KCET 2023 Solved Paper

Mathematics

Question 1

If A and B are two matrices such that AB = B and BA = A then $A^2 + B^2$ =

Options:

A. AB

B. 2 BA

C. A + B

D. 2 AB

Answer: C

Solution:

Solution:

Question 2

If A = $\begin{bmatrix} 2-k & 2 \\ 1 & 3-k \end{bmatrix}$ is singular matrix, then the value of $5k - k^2$ is equal to

Options:

A. -4

B. 6

C. 4

D. -6

Answer: C

Solution:

Solution:

Question 3

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The area of a triangle with vertices (−3, 0), (3, 0) and (0, k) is 9 sq. units, the value of k is

Options:

A. 6

B. 3

C. 9

D. −9

Answer: B

Solution:

Solution:

Question 4

If $\Delta = \begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix}$ **and** $\Delta_1 = \begin{vmatrix} 1 & 1 & 1 \\ bc & ca & ab \\ a & b & c \end{vmatrix}$ **then**

Options:

A. $\Delta_1 \neq \Delta$

B. $\Delta_1 = -\Delta$

C. $\Delta_1 = \Delta$

D. $\Delta_1 = 3\Delta$

Answer: B

Solution:

Solution:

Question 5

If $\sin^{-1}\left(\frac{2a}{1+a^2}\right) + \cos^{-1}\left(\frac{1-a^2}{1+a^2}\right) = \tan^{-1}\left(\frac{2x}{1-x^2}\right)$ **where a, x ∈ (0, 1) then the value of x is**

Options:

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A. $\frac{2a}{1+a^2}$

B. $\frac{2a}{1-a^2}$

C. 0

D. $\frac{a}{2}$

Answer: B

Solution:

Solution:

Question 6

The value of $\cot^{-1}\left[\frac{\sqrt{1-\sin x}+\sqrt{1+\sin x}}{\sqrt{1-\sin x}-\sqrt{1+\sin x}}\right]$ where $x \in \left(0, \frac{\pi}{4}\right)$ is

Options:

A. $\pi - \frac{x}{3}$

B. $\pi - \frac{x}{2}$

C. $\frac{x}{2}$

D. $\frac{x}{2} - \pi$

Answer: B

Solution:

Solution:

Question 7

If $x\begin{bmatrix}3\\2\end{bmatrix} + y\begin{bmatrix}1\\-1\end{bmatrix} = \begin{bmatrix}15\\5\end{bmatrix}$ then the value of x and y are

Options:

A. $x = -4, y = -3$

B. $x = -4, y = 3$

C. $x = 4, y = 3$

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D. $x = 4, y = -3$

Answer: C

Solution:

Solution:

Question 8

If the function is $f(x) = \frac{1}{x+2}$, then the point of discontinuity of the composite function $y = f(f(x))$ is

Options:

A. $\frac{2}{5}$

B. $\frac{1}{2}$

C. $\frac{-5}{2}$

D. $\frac{5}{2}$

Answer: C

Solution:

Solution:

Question 9

If $y = a\sin x + b\cos x$, then $y^2 + \left(\frac{dy}{dx}\right)^2$ is a

Options:

A. function of x and y

B. constant

C. function of x

D. function of y

Answer: B

Solution:

Solution:

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Question 10

If $f(x) = 1 + nx + \frac{n(n-1)}{2}x^2 + \frac{n(n-1)(n-2)}{6}x^3 + ... + x^n$ then $f''(1) =$

Options:

A. $n(n-1)2^n$

B. 2^{n-1}

C. $(n-1)2^{n-1}$

D. $n(n-1)2^{n-2}$

Answer: D

Solution:

Solution:

Question 11

If $A = \begin{bmatrix} 1 & \tan\frac{\alpha}{2} \\ -\tan\frac{\alpha}{2} & 1 \end{bmatrix}$ and AB = I then B =

Options:

A. $\cos^2\frac{\alpha}{2}.I$

B. $\sin^2\frac{\alpha}{2}.A$

C. $\cos^2\frac{\alpha}{2} \cdot A^T$

D. $\cos^2\frac{\alpha}{2}.A$

Answer: C

Solution:

Solution:

Question 12

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If $u = \sin^{-1}\left(\frac{2x}{1+x^2}\right)$ and $v = \tan^{-1}\left(\frac{2x}{1-x^2}\right)$ then $\frac{du}{dv}$ is

Options:

A. $\frac{1-x^2}{1+x^2}$

B. 1

C. $\frac{1}{2}$

D. 2

Answer: B

Solution:

Solution:

Question 13

The function f(x) = cot x is discontinuous on every point of the set

Options:

A. $\left\{x = (2n+1)\frac{\pi}{2}; n \in Z\right\}$

B. $\left\{x = \frac{n\pi}{2}; n \in Z\right\}$

C. $\{x = n\pi; n \in Z\}$

D. $\{x = 2n\pi; n \in Z\}$

Answer: C

Solution:

Solution:

Question 14

A particle moves along the curve $\frac{x^2}{16} + \frac{y^2}{4} = 1$. When the rate of change of abscissa is 4 times that of its ordinate, then the quadrant in which the particle lies in

Options:

A. III or IV

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B. II or III

C. I or III

D. II or IV

Answer: D

Solution:

Solution:

Question 15

An enemy fighter jet is flying along the curve given by $y = x^2 + 2$. A solider is placed at (3, 2) wants to shoot down the jet when it is nearest to him. Then the nearest distance is

Options:

A. 2 units

B. $\sqrt{5}$ units

C. $\sqrt{3}$ units

D. $\sqrt{6}$ units

Answer: B

Solution:

Solution:

Question 16

$\int_2^8 \frac{5^{\sqrt{10-x}}}{5^{\sqrt{x}} + 5^{\sqrt{10-x}}} dx =$

Options:

A. 4

B. 3

C. 5

D. 6

Answer: B

Solution:

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Solution:

Question 17

$\int \sqrt{\text{cosec}\, x - \sin x}\, dx =$

Options:

A. $2\sqrt{\sin x} + C$

B. $\frac{2}{\sqrt{\sin x}} + C$

C. $\sqrt{\sin x} + C$

D. $\frac{\sqrt{\sin x}}{2} + C$

Answer: A

Solution:

Solution:

Question 18

If f (x) and g(x) are two functions with $g(x) = x - \frac{1}{x}$ and $fog(x) = x^3 - \frac{1}{x^3}$ then $f'(x) =$

Options:

A. $x^2 - \frac{1}{x^2}$

B. $1 - \frac{1}{x^2}$

C. $3x^2 + 3$

D. $3x^2 + \frac{3}{x^4}$

Answer: C

Solution:

Solution:

Question 19

A circular plate of radius 5 cm is heated. Due to expansion, its radius

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increases at the rate of 0.05 cm / sec. The rate at which its area is increasing when the radius is 5.2 cm is

Options:

A. $5.05\pi cm^2$ / sec

B. $0.52\pi cm^2$ / sec

C. $5.2\pi cm^2$ / sec

D. $27.4\pi cm^2$ / sec

Answer: B

Solution:

Solution:

Question 20

The distance ' s ' in meters travelled by a particle in ' t ' seconds is given by s = $\frac{2t^3}{3}$ − 18t + $\frac{5}{3}$. The acceleration when the particle comes to rest is

Options:

A. $12m^2$ / sec

B. $18m^2$ / sec

C. $3m^2$ / sec

D. $10m^2$ / sec

Answer: A

Solution:

Solution:

Question 21

$\int_0^{\pi} \frac{x \tan x}{\sec x \cdot \operatorname{cosec} x} dx$ =

Options:

A. π / 2

B. π^2 / 2

C. π / 4

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D. $\pi^2 / 4$

Answer: D

Solution:

Solution:

Question 22

$$\int \sqrt{5 - 2x + x^2}\, dx =$$

Options:

A. $\frac{x-1}{2}\sqrt{5 + 2x + x^2} + 2\log\left|(x-1) + \sqrt{5 + 2x + x^2}\right| + C$

B. $\frac{x-1}{2}\sqrt{5 - 2x + x^2} + 2\log\left|(x-1) + \sqrt{5 - 2x + x^2}\right| + C$

C. $\frac{x-1}{2}\sqrt{5 - 2x + x^2} + 2\log\left|(x+1) + \sqrt{x^2 + 2x + 5}\right| + C$

D. $\frac{x}{2}\sqrt{5 - 2x + x^2} + 4\log\left|(x+1) + \sqrt{x^2 - 2x + 5}\right| + C$

Answer: B

Solution:

Solution:

Question 23

$$\int \frac{1}{1 + 3\sin^2 x + 8\cos^2 x}\, dx =$$

Options:

A. $\frac{1}{6}\tan^{-1}\left(\frac{2\tan x}{3}\right) + C$

B. $6\tan^{-1}\left(\frac{2\tan x}{3}\right) + C$

C. $\frac{1}{6}\tan^{-1}(2\tan x) + C$

D. $\tan^{-1}\left(\frac{2\tan x}{3}\right) + C$

Answer: A

Solution:

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Solution:

Question 24

$$\int_{-2}^{0} (x^3 + 3x^2 + 3x + 3 + (x + 1)\cos(x + 1))\,dx =$$

Options:

A. 4

B. 1

C. 0

D. 3

Answer: A

Solution:

Solution:

Question 25

The degree of the differential equation

$$1 + \left(\frac{dy}{dx}\right)^2 + \left(\frac{d^2y}{dx^2}\right)^2 = \sqrt[3]{\frac{d^2y}{dx^2} + 1}$$ **is**

Options:

A. 1

B. 2

C. 6

D. 3

Answer: C

Solution:

Solution:

Question 26

If $\left|\vec{a} + \vec{b}\right| = \left|\vec{a} - \vec{b}\right|$ **then**

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Options:

A. $\vec{a}$ and $\vec{b}$ are coincident

B. Inclined to each other at 60°

C. $\vec{a}$ and $\vec{b}$ are perpendicular

D. $\vec{a}$ and $\vec{b}$ are parallel

Answer: C

Solution:

Solution:

Question 27

The component of $\hat{i}$ in the direction of the vector $\hat{i} + \hat{j} + 2\hat{k}$ is

Options:

