the following statements are correct.

- (1) Conductivity (K) decreases with increase in dilution for both strong & weak electrolyte
- (2) Molar conductivity increases with increase in dilution for both strong and weak electrolyte
- (3) Molar conductivity increases with increase in ' α ' for weak electrolyte.
- (4) Change in molar conductivity is same for both strong and weak electrolyte with increase in dilution.

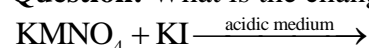
Answer: 3

Question: Lowering of vapour pressure of 30% of aqueous solution of glucose. (in mm Hg)

$P_{\text{H}_2\text{O}} = 760$ mm of Hg

Answer: 729

Question: What is the change in oxidation state of Mn in the reaction



Answer: 5

Question: How many of the following have 10 electrons?

- (i) O^{2-} (ii) O

(iii) Al^{3+} (iv) Al
(v) F (vi) F^-
(vii) Mg^{2+} (viii) Mg
(ix) N^{3-}

Answer: 5

Question: Oxidation state of Cr in chromyl chloride is

Answer: 6

Question: For a radioactive decay $t_{1/2} = 15$ years. What will be the rate constant (yr^{-1})?

Answer: 0.05



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[Morning Shift]**

Mathematics

Question: There are 5 black and 3 white balls in a bag. A die is rolled, we need to pick the number of balls appearing on a die. The probability that all balls are white is

Options:

- (a) $\frac{1}{12}$
- (b) $\frac{1}{18}$
- (c) $\frac{2}{9}$
- (d) $\frac{1}{2}$

Answer: (a)

Question: The mean and variance of 15 observations is 20 and 64, respectively. If 55 is wrongly read as 40 as one of the observation, then the correct variance is _____.

Options:

- (a) $\frac{243}{3}$
- (b) $\frac{167}{2}$
- (c) $\frac{247}{3}$
- (d) 96

Answer: (c)

Question: Matrix A having order m has the value of its determinant as $(m)^{-n}$. The value of $\det(n \operatorname{adj}(\operatorname{adj}(mA)))$ is

Options:

- (a) $n^m (m^{m-n})^{(m-1)^2}$
- (b) $n^m (m^{m-n})^{(m-1)}$
- (c) $m^n (m^{m-n})$

(d) $n^m (m^{n-m})^2$

Answer: (a)

Question: The orthocentre of a triangle having vertices as $A(1,2), B(3,-4), C(0,6)$ is

Options:

(a) $(-129, -37)$

(b) $(9, -1)$

(c) $(7, -3)$

(d) $(28, -16)$

Answer: (a)

Question: The statement $p \wedge (q \wedge \sim (p \wedge q))$ is

Options:

(a) Tautology

(b) Fallacy

(c) Is equivalent to $p \wedge q$

(d) Is equivalent to $p \vee q$

Answer: (b)

Question: If we have a ATM pin of 4 digit. The Sum of first two digits is equal to sum of last two digits and the greatest integer used is 7. Then the number of trials used to get the pin if all digits are different

Options:

(a) 194

(b) 192

(c) 200

(d) 220

Answer: (b)

Question: 3 points $A(1,1,1), B(-2,3,2)$ and $C(0,3,0)$ lie on a plane. Line $\frac{x-1}{-2} = \frac{y+2}{-1} = \frac{z}{4}$ intersects the plane at P . The distance OP is (O is origin) _____.

Options:

(a) $\sqrt{349}$

(b) $\sqrt{231}$

(c) $\sqrt{341}$

(d) $\sqrt{168}$

Answer: (c)

Question: $A(5, -3), C(7, 8)$ and $B(t, 0), 0 \leq t \leq 4$. The perimeter is maximum at $t = \alpha$ and minimum at $t = \beta$, then $\alpha^2 + \beta^2$ is

Options:

- (a) 12
- (b) 9
- (c) 16
- (d) 25

Answer: (c)

Question: Consider the circles $x^2 + y^2 - 13x - 15y + 13 = 0$ and $x^2 + y^2 - 6x - 6y - 7 = 0$, then number of common tangents is

Options:

- (a) 2
- (b) 0
- (c) 1
- (d) 4

Answer: (a)

Question: $f(x) = \int \frac{dx}{\sqrt{4-3x^2}(4x^2+3)}$, then $f(x) =$

Options:

(a) $-\frac{1}{25} \left(\frac{\log\left(\frac{4}{x^2}-3\right) - \log\left(\frac{12}{x^2}+16\right)}{2} \right) + c$

(b) $\frac{1}{25} \left(\frac{\log(4-x^2) - \log(x^2-16)}{4} \right)$

(c) $-\frac{1}{25} \left[\log(4-3x^2) + \log(3x^2-16) \right]$

(d) $-\frac{1}{25} \left(\frac{\log(4-3x^2)}{2} + \frac{\log(12-16x^2)}{6} \right)$

Answer: (a)

Question: The number of solution of equation $x|x| + 5|x+2| + 6 = 0$ is

Answer: 1.00

Question: Let $f(x) = \log(4x^2 + 11x + 9) + \sin^{-1}(4x + 3) + \cos^{-1}\left(\frac{10x + 6}{3}\right)$ and if domain of $f(x)$ is $[\alpha, \beta]$, then $|10[\alpha - \beta]|$ is

Answer: 4.00

Question: How many three-digit number can be formed which are divisible by 3 using the digits 1, 3, 5, 8 and repetition is allowed.

Answer: 22.00

Question: Area bounded by the curve $2y^2 = 3x$ and the line $x + y = 3$ outside the circle $(x - 3)^2 + y^2 = 2$ and above x -axis is A . Then value of $4(\pi + 4A)$ is

Answer: 42.00

Question: If $n \in [10, 100]$ and $n \in N$, then how many such n are possible where $3^n - 3$ is divisible by 7?

Answer: 15.00

Question: If $y = \max\{\sqrt{x}, x^2 - 4, x^3 + 2\}$, then number of solution(s) of $y = 1$ is/are _____.

Answer: 0.00

Question: Let $A = \{1, 2, 3, 4\}$ if R on a set $A \times A$ such that $(a, b)R(c, d)$ iff $2a + 3b = 6c + 5d$, then number of elements in R is

Answer: 4.00

Question: If $f(x) = \max\{1 + x + [x], x + 1, 1 - x + [x]\}$, $0 \leq x \leq 2$, then number of points where $f(x)$ is non-differentiable is

Answer: 1.00