A. $6\sqrt{6}$

B. $\frac{\sqrt{6}}{6}$

C. $\sqrt{6}$

D. 6

Answer: B

Solution:

Solution:

Question 28

In the interval (0, π / 2), area lying between the curves y = tan x and y = cot x and the X-axis is

Options:

A. $4 \log 2$ sq. units

B. $\log 2$ sq. units

C. $3 \log 2$ sq. units

D. $2 \log 2$ sq. units

Answer: B

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Solution:

Solution:

Question 29

The area of the region bounded by the line y = x + 1, and the lines x = 3 and x = 5 is

Options:

A. $\frac{11}{2}$ sq. units

B. 7 sq. units

C. 10 sq. units

D. $\frac{7}{2}$ sq. units

Answer: C

Solution:

Solution:

Question 30

If the curve passes through the point (1, 1) and at any point (x, y) on the curve, the product of the slope of its tangent and x co-ordinate of the point is equal to the y co-ordinate of the point, then the curve also passes through the point

Options:

A. $(-1, 2)$

B. $(\sqrt{3}, 0)$

C. (2, 2)

D. (3, 0)

Answer: C

Solution:

Solution:

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Question 31

The length of perpendicular drawn from the point (3, −1, 11) to the line $\frac{x}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ is

Options:

A. $\sqrt{33}$

B. $\sqrt{53}$

C. $\sqrt{66}$

D. $\sqrt{29}$

Answer: B

Solution:

Solution:

Question 32

The equation of the plane through the points (2, 1, 0), (3, 2, −2) and (3, 1, 7) is

Options:

A. $6x - 3y + 2z - 7 = 0$

B. $7x - 9y - z - 5 = 0$

C. $3x - 2y + 6z - 27 = 0$

D. $2x - 3y + 4z - 27 = 0$

Answer: B

Solution:

Solution:

Question 33

The point of intersection of the line $x + 1 = \frac{y+3}{3} = \frac{-z+2}{2}$ with the plane $3x + 4y + 5z = 10$ is

Options:

A. (2, 6, −4)

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B. (2, 6, 4)

C. (−2, 6, −4)

D. (2, −6, −4)

Answer: A

Solution:

Solution:

Question 34

If (2, 3, −1) is the foot of the perpendicular from (4, 2, 1) to a plane, then the equation of the plane is

Options:

A. $2x - y + 2z = 0$

B. $2x + y + 2z - 5 = 0$

C. $2x - y + 2z + 1 = 0$

D. $2x + y + 2z - 1 = 0$

Answer: C

Solution:

Solution:

Question 35

$\left|\vec{a} \times \vec{b}\right|^2 + \left|\vec{a} \cdot \vec{b}\right|^2 = 144$ and $\left|\vec{a}\right| = 4$ then $\left|\vec{b}\right|$ is equal to

Options:

A. 8

B. 4

C. 12

D. 3

Answer: D

Solution:

Solution:

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Question 36

If $\vec{a} + 2\vec{b} + 3\vec{c} = 0$ and $(\vec{a} \times \vec{b}) + (\vec{b} \times \vec{c}) + (\vec{c} \times \vec{a}) = \lambda(\vec{b} \times \vec{c})$ then the value of λ is equal to

Options:

A. 4

B. 6

C. 2

D. 3

Answer: B

Solution:

Solution:

Question 37

If a line makes an angle of $\frac{\pi}{3}$ with each X and Y axis then the acute angle made by Z-axis is

Options:

A. $\frac{\pi}{2}$

B. $\frac{\pi}{4}$

C. $\frac{\pi}{6}$

D. $\frac{\pi}{3}$

Answer: B

Solution:

Solution:

Question 38

Let A = {x, y, z, u} and B = {a, b}. A function f : A → B is selected randomly. The probability that the function is an onto function is

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Options:

A. $\frac{5}{8}$

B. $\frac{1}{35}$

C. $\frac{7}{8}$

D. $\frac{1}{8}$

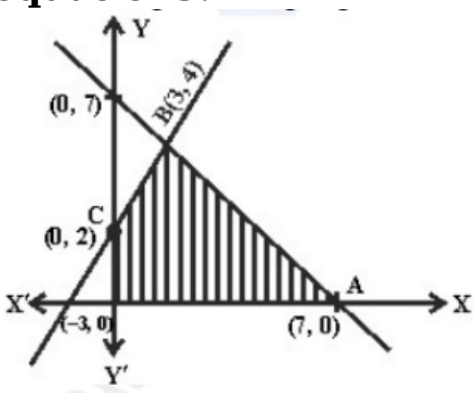
Answer: B

Solution:

Solution:

Question 39

The shaded region in the figure given in the solution of which of the in equations?



Options:

A. $x + y \geq 7, 2x - 3y + 6 \geq 0, x \geq 0, y \geq 0$

B. $x + y \leq 7, 2x - 3y + 6 \leq 0, x \geq 0, y \geq 0$

C. $x + y \leq 7, 2x - 3y + 6 \geq 0, x \geq 0, y \geq 0$

D. $x + y \geq 7, 2x - 3y + 6 \leq 0, x \geq 0, y \geq 0$

Answer: C

Solution:

Solution:

Question 40

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If A and B are events such that P(A) = $\frac{1}{4}$, P(A / B) = $\frac{1}{2}$ and P(B / A) = $\frac{2}{3}$ then P(B) is

Options:

A. $\frac{2}{3}$

B. $\frac{1}{2}$

C. $\frac{1}{6}$

D. $\frac{1}{3}$

Answer: D

Solution:

Solution:

Question 41

A bag contains 2n + 1 coins. It is known that n of these coins have head on both sides whereas the other n + 1 coins are fair. One coin is selected at random and tossed. If the probability that toss results in heads is $\frac{31}{42}$, then the value of n is

Options:

A. 8

B. 10

C. 5

D. 6

Answer: B

Solution:

Solution:

Question 42

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The value of $\begin{vmatrix} \sin^2 14^\circ & \sin^2 66^\circ & \tan 135^\circ \\ \sin^2 66^\circ & \tan 135^\circ & \sin^2 14^\circ \\ \tan 135^\circ & \sin^2 14^\circ & \sin^2 66^\circ \end{vmatrix}$ **is**

Options:

A. 1

B. 2

C. -1

D. 0

Answer: D

Solution:

Solution:

Question 43

The modulus of the complex number $\frac{(1+i)^2(1+3i)}{(2-6i)(2-2i)}$ **is**

Options:

A. $\frac{1}{\sqrt{2}}$

B. $\frac{\sqrt{2}}{4}$

C. $\frac{4}{\sqrt{2}}$

D. $\frac{2}{\sqrt{2}}$

Answer: B

Solution:

Solution:

Question 44

Given that a, b and x are real numbers and a < b, x < 0 then

Options:

A. $\frac{a}{x} < \frac{b}{x}$

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B. $\frac{a}{x} \leq \frac{b}{x}$

C. $\frac{a}{x} > \frac{b}{x}$

D. $\frac{a}{x} \geq \frac{b}{x}$

Answer: C

Solution:

Solution:

Question 45

Ten chairs are numbered as 1 to 10 Three women and two men wish to occupy one chair each. First the women choose the chairs marked 1 to 6 , then the men choose the chairs from the remaining. The number of possible ways is

Options:

A. ${}^{6}C_{3} \times {}^{4}P_{2}$

B. ${}^{6}P_{3} \times {}^{4}C_{2}$

C. ${}^{6}C_{3} \times {}^{4}C_{2}$

D. ${}^{6}P_{3} \times {}^{4}P_{2}$

Answer: D

Solution:

Solution:

Question 46

Which of the following is an empty set?

Options:

A. $\{x : x^2 - 9 = 0, x \in R\}$

B. $\{x : x^2 = x + 2, x \in R\}$

C. $\{x : x^2 - 1 = 0, x \in R\}$

D. $\{x : x^2 + 1 = 0, x \in R\}$

Answer: D

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Solution:

Solution:

Question 47

If f(x) = ax + b, where a and b are integers, f(−1) = −5 and f(3) = 3 then a and b are respectively

Options:

A. 0, 2

B. 2, 3

C. −3, −1

D. 2, −3

Answer: D

Solution:

Solution:

Question 48

The value of $e^{\log_{10}\tan 10^\circ + \log_{80}\tan 22^2 + \log_{10}\tan 3^9 + \ldots + \log_{10}\tan 89^\circ}$ is

Options:

A. $\frac{1}{e}$

B. 1

C. 0

D. 3

Answer: B

Solution:

Solution:

Question 49

A line passes through (2, 2) and is perpendicular to the line 3x + y = 3.

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Its y-intercept is

Options:

A. 1

B. $\frac{4}{3}$

C. $\frac{1}{3}$

D. $\frac{2}{3}$

Answer: B

Solution:

Solution:

Question 50

The distance between the foci of a hyperbola is 16 and its eccentricity is $\sqrt{2}$. Its equation is

Options:

A. $2x^2 - 3y^2 = 7$

B. $y^2 - x^2 = 32$

C. $x^2 - y^2 = 32$

D. $\frac{x^2}{4} - \frac{y^2}{9} = 1$

Answer: B

Solution:

Solution:

Question 51

If $\lim_{x \to 0} \frac{\sin(2+x) - \sin(2-x)}{x} = A\cos B$, then the values of A and B respectively are

Options:

A. 2, 1

B. 1, 1

C. 2, 2

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D. 1, 2

Answer: C

Solution:

Solution:

Question 52

If n is even and the middle term in the expansion of $\left(x^2 + \frac{1}{x}\right)^n$ is $924x^6$, then n is equal to

Options:

A. 12

B. 8

C. 10

D. 14

Answer: A

Solution:

Solution:

Question 53

n^{th} term of the series $1 + \frac{3}{7} + \frac{5}{7^2} + \frac{1}{7^2} + \ldots$ is

Options:

A. $\frac{2n-1}{7^n}$

B. $\frac{2n+1}{7^{n-1}}$

C. $\frac{2n-1}{7^{n-1}}$

D. $\frac{2n+1}{7^n}$

Answer: C

Solution:

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Solution:

Question 54

If $p\left(\frac{1}{q}+\frac{1}{r}\right), q\left(\frac{1}{r}+\frac{1}{p}\right), r\left(\frac{1}{p}+\frac{1}{q}\right)$ are in A.P., then p, q, r

Options:

A. are in A.P.

B. are not in G.P.

C. are not in A.P.

D. are in G.P.

Answer: A

Solution:

Solution:

Question 55

Let f : R → R be defined by $f(x) = 3x^2 - 5$ and g : R → R by $g(x) = \frac{x}{x^2+1}$ then gof is

Options:

A. $\frac{3x^2}{x^4+2x^2-4}$

B. $\frac{3x^2}{9x^4+30x^2-2}$

C. $\frac{3x^2-5}{9x^4-30x^2+26}$

D. $\frac{3x^2-5}{9x^4-6x^2+26}$

Answer: C

Solution:

Solution:

Question 56

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Let the relation R be defined in N by aRb if 3a + 2b = 27 then R is

Options:

A. {(1, 12), (3, 9), (5, 6), (7, 3), (9, 0)}

B. {(2, 1), (9, 3), (6, 5), (3, 7)}

C. {(1, 12), (3, 9), (5, 6), (7, 3)}

D. $\left\{ \left(0, \frac{27}{2}\right), (1, 12), (3, 9), (5, 6), (7, 3) \right\}$

Answer: C

Solution:

Solution:

Question 57

Let f (x) = sin 2x + cos 2 x and g(x) = x^2 − 1, then g(f (x)) is invertible in the domain

Options:

A. $x \in \left[\frac{-\pi}{2}, \frac{\pi}{2} \right]$

B. $x \in \left[0, \frac{\pi}{4}\right]$

C. $x \in \left[\frac{-\pi}{4}, \frac{\pi}{4} \right]$

D. $x \in \left[\frac{-\pi}{8}, \frac{\pi}{8} \right]$

Answer: D

Solution:

Solution:

Question 58

The contrapositive of the statement
"If two lines do not intersect in the same plane then they are parallel." is

Options:

A. If two lines are not parallel then they do not intersect in the same plane

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B. If two lines are parallel then they do not intersect in the same plane.

C. If two lines are not parallel then they intersect in the same plane

D. If two lines are parallel then they intersect in the same plane

Answer: C

Solution:

Solution:

Question 59

The mean of 100 observations is 50 and their standard deviation is 5 . Then the sum of squares of all observations is

Options:

A. 250000

B. 255000

C. 50000

D. 252500

Answer: D

Solution:

Solution:

Question 60

$f : R \to R$ and $g : [0, \infty) \to R$ are defined by $f(x) = x^2$ and $g(x) = \sqrt{x}$. Which one of the following is not true?

Options:

A. $(f \circ g)(2) = 2$

B. $(gof)(-2) = 2$

C. $(gof)(4) = 4$

D. $(fog)(-4) = 4$

Answer: D

Solution:

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Solution:

Physics

Question 1

The torque acting on a magnetic dipole placed in uniform magnetic field is zero, when the angle between the dipole axis and the magnetic field is .....

Options:

A. 60°

B. 90°

C. Zero

D. 45°

Answer: C

Solution:

Solution:

Question 2

The horizontal component of Earth's magnetic field at a place is 3×10^{-5}T. If the dip at that place is 45°, the resultant magnetic field at that place is

Options:

A. $\frac{3}{2}\sqrt{3} \times 10^{-5}$T

B. $3\sqrt{2} \times 10^{-5}$T

C. 3×10^{-5}T

D. $\frac{3}{\sqrt{2}} \times 10^{-5}$T

Answer: B

Solution:

Solution:

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Question 3

A proton and an alpha-particle moving with the same velocity enter a uniform magnetic field with their velocities perpendicular to the magnetic field. The ratio of radii of their circular paths is

Options:

A. 4 : 1

B. 1 : 2

C. 2 : 1

D. 1 : 4

Answer: B

Solution:

Solution:

Question 4

A moving coil galvanometer is converted into an ammeter of range 0 to 5 mA. The galvanometer resistance is 90Ω and the shunt resistance has a value of 10Ω. If there are 50 divisions in the galvanometer-turnedammeter on either sides of zero, its current sensitivity is

Options:

A. 2×10^4A / div

B. 1×10^5 div / A

C. 2×10^4 div / A

D. 1×10^5A / div

Answer: B

Solution:

Solution:

Question 5

A positively charged particle of mass m is passed through a velocity selector. It moves horizontally rightward without deviation along the line y = $\frac{2\ mv}{qB}$ with a speed v. The electric field is vertically downwards

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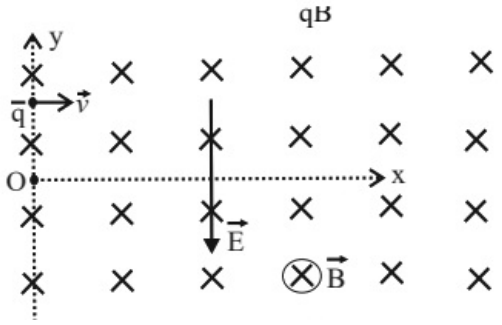
and magnetic field is into the plane of the paper. Now, the electric field is switched off at t = 0. The angular momentum of the charged particle about origin O at t = $\frac{\pi m}{qB}$ is



Options:

A. Zero

B. $\frac{mE^3}{qB^2}$

C. $\frac{mE^2}{qB^3}$

D. $\frac{2mE^2}{qB^3}$

Answer: A

Solution:

Solution:

Question 6

The Curie temperatures of Cobalt and iron are 1400K and 1000K respectively. At T = 1600K, the ratio of magnetic susceptibility of Cobalt to that of iron is

Options:

A. $\frac{7}{5}$

B. $\frac{5}{7}$

C. $\frac{1}{3}$

D. 3

Answer: D

Solution:

Solution:

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Question 7

An ideal transfomer has a turns ratio of 10 . When the primary is connected to 220V, 50 Hz ac source, the power output is

Options:

A. Equal to power input

B. Zero

C. 10 times the power input

D. $\frac{1}{10^{th}}$ the power input

Answer: A

Solution:

Solution:

Question 8

The current in a coil changes from 2A to 5A in 0.3 s. The magnitude of emf induced in the coil is 1.0V. The value of self-inductance of the coil is

Options:

A. 0.1 mH

B. 10 mH

C. 1.0 mH

D. 100 mH

Answer: D

Solution:

Solution:

Question 9

A metallic rod of length 1m held along east-west direction is allowed to fall down freely. Given horizontal component of earth's magnetic field $B_H = 3 \times 10^{-5}$T. The emf induced in the rod at an instant t = 2 s after it

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is released is (Take g = $10ms^{-2}$)

Options:

A. $3 \times 10^{-4}V$

B. $6 \times 10^{-3}V$

C. $6 \times 10^{-4}V$

D. $3 \times 10^{-3}V$

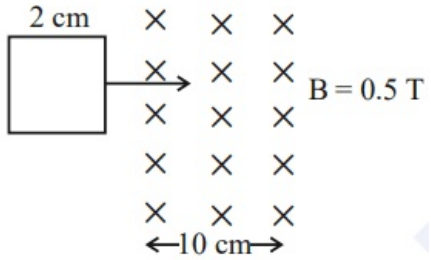
Answer: C

Solution:

Solution:

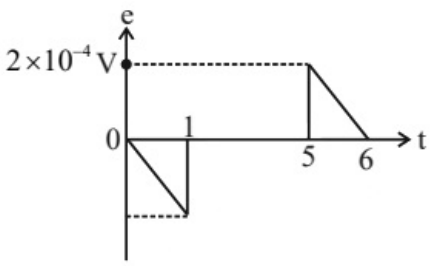
Question 10

A square loop of side 2 cm enters a magnetic field with a constant speed of 2 cm s^{-1} as shown. The front edge enters the field at t = 0 s. Which of the following graph correctly depicts the induced emf in the loop? (Take clockwise direction positive)

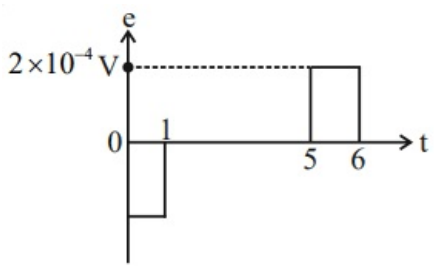


Options:

A.



B.



C.

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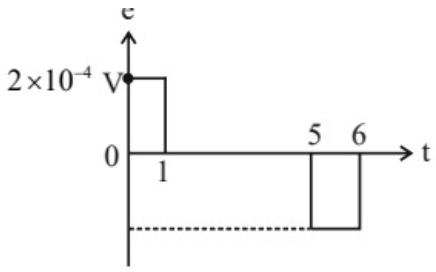
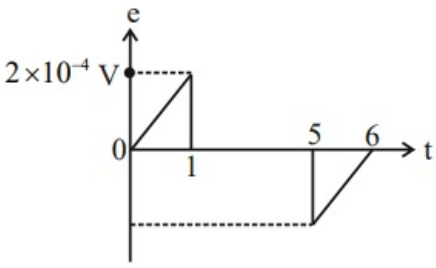


D.



Answer: B

Solution:

Solution:

Question 11

In series LCR circuit at resonance, the phase difference between voltage and current is

Options:

A. $\frac{\pi}{4}$

B. $\frac{\pi}{2}$

C. Zero

D. π

Answer: C

Solution:

Solution:

Question 12

An equiconvex lens made of glass of refractive index $\frac{3}{2}$ has focal length f in air. It is completely immersed in water of refractive index $\frac{4}{3}$. The

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percentage change in the focal length is

Options:

A. 400% decrease

B. 300% increase

C. 400% increase

D. 300% decrease

Answer: B

Solution:

Solution:

Question 13

A point object is moving at a constant speed of $1 ms^{-1}$ along the principal axis of a convex lens of focal length 10 cm. The speed of the image is also $1 ms^{-1}$, when the object is at cm from the optic centre of the lens.

Options:

A. 20

B. 5

C. 10

D. 15

Answer: A

Solution:

Solution:

Question 14

When light propagates through a given homogeneous medium, the velocities of

Options:

A. Primary wavefronts are greater than or equal to those of secondary wavelets.

B. Primary wavefronts and wavelets are equal

C. Primary wavefronts are larger than those of secondary wavelets

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D. Primary wavefronts are lesser than those of secondary wavelets

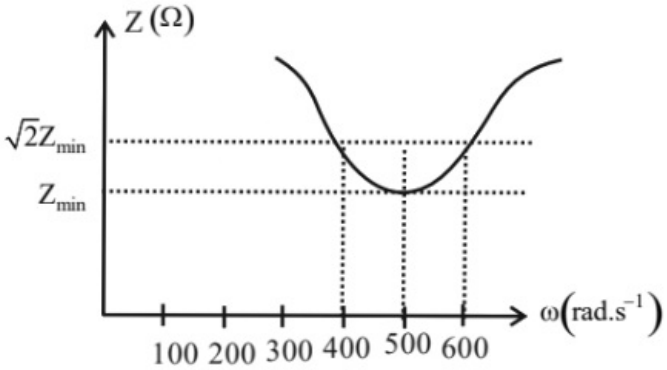
Answer: B

Solution:

Solution:

Question 15

Total impedance of a series LCR circuit varies with angular frequency of the AC source connected to it as shown in the graph. The quality factor Q of the series LCR circuit is



Options:

A. 5

B. 1

C. 0.4

D. 2.5

Answer: D

Solution:

Solution:

Question 16

The ratio of the magnitudes of electric field to the magnetic field of an electromagnetic wave is of the order of

Options:

A. $10^{-5}ms^{-1}$

B. $10^{8}ms^{-1}$

C. $10^{-8}ms^{-1}$

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D. $10^5 ms^{-1}$

Answer: B

Solution:

Solution:

Question 17

For a point object, which of the following always produces virtual image in air?

Options:

A. Convex mirror

B. Biconvex lens

C. Concave mirror

D. Plano-Convex lens

Answer: A

Solution:

Solution:

Question 18

For a given pair of transparent media, the critical angle for which colour is maximum?

Options:

A. Blue

B. Violet

C. Green

D. Red

Answer: D

Solution:

Solution:

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Question 19

In the Rutherford's alpha scattering experiment, as the impact parameter increases, the scattering angle of the alpha particle

Options:

A. Decreases

B. Increases

C. Remains the same

D. Is always 90˚

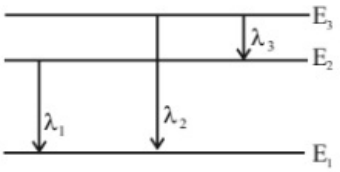
Answer: A

Solution:

Solution:

Question 20

Three energy levels of hydrogen atom and the corresponding wavelength of the emitted radiation due to different electron transition are as shown. Then.



Options:

A. $\lambda_2 = \lambda_1 + \lambda_3$

B. $\lambda_2 = \frac{\lambda_1\lambda_3}{\lambda_1 + \lambda_3}$

C. $\lambda_3 = \frac{\lambda_1\lambda_2}{\lambda_1 + \lambda_2}$

D. $\lambda_1 = \frac{\lambda_2\lambda_3}{\lambda_2 + \lambda_3}$

Answer: B

Solution:

Solution:

Question 21

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An unpolarised light of intensity I is passed through two polaroids kept one after the other with their planes parallel to each other. The intensity of light emerging from second polaroid is $\frac{I}{4}$. The angle between the pass axes of the polaroids is

Options:

A. 60°

B. 30°

C. 45°

D. 0°

Answer: C

Solution:

Solution:

Question 22

In the Young's double slit experiment, the intensity of light passing through each of the two double slits is $2 \times 10^{-2} Wm^{-2}$. The screen-slit distance is very large in comparison with slit-slit distance. The fringe width is β. The distance between the central maximum and a point P on the screen is x = $\frac{\beta}{3}$. Then the total light intensity at that point is

Options:

A. $2 \times 10^{-2} Wm^{-2}$

B. $16 \times 10^{-2} Wm^{-2}$

C. $8 \times 10^{-2} Wm^{-2}$

D. $4 \times 10^{-2} Wm^{-2}$

Answer: A

Solution:

Solution:

Question 23

A 60W source emits monochromatic light of wavelength 662.5 nm. The number of photons emitted per second is

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Options:

A. 5×10^{26}

B. 2×10^{29}

C. 5×10^{17}

D. 2×10^{20}

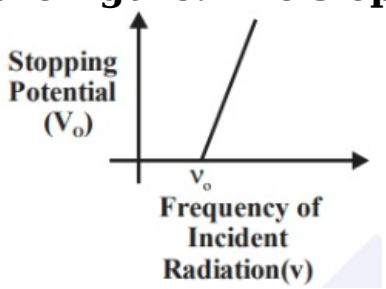
Answer: D

Solution:

Solution:

Question 24

In an experiment to study photo-electric effect the observed variation of stopping potential with frequency of incident radiation is as shown in the figure. The slope and y-intercept are respectively



Options:

A. $\frac{hv}{e}, -\frac{h}{e}$

B. $hv, -hv_0$

C. $\frac{h}{e}, -\frac{hv_0}{e}$

D. $\frac{hv}{e}, v_0$

Answer: C

Solution:

Solution:

Question 25

A full-wave rectifier with diodes D_1 and D_2 is used to rectify 50 Hz alternating voltage. The diode D_1 conducts ..... times in one

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second.

Options:

A. 75

B. 50

C. 100

D. 25

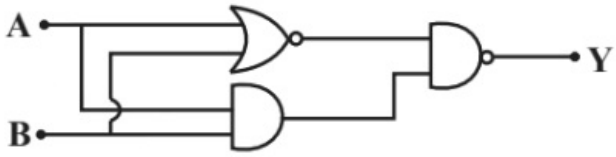
Answer: B

Solution:

Solution:

Question 26

The truth table for the given circuit is



Options:

A.

A	B	Y
1	1	1
1	0	1
0	1	1
0	0	1

B.

A	B	Y
1	1	1
1	0	1
0	1	1
0	0	0

C.

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A	B	Y
1	1	1
1	0	1
0	1	0
0	0	1

D.

A	B	Y
1	1	1
1	0	0
0	1	1
0	0	1

Answer: A

Solution:

Solution:

Question 27

The energy gap of an LED is 2.4 eV. When the LED is switched ' ON ', the momentum of the emitted photons is

Options:

A. $1.28 \times 10^{-11}\,\mathrm{kg \cdot m \cdot s^{-1}}$

B. $0.64 \times 10^{-27}\,\mathrm{kg \cdot m^{-1}}$

C. $1.28 \times 10^{-27}\,\mathrm{kg \cdot m \cdot s^{-1}}$

D. $2.56 \times 10^{-27}\,\mathrm{kg \cdot m \cdot s^{-1}}$

Answer: C

Solution:

Solution:

Question 28

In the following equation representing β^- decay, the number of neutrons in the nucleus X is $_{83}{}^{210}\mathrm{Bi} \rightarrow \mathrm{X} + \mathrm{e}^{-1} + \bar{\nu}$

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Options:

A. 125

B. 84

C. 126

D. 127

Answer: C

Solution:

Solution:

Question 29

A nucleus with mass number 220 initially at rest emits an alpha particle. If the Q value of reaction is 5.5 MeV, calculate the value of kinetic energy of alpha particle.

Options:

A. 7.4 MeV

B. 4.5 MeV

C. 6.5 MeV

D. 5.4 MeV

Answer: D

Solution:

Solution:

Question 30

A radioactive sample has half-life of 3 years. The time required for the activity of the sample to reduce to $\frac{1}{5}$ th of its initial value is about

Options:

A. 15 years

B. 5 years

C. 10 years

D. 7 years

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Answer: D

Solution:

Solution:

Question 31

When a p-n junction diode is in forward bias, which type of charge carriers flows in the connective wire?

Options:

A. Protons

B. Holes

C. Free electrons

D. Ions

Answer: C

Solution:

Solution:

Question 32

A ball of mass 0.2 kg is thrown vertically down from a height of 10m. It collides with the floor and loses 50% of its energy and then rises back to the same height. The value of its initial velocity is

Options:

A. $196ms^{-1}$

B. $20ms^{-1}$

C. Zero

D. $14ms^{-1}$

Answer: D

Solution:

Solution:

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Question 33

The moment of inertia of a rigid body about an axis

Options:

A. Depends on the positions of axis of rotation

B. Does not depend on its size

C. Does not depend on its mass

D. Does not depend on its shape

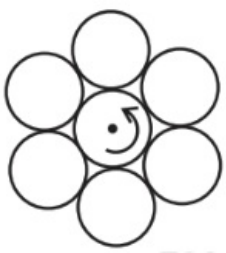
Answer: A

Solution:

Solution:

Question 34

Seven identical discs are arranged in a planar pattern, so as to touch each other as shown in the figure. Each disc has mass ' m ' radius R. What is the moment of inertia of system of six discs about an axis passing through the center of central disc and normal to plane of all discs?



Options:

A. $55\ \frac{mR^2}{2}$

B. $85\ \frac{mR^2}{2}$

C. $27mR^2$

D. $100mR^2$

Answer: A

Solution:

Solution:

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Question 35

The true length of a wire is 3.678 cm. When the length of this wire is measured using instrument A, the length of the wire is 3.5 cm. When the length of the wire is measured using instrument B, it is found to have length 3.38 cm. Then the

Options:

A. Measurement with B is more accurate and precise

B. Measurement with A is more precise while measurement with B is more accurate

C. Measurement with A is more accurate and precise

D. Measurement with A is more accurate while measurement with B is more precise

Answer: D

Solution:

Solution:

Question 36

A body is moving along a straight line with initial velocity v_0. Its acceleration a is constant. After t seconds, its velocity becomes v. The average velocity of the body over the given time interval is

Options:

A. $\bar{v} = \frac{v^2 + v_0^2}{at}$

B. $\bar{v} = \frac{v^2 - v_0^2}{2at}$

C. $\bar{v} = \frac{v^2 - v_0^2}{at}$

D. $\bar{v} = \frac{v^2 + v_0^2}{2at}$

Answer: B

Solution:

Solution:

Question 37

A particle is in uniform circular motion. Related to one complete

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revolution of the particle, which among the statements is correct?

Options:

A. Average speed of the particle is zero

B. Average velocity of the particle is zero

C. Average acceleration of the particle is zero

D. Displacement of the particle is zero

Answer: A

Solution:

Solution:

Question 38

A body of mass 10 kg is kept on a horizontal surface. The coefficient of kinetic friction between the body and the surface is 0.5 . A horizontal force of 60N is applied on the body. The resulting acceleration of the body is about

Options:

A. $6ms^{-2}$

B. Zero

C. $1ms^{-2}$

D. $5ms^{-2}$

Answer: C

Solution:

Solution:

Question 39

The P − V diagram of a Carnot's engine is shown in the graph below. The engine uses 1 mole of an ideal gas as working substance. From the graph, the area enclosed by the P − V diagram is [The heat supplied to the gas is 8000J]

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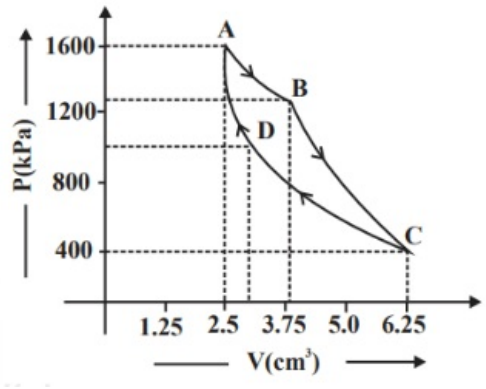

Options:

A. 3000J

B. 1000J

C. 1200J

D. 2000J

Answer: A

Solution:

Solution:

Question 40

When a planet revolves around the Sun, in general, for the planet

Options:

A. Kinetic and potential energy of the planet are constant.

B. Angular momentum about the Sun and aerial velocity of the planet are constant.

C. Linear momentum and linear velocity are constant.

D. Linear momentum and aerial velocity are constant.

Answer: B

Solution:

Solution:

Question 41

A stretched wire of a material whose Young's modulus $Y = 2 \times 10^{11} Nm^{-2}$ has Poisson's ratio 0.25 . Its lateral strain $\varepsilon_\ell = 10^{-3}$. The elastic energy density of the wire is

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Options:

A. $4 \times 10^5 \text{Jm}^{-3}$

B. $8 \times 10^5 \text{Jm}^{-3}$

C. $16 \times 10^5 \text{Jm}^{-3}$

D. $1 \times 10^5 \text{Jm}^{-3}$

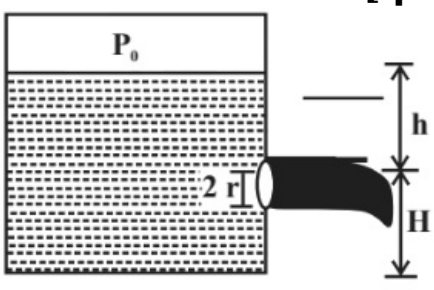
Answer: C

Solution:

Solution:

Question 42

A closed water tank has cross-sectional area A. It has a small hole at a depth of h from the free surface of water. The radius of the hole is r so that r< < $\sqrt{\frac{A}{\pi}}$. If P_o is the pressure inside the tank above water level, and P_a is the atmospheric pressure, the rate of flow of the water coming out of the hole is [ρ is the density of water]



Options:

A. $\pi r^2\sqrt{2\,gH}$

B. $\pi r^2 \sqrt{gh + \frac{2(P_o - P_a)}{\rho}}$

C. $\pi r^2\sqrt{2\,gh}$

D. $\pi r^2 \sqrt{2\,gh + \frac{2(P_o - P_a)}{\rho}}$

Answer: D

Solution:

Solution:

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Question 43

100g of ice at 0˚C is mixed with 100g of water at 100˚C. The final temperature of the mixture is
[Take $L_f = 3.36 \times 10^5 Jkg^{-1}$ and $S_w = 4.2 \times 10^3 Jkg^{-1}k^{-1}$]

Options:

A. 50˚C

B. 1˚C

C. 40˚C

D. 10˚C

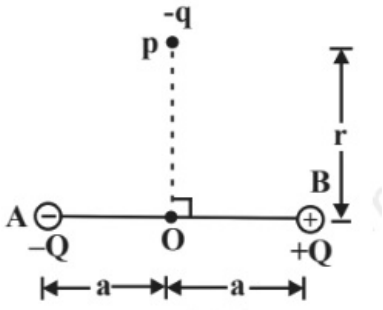
Answer: D

Solution:

Solution:

Question 44

In the situation shown in the diagram, magnitude of $q << |Q|$ and $r \gg a$. The net force on the free charge $-q$ and net torque on it about O at the instant shown are respectively [$p = 2aQ$ is the dipole moment]



Options:

A. $-\frac{1}{4\pi\varepsilon_0}\frac{pq}{r^2}\hat{k}, -\frac{1}{4\pi\varepsilon_0}\frac{pq}{r^3}\hat{i}$

B. $\frac{1}{4\pi\varepsilon_0}\frac{pq}{r^3}\hat{i}, +\frac{1}{4\pi\varepsilon_0}\frac{pq}{r^2}\hat{k}$

C. $\frac{1}{4\pi\varepsilon_0}\frac{pq}{r^3}\hat{i}, -\frac{1}{4\pi\varepsilon_0}\frac{pq}{r^2}\hat{k}$

D. $\frac{1}{4\pi\varepsilon_0}\frac{pq}{r^2}\hat{k}, \frac{1}{4\pi\varepsilon_0}\frac{pq}{r^3}\hat{i}$

Answer: C

Solution:

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Solution:

Question 45

Pressure of ideal gas at constant volume is proportional to .....

Options:

A. Total energy of the gas

B. Average kinetic energy of the molecules

C. Force between the molecules

D. Average potential energy of the molecules

Answer: A

Solution:

Solution:

Question 46

A block of mass m is connected to a light spring of force constant k. The system is placed inside a damping medium of damping constant b. The instantaneous values of displacement, acceleration and energy of the block are x, a and E respectively. The initial amplitude of oscillation is A and ω ' is the angular frequency of oscillations. The incorrect expression related to the damped oscillation is

Options:

A. $E = \frac{1}{2}kA^2e^{-\frac{bt}{m}}$

B. $m\frac{d^2x}{dt^2} + b\frac{dx}{dt} + kx = 0$

C. $x = Ae^{-\frac{b}{m}}\cos(\omega' t + \varphi)$

D. $\omega' = \sqrt{\frac{k}{m} - \frac{b^2}{4m^2}}$

Answer: C

Solution:

Solution:

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Question 47

The speed of sound in an ideal gas at a given temperature T is v. The rms speed of gas molecules at that temperature is v_{rms}. The ratio of the velocities v and v_{ms} for helium and oxygen gases are X and X, respectively. Then $\frac{X}{X'}$ is equal to

Options:

A. $\sqrt{\frac{5}{21}}$

B. $\frac{21}{5}$

C. $\frac{21}{\sqrt{5}}$

D. $\frac{5}{\sqrt{21}}$

Answer: D

Solution:

Solution:

Question 48

A positively charged glass rod is brought near uncharged metal sphere, which is mounted on an insulated stand. If the glass rod is removed, the net charge on the metal sphere is

Options:

A. 1.6×10^{-19}C

B. Positive charge

C. Negative charge

D. Zero

Answer: D

Solution:

Solution:

Question 49

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A parallel plate capacitor of capacitance C_1 with a dielectric slab in between its plates is connected to a battery. It has a potential difference V_1 across its plates. When the dielectric slab is removed, keeping the capacitor connected to the battery, the new capacitance and potential difference are C_2 and V_2 respectively. Then,

Options:

A. $V_1 < V_2, C_1 > C_2$

B. $V_1 = V_2, C_1 > C_2$

C. $V_1 = V_2, C_1 < C_2$

D. $V_1 > V_2, C_1 > C_2$

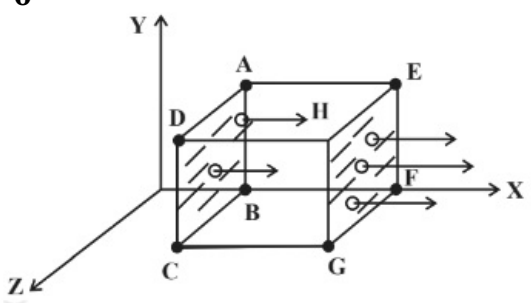
Answer: B

Solution:

Solution:

Question 50

A cubical Gaussian surface has side of length a = 10 cm. Electric field lines are parallel to x-axis as shown. The magnitudes of electric fields through surfaces ABCD and EFGH are $6 kNC^{-1}$ and $9 kNC^{-1}$ respectively. Then the total charge enclosed by the cube is [. Take $\varepsilon_0 = 9 \times 10^{-12} Fm^{-1}$]



Options:

A. $-1.35\,nC$

B. $0.27\,nC$

C. $-0.27\,nC$

D. $1.35\,nC$

Answer: B

Solution:

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Solution:

Question 51

Electric field at a distance ' r ' from an infinitely long uniformly charged straight conductor, having linear charge density λ is E_1. Another uniformly charged conductor having same linear charge density λ is bent into a semicircle of radius ' r '. The electric field at its centre is E_2. Then

Options:

A. $E_1 = E_2$

B. $E_1 = \pi r E_2$

C. $E_2 = \pi r E_1$

D. $E_2 = \frac{E_1}{r}$

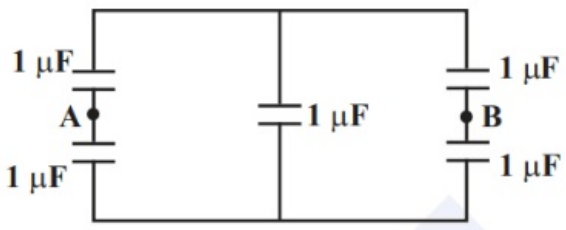
Answer: A

Solution:

Solution:

Question 52

Five capacitors each of value 1μF are connected as shown in the figure. The equivalent capacitance between A and B is



Options:

A. 2μF

B. 5μF

C. 3μF

D. 1μF

Answer: D

Solution:

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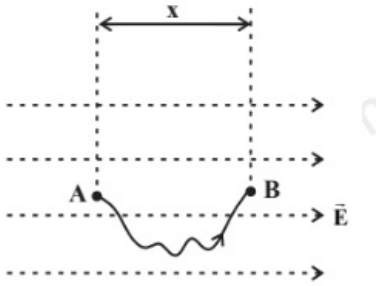
Solution:

Question 53

A uniform electric field vector $\vec{E}$ exists along horizontal direction as shown. The electric potential at A is V_A. A small point charge q is slowly taken from A to B along the curved path as shown. The potential energy of the charge when it is at point B is



Options:

A. $q[Ex - V_A]$

B. qEx

C. $q[V_A - Ex]$

D. $q[V_A + Ex]$

Answer: C

Solution:

Solution:

Question 54

Ten identical cells each emf 2V and internal resistance 1Ω are connected in series with two cells wrongly connected. A resistor of 10Ω is connected to the combination. What is the current through the resistor?

Options:

A. 0.6A

B. 1.2A

C. 1.8A

D. 2.4A

Answer: A

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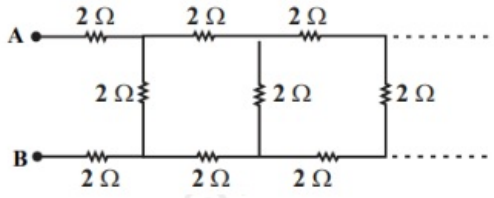
Solution:

Solution:

Question 55

The equivalent resistance between the points A and B in the following circuit is



Options:

A. 0.05Ω

B. 5Ω

C. 0.5Ω

D. 5.5Ω

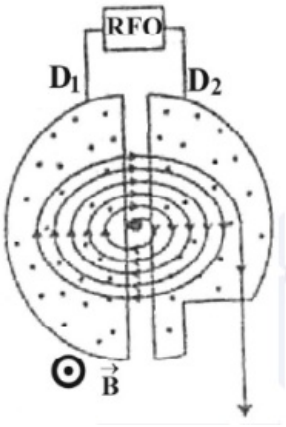
Answer: D

Solution:

Solution:

Question 56

A charged particle is subjected to acceleration in a cyclotron as shown. The charged particle undergoes increase in its speed



Options:

A. Inside D_1, D_2 and the gaps

B. Only inside D_1

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C. Only in the gap between D_1 and D_2

D. Only inside D_2

Answer: C

Solution:

Solution:

Question 57

The resistance of a carbon resistor is 4.7kΩ ± 5%. The colour of the third band is

Options:

A. Violet

B. Orange

C. Gold

D. Red

Answer: D

Solution:

Solution:

Question 58

The four bands of a colour coded resistor are of the colours gray, red, gold and gold. The value of the resistance of the resistor is

Options:

A. 8.2Ω ± 5%

B. 82Ω ± 5%

C. 5.2Ω ± 5%

D. 82Ω ± 10%

Answer: A

Solution:

Solution:

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Question 59

A wire of resistance R is connected across a cell of emf ε and internal resistance r. The current through the circuit is I. In time t, the work done by the battery to establish the current I is

Options:

A. IRt

B. I^2Rt

C. ε It

D. $\frac{\varepsilon^2 t}{R}$

Answer: C

Solution:

Solution:

Question 60

For a given electric current the drift velocity of conduction electrons in a copper wire is v and their mobility is μ. When the current is increased at constant temperature

Options:

A. v_d decreases, μ remains the same

B. v_d remains the same, μ decreases

C. v_d increases, μ remains the same

D. v_d remains the same, μ increases

Answer: C

Solution:

Solution:

Chemistry

Question 1

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Compounds P and R in the following reaction are

$$CH_3CHO \xrightarrow[(ii)H_3O^+]{(i)CH_3MgBr} P \xrightarrow[heat]{conc.\ H_2SO_4} Q \xrightarrow[(i)B_2H_6(ii)H_2O_2/OH^-]{} R$$

Options:

A. Metamers

B. Identical

C. Position isomers

D. Functional isomers

Answer: C

Solution:

Solution:

Question 2

Aniline does not undergo

Options:

A. Friedel-Craft reaction

B. Bromination

C. Nitration

D. Sulphonation

Answer: A

Solution:

Solution:

Question 3

The heating of phenyl methyl ether with HI produces an aromatic compound A which on treatment with con. HNO_3 gives B. A and B respectively are,

Options:

A. Iodobenzene, 1-Iodo-4-nitrobenzene

B. Phenol, Picric acid

C. Methanol, Ethanoic acid

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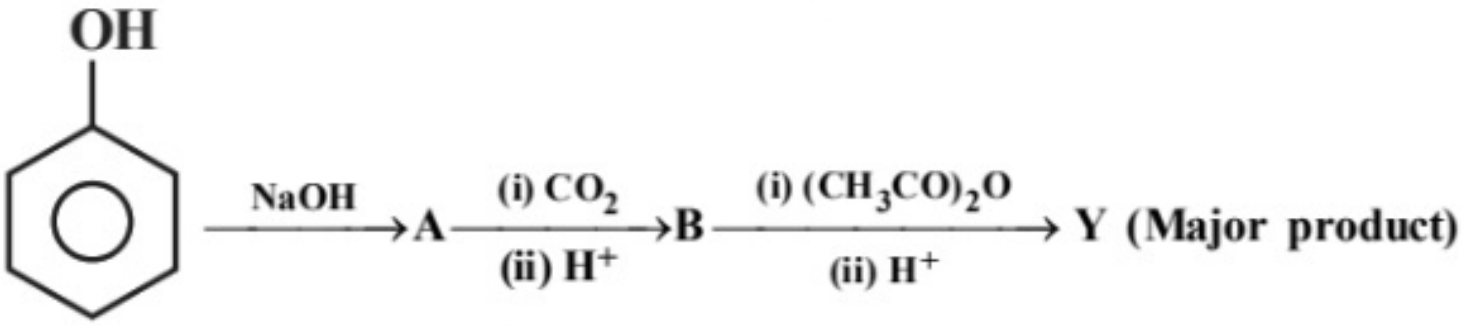
D. Picric acid, Phenol

Answer: B

Solution:

Solution:

Question 4



Y in the above reaction is

Options:

A. Cumene

B. Picric acid

C. Salicylaldehyde

D. Aspirin

Answer: D

Solution:

Solution:

Question 5

A better reagent to oxidize primary alcohols into aldehyde is :

Options:

A. Acidified $K_2Cr_2O_7$

B. CrO_3

C. PCC

D. Alkaline $KMnO_4$

Answer: C

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Solution:

Solution:

Question 6

In the reaction:

$$C_6H_5CN \xrightarrow[(ii)H_3O^+]{(i)SnCl_2 + HCl} X \xrightarrow{con.\ KOH} Y + Z$$

Formation of X , formation of Y and Z are known by

Options:

A. Wolff-Kishner reduction, Wurtz reaction.

B. Stephen reaction, Cannizaro reaction

C. Rosenmund reduction, Cannizaro reaction

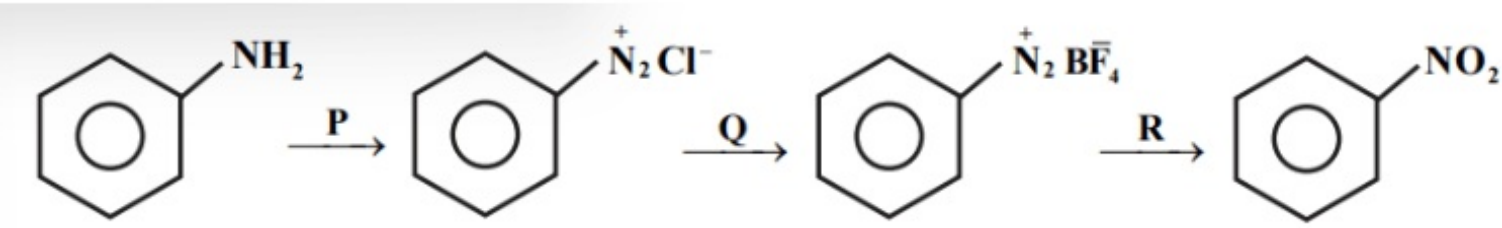
D. Clemmensen reduction, Sandmeyer reaction.

Answer: B

Solution:

Solution:

Question 7



P, Q and R respectively are :

Options:

A. $NaNO_2$ + dil · HCl, BF_3, Cu + $NaNO_2$

B. $NaNO_3$ + dil. HCl, F_2, Cu + $NaNO_3$

C. $NaNO_2$ + dil. HCl, HBF_4, Cu + $NaNO_2$

D. $NaNO_2$ + con. HCl, F_2, Cu + $NaNO_3$

Answer: C

Solution:

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Solution:

Question 8

Thyroxine produced in the thyroid gland is an iodinated derivative of

Options:

A. Tyrosine

B. Tryptophan

C. Threonine

D. Lysine

Answer: A

Solution:

Solution:

Question 9

Sucrose is dextrorotatory but after hydrolysis the mixture show laevorotation, this is because of

Options:

A. Recemic mixture is formed.

B. Laevorotation of fructose is more than dextrorotation of glucose.

C. Laevorotation of glucose is more than dextrorotation of fructose.

D. Sucrose is a non-reducing sugar

Answer: B

Solution:

Solution:

Question 10

The correct order of match between column X and column Y is :

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X	Y
I. Vitamin A	i. Muscular weakness
II. Vitamin D	ii. Increased blood clotting time
III. Vitamin E	iii. Night-blindness
IV. Vitamin K	iv. Osteomalacia

Options:

A. I - iii, II - ii, III - iv, IV - i

B. I - iii, II - iv, III - i, IV - ii

C. I - iv, II - iii, III - ii, IV - i

D. I - ii, II - i, III - iii, IV - iv

Answer: B

Solution:

Solution:

Question 11

Which of the following monomers form biodegradable polymers?

Options:

A. Phenol and formaldehyde

B. 3-hydroxybutanoic acid and 3-hydroxypentanoic acid

C. Ethylene glycol and pthalic acid

D. Caprolactum and 1,3-Butadiene

Answer: B

Solution:

Solution:

Question 12

Match the List-I with List-II in the following

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List-I	List-II
1.Caprolactum	(a)
2. Vinyl chloride	(b)
3. Styrene	(c)
4.Propene	(d)

Options:

A. 1 − d, 2 − c, 3 − a, 4 − b

B. 1 − d, 2 − c, 3 − b, 4 − a

C. 1 − c, 2 − d, 3 − a, 4 − b

D. 1 − a, 2 − d, 3 − c, 4 − b

Answer: B

Solution:

Solution:

Question 13

Which one of the following is a non-narcotic analgesic?

Options:

A. Aspirin

B. Morphine

C. Heroin

D. Codeine

Answer: A

Solution:

Solution:

Question 14

Receptors are proteins and crucial to body communication process. These receptors are embedded in

Options:

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A. Endocrine gland

B. Chromosomes

C. Cell membrane

D. Protein

Answer: C

Solution:

Solution:

Question 15

A gas at a pressure of 2 atm is heated from 25˚C to 323˚C and simultaneously compressed to $\frac{2^{rd}}{3}$ of its original value. Then the final pressure is

Options:

A. 2 atm

B. 4 atm

C. 1.33 atm

D. 6 atm

Answer: D

Solution:

Solution:

Question 16

Lattice enthalpy for NaCl is $+788\,kJ\,mol^{-1}$ and $\Delta_{Hyd}^{H} = -784\,kJ\,mol^{-1}$. Enthalpy of solution of NaCl is

Options:

A. $-572\,kJ\,mol^{-1}$

B. $-4\,kJ\,mol^{-1}$

C. $+572\,kJ\,mol^{-1}$

D. $+4\,kJ\,mol^{-1}$

Answer: D

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Solution:

Solution:

Question 17

At 500K, for a reversible reaction $A_{2(g)} + B_{2(g)} \rightleftharpoons 2AB_{(g)}$ in a closed container, $K_C = 2 \times 10^{-5}$. In the presence of catalyst, the equilibrium is attaining 10 times faster. The equilibrium constant K_C in the presence of catalyst at the same temperature is

Options:

A. 2×10^{-10}

B. 2×10^{-5}

C. 2×10^{-4}

D. 2×10^{-6}

Answer: B

Solution:

Solution:

Question 18

A weak acid with $pK_a 5.9$ and weak base with $pK_b 5.8$ are mixed in equal proportions pH of the resulting solution is

Options:

A. 7

B. 7.05

C. 7.005

D. 7.5

Answer: B

Solution:

Solution:

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Question 19

Temperature of 25˚C in Fahrenheit and Kelvin scale respectively are

Options:

A. 45˚F and 260.15K

B. 47˚F and 312.15K

C. 77˚F and 298.15K

D. 17˚F and 298.15K

Answer: C

Solution:

Solution:

Question 20

The number of protons, neutrons and electrons in the ion $_{16}^{32}S^{2-}$ respectively are

Options:

A. 18, 16, 16

B. 16, 16, 16

C. 16, 18, 16

D. 16, 16, 18

Answer: D

Solution:

Solution:

Question 21

The correct order of first ionisation enthalpy of given elements is

Options:

A. C < B <Be < Li

B. Li < Be< B < C

C. Li < B < Be < C

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D. Be < Li < B < C

Answer: C

Solution:

Solution:

Question 22

Which of the following statement is INCORRECT?

Options:

A. Bond length of O_2< Bond length of O_2^{2-}

B. Bond order of O_2> Bond order of O_2^{2-}

C. Bond length of O_2> Bond length of O_2^{2+}

D. Bond order of O_2^{+}<Bond order of O_2^{2-}

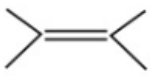
Answer: D

Solution:

Solution:

Question 23

IUPAC name of the compound is



Options:

A. 1, 1, 2, 2− tetra methylethene

B. 2, 3− dimethyl butene

C. 2, 3− dimethylbut-2-ene

D. 2, 3− dimethyl butyne

Answer: C

Solution:

Solution:

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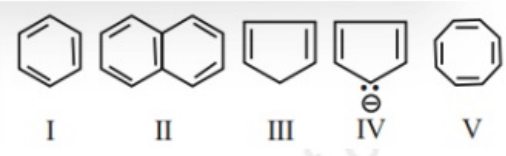
Question 24

Among the following:



The set which represents aromatic species is

Options:

A. II and III

B. I, II and IV

C. I, II and III

D. III, IV and V

Answer: B

Solution:

Solution:

Question 25

Which one of the following gases converts haemoglobin into carboxy haemoglobin?

Options:

A. NO

B. CO_2

C. CO

D. O_2

Answer: C

Solution:

Solution:

Question 26

What is the oxidation number of S in $H_2S_2O_8$?

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Options:

A. +7

B. +6

C. +5

D. +4

Answer: B

Solution:

Solution:

Question 27

A 30% solution of hydrogen peroxide is

Options:

A. '50 volume' hydrogen peroxide

B. '100 volume' hydrogen peroxide

C. '30 volume' hydrogen peroxide

D. '10 volume' hydrogen peroxide

Answer: B

Solution:

Solution:

Question 28

A pair of amphoteric oxides is

Options:

A. BeO, MgO

B. BeO, ZnO

C. Al_2O_3, Li_2O

D. BeO, BO_3

Answer: B

Solution:

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Solution:

Question 29

The composition of water gas is

Options:

A. $CO_{(g)} + H_2O_{(g)}$

B. $CO_{(g)} + H_{2(g)}$

C. $CO_{(g)} + N_{2(g)}$

D. $CH_{4(k)}$

Answer: B

Solution:

Solution:

Question 30

The swelling in feet and ankles of an aged person due to sitting continuously for long hours during travel, is reduced by soaking the feet in warm salt water. This is because of:

Options:

A. Edema

B. Diffusion

C. Reverse Osmosis

D. Osmosis

Answer: D

Solution:

Solution:

Question 31

A sample of water is found to contain 5.85% $\left(\frac{w}{w}\right)$ of AB (molecular mass

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58.5) and 9.50% $\left(\frac{w}{w}\right)$ XY (molecular mass 95). Assuming 80% ionisation of AB and 60% ionisation of XY_2, the freezing point of water sample is
[Given : K_f for water $1.86 K\,kg\,mol^{-1}$, Freezing point of pure water is 273K and A, B and Yare monovalent ions]

Options:

A. 280.44K

B. 281.75K

C. 264.25K

D. 265.56K

Answer: C

Solution:

Solution:

Question 32

Match the column A (type of crystalline solid) with the column B (example for each type):

	A		B
P.	Molecular Solid	i.	SiC
Q.	Ionic Solid	ii.	Mg
R.	Metallic Solid	iii.	H_2O
S.	Network Solid	iv.	MgO

Options:

A. P - ii, Q - iv, R - iii, S - i

B. P - iii, Q - iv, R - ii, S - i

C. P - iii, Q - i, R - ii, S - iv

D. P - iv, Q - iii, R - ii, S - i

Answer: B

Solution:

Solution:

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Question 33

A metal crystallises in a body centered cubic lattice with the metallic radius $\sqrt{3}$Å. The volume of the unit cell in m^3 is

Options:

A. 6.4×10^{-29}

B. 4×10^{-10}

C. 64×10^{-29}

D. 4×10^{-29}

Answer: A

Solution:

Solution:

Question 34

If 'a' stands for the edge length of the cubic systems - The ratio of radii in simple cubic, body centered cubic and face centered cubic unit cells is

Options:

A. $\frac{1}{2}a : \frac{\sqrt{3}}{2}a : \frac{\sqrt{2}}{2}a$

B. $\frac{1}{2}a : \sqrt{3}a : \frac{1}{\sqrt{2}}a$

C. $1a : \sqrt{3}a : \sqrt{2}a$

D. $\frac{1}{2}a : \frac{\sqrt{3}}{4}a : \frac{1}{2\sqrt{2}}a$

Answer: D

Solution:

Solution:

Question 35

Dimerisation of solute molecules in low dielectric constant solvent is due to:

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Options:

A. Co-ordinate bond

B. Ionic bond

C. Hydrogen bond

D. Covalent bond

Answer: C

Solution:

Solution:

Question 36

For a reaction, the value of rate constant at 300K is $6.0 \times 10^5\ s^{-1}$. The value of Arrhenius factor A at infinitely high temperature is :

Options:

A. $\frac{6 \times 10^{-5}}{300}$

B. 6×10^5

C. $6 \times 10^5 \times e^{-Ea\ /\ 300R}$

D. $e^{-Ea\ /\ 300R}$

Answer: B

Solution:

Solution:

Question 37

The rate constants k_1 and k_2 for two different reactions are $10^{16} \times e^{-2000\ /\ T}$ and $10^{15} \times e^{-1000\ /\ T}$ respectively. The temperature at which $k_1 = k_2$ is :

Options:

A. $\frac{1000}{2.303}K$

B. 1000K

C. $\frac{2000}{2.303}K$

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D. 2000K

Answer: A

Solution:

Solution:

Question 38

During the electrolysis of brine, by using inert electrodes,

Options:

A. Na deposits on cathode

B. Cl_2 liberates at anode

C. O_2 liberates at anode

D. H_2 liberates at anode

Answer: B

Solution:

Solution:

Question 39

Consider the following 4 electrodes

A : $Ag^+(0.0001M) / Ag_{(s)}$; B : $Ag^+(0.1M) / Ag_{(s)}$

C : $Ag^+(0.01M) / Ag_{(s)}$; D : $Ag^+(0.001M) / Ag_{(s)}$; $E^\circ_{Ag^+/Ag} = +0.80V$.

Then reduction potential in volts of the electrodes in the order

Options:

A. A> D > C > B

B. A > B > C > D

C. B > C > D > A

D. C > D > A > B

Answer: C

Solution:

Solution:

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Question 40

The resistance of 0.1M weak acid HA in a conductivity cell is 2×10^3 Ohm. The cell constant of the cell is $0.78 Cm^{-1}$ and λ_m° of acid HA is $390 Scm^2 mol^{-1}$. The pH of the solution is

Options:

A. 5

B. 3

C. 3.3

D. 4.2

Answer: B

Solution:

Solution:

Question 41

In which one of the following reactions, rate constant has the unit $mol\, L^{-1}\ s^{-1}$.

Options:

A. $2NO_{(g)} + O_{2_{(8)}} \rightarrow 2NO_{2_{(8)}}$

B. Decomposition of HI on the surface of Gold

C. Acid catalysed hydrolysis of CH_3COOCH_3

D. $CHCl_3 + Cl_2 \rightarrow CCl_4 + HCl$

Answer: B

Solution:

Solution:

Question 42

For the formation of which compound in Ellingham diagram ΔG° becomes more and more negative with increase in temperature?

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Options:

A. ZnO

B. Cu_2O

C. CO

D. FeO

Answer: C

Solution:

Solution:

Question 43

Which of the following compound does not give dinitrogen on heating ?

Options:

A. NH_4NO_3

B. $(NH_4)_2Cr_2O_7$

C. $Ba(N_3)_2$

D. NH_4NO_2

Answer: A

Solution:

Solution:

Question 44

Aqueous solution of raw sugar when passed over beds of animal charcoal, it becomes colourless. Pick the correct set of terminologies that can be used for the above example.

Options:

A.

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	Adsorbent	Adsorbate	Process
(A)	Animal Charcoal	Colouring Substance	Adsorption

B.

	Adsorbent	Adsorbate	Process
(B)	Colouring Substance	Animal Charcoal	Adsorption

C.

	Adsorbent	Adsorbate	Process
(C)	Solution of Sugar	Animal Charcoal	Sorption

D.

	Adsorbent	Adsorbate	Process
(D)	Animal Charcoal	Solution of Sugar	Absorption

Answer: A

Solution:

Solution:

Question 45

For Freundlich adsorption isotherm, a graph of log(x / m) Vs. log(P) gives a straight line. The slope of line and its Y-axis intercept respectively are

Options:

A. $\log\left(\frac{1}{n}\right)$, $\log K$

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B. $\frac{1}{n}$, K

C. $\log\left(\frac{1}{n}\right)$, K

D. $\frac{1}{n}$, $\log K$

Answer: D

Solution:

Solution:

Question 46

When $FeCl_3$ is added to excess of hot water gives a sol ' X '. When $FeCl_3$ is added to $NaOH_{(aq)}$ solution, gives sol ' Y '.
X and Y formed in the above processes respectively are

Options:

A. $Fe_2O_3 \cdot xH_2O / Cl^-$ and $Fe_2O_3 \cdot xH_2O / OH^-$

B. $Fe_2O_3 \cdot xH_2O / Fe^{3+}$ and $Fe_2O_3 \cdot xH_2O / OH^-$

C. $Fe_2O_3 \cdot xH_2O / OH^-$ and $Fe_2O_3 \cdot xH_2O / Fe^{3+}$

D. $Fe_2O_3 \cdot xH_2O / H^+$ and $Fe_2O_3 \cdot xH_2O / Na^+$

Answer: B

Solution:

Solution:

Question 47

The reducing agent in the given equations :
$$4Ag_{(s)} + 8CN^-_{(aq)} + 2H_2O_{(aq)} + O_{2_{(g)}} \rightarrow 4[Ag(CN)_2]^-_{(aq)} + 4OH^-_{(aq)}$$
$$2[Ag(CN)_2]^-_{(aq)} + Zn_{(s)} \rightarrow [Zn(CN)_4]^{2-}_{(aq)} + 2Ag_{(s)}$$

Options:

A. H_2O

B. CN^-

C. Zn

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D. O_2

Answer: C

Solution:

Solution:

Question 48

Which of the following is CORRECT with respect to melting point of a transition element?

Options:

A. Mn > Fe

B. Ti >V

C. V > Cr

D. Cr > Mn

Answer: D

Solution:

Solution:

Question 49

$aMnO_4^- + bS_2O_3^{-2} + H_2O \rightarrow xMnO_2 + ySO_4^{-2} + zOH^-$a and y respectively are

Options:

A. 3; 6

B. 8; 8

C. 8; 3

D. 8; 6

Answer: D

Solution:

Solution:

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Question 50

Which formula and name combination is INCORRECT?

Options:

A. $[CoCl_2(en)_2]$ Cl-Dichloridodiethylenediammine cobalt (II) chloride

B. $[Co(NH_3)_4(H_2O)\,Cl]Cl_2$ - Tetraammineaquachloridocobalt (III) chloride

C. $K_3[Al(C_2O_4)_3]$ - Potassium trioxalatoaluminate (III)

D. $[Pt(NH_3)_2\,Cl(NO_2)]$ - Diamminechloridonitrito - N - platinum (II)

Answer: A

Solution:

Solution:

Question 51

Which of the following system in an octahedral complex has maximum unpaired electrons?

Options:

A. d^4 (low spin)

B. d^7 (high spin)

C. d^9 (high spin)

D. d^6 (low spin)

Answer: B

Solution:

Solution:

Question 52

The correct decreasing order of basicity of hydrides of Group - 15 elements is

Options:

A. $AsH_3 > SbH_3 > NH_3 > PH_3$

B. $NH_3 > PH_3 > AsH_3 > SbH_3$

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C. $SbH_3 > AsH_3 > PH_3 > NH_3$

D. $PH_3 > AsH_3 > SbH_3 > NH_3$

Answer: B

Solution:

Solution:

Question 53

Which one of the following oxoacids of phosphorus can reduce $AgNO_3$ to metallic silver?

Options:

A. $H_4P_2O_6$

B. H_3PO_4

C. H_3PO_2

D. $H_4P_2O_7$

Answer: C

Solution:

Solution:

Question 54

In solid state, PCl_5 is a/an

Options:

A. Ionic solid with $[PCl_4]^+$and $[PCl_6]^-$

B. Covalent solid present in the form of P_2Cl_{10}

C. Octahedral structure

D. Ionic solid with $[PCl_6]^+$and $[PCl_4]^-$

Answer: A

Solution:

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Solution:

Question 55

In which one of the following pairs, both the elements does not have $(n-1)d^{10}ns^2$ configuration in its elementary state?

Options:

A. Hg, Cn

B. Cu, Zn

C. Zn, Cd

D. Cd, Hg

E. None of above

Answer: E

Solution:

Solution:

Question 56

$CH_3 - CH = CH - CH_2OH \xrightarrow{PCC} CH_3 - CH = CH - CHO$
Hybridisation change involved at C − 1 in the above reaction

Options:

A. sp^2 to sp^3

B. sp to sp^2

C. sp^3 to sp

D. sp^3 to sp^2

Answer: D

Solution:

Solution:

Question 57

If a didentate ligand ethane −1, 2 - diamine is progressively added in

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the molar ratio en : Ni: : 1 : 1, 2 : 1, 3 : 1 to $[Ni(H_2O)_6]^{2+}$ aq solution, following co-ordination entities are formed.

I. $[Ni(H_2O)_4\,en]_{(aq)}^{2+}$-pale blue

II. $[Ni(H_2O)_2(en)_2]_{(aq)}^{2+}$-blue/purple

III. $[Ni(en)_3]_{(aq)}^{2+}$-violet

The wavelength in nm of light absorbed in case of I and III are rsepctively

Options:

A. 310 nm and 500 nm

B. 600 nm and 535 nm

C. 475 nm and 310 nm

D. 300 nm and 475 nm

Answer: B

Solution:

Solution:

Question 58

Which of the following is an organometallic compound?

Options:

A. $(CH_3COO)_2Ca$

B. CH_3ONa

C. CH_3COONa

D. CH_3CH_2MgBr

Answer: D

Solution:

Solution:

Question 59

A pair of compounds having the same boiling points are

Options:

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A. Benzene and naphthalene

B. (+) butan and $-2-$ ol and (−) butan $-2-$ ol

C. cis but-2-ene and trans but-2-ene

D. n-hexane and neo-hexane

Answer: B

Solution:

Solution:

Question 60

Identify A, B and C in the sequence:

$$\mathbf{CH_3CH_2Br \xrightarrow{alc} KCN \xrightarrow{LiAlH_4} B \xrightarrow{0^\circ CNO} C}$$

Options:

A. CH_3CH_2CN, C_2H_5OH, $C_2H_5N_2Cl$

B. CH_3CH_2CN, $CH_3CH_2NH_2$, C_2H_5OH

C. CH_3CH_2CN, $CH_3CH_2CH_2NH_2$, $CH_3CH_2CH_2OH$

D. CH_3CH_2NC, CH_3CH_2OH, $CH_3CH_2CH_2NH_2$

Answer: C

Solution:

Solution:

Biology

Question 1

Which of the following is abbreviated as ZIFT?

Options:

A. Zygote Intra Fallopian Tube

B. Zygote Intra Fallopian Transfer

C. Zygote Inter Fallopian Tube

D. Zygote Inter Fallopian Transfer

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Answer: B

Solution:

Solution:

Question 2

An example for hormone releasing IUD is

Options:

A. Lippes loop

B. LNG - 20

C. Implant

D. Multiload 375

Answer: B

Solution:

Solution:

Question 3

MTPs are considered relatively safe during

Options:

A. 180 days of pregnancy

B. Second trimester

C. First trimester

D. 24 weeks of pregnancy

Answer: C

Solution:

Solution:

Question 4

Which of the following statements is corret?

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Options:

A. Sickle cell anaemia is a quantitative problem.

B. Thalassemia is a qualitative problem.

C. Female carrier for haemophilia may transmit the disease to sons.

D. Change in whole set of chromosomes is called aneuploidy.

Answer: C

Solution:

Solution:

Question 5

'Gene-mapping' technology was developed by

Options:

A. Sturtvent

B. Tschermak

C. Mendel

D. Correns

Answer: A

Solution:

Solution:

Question 6

Find the correct statement.
(1) Generally a gene regulates a trait, but sometimes one gene has effect on multiple traits.
(2) The trait AB-blood group of man is regulated by one dominant allele and another recessive allele. Hence it is co-dominant.

Options:

A. Both Statements (1) and (2) are correct.

B. Statement (1) is correct.

C. Both the Statements are wrong.

D. Statement (2) is correct.

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Answer: B

Solution:

Solution:

Question 7

From the following table, select the option that correctly characterizes various phases of menstrual cycle :

Options:

A.

	Menstruation phase	Follicular phase	Luteal phase
A	Menses	L.H. Surge	Regenration of endometrium

B.

	Menstruation phase	Follicular phase	Luteal phase
B	Matured follicle	Regression of corpus luteum	Ovulation

C.

	Menstruation phase	Follicular phase	Luteal phase
C	Regeneration of endometrium	High level of progesterone	Developing corpus luteum

D.

	Menstruation phase	Follicular phase	Luteal phase
D	Menses	Developing corpus luteum	Follicle maturation

Answer: A

Solution:

Solution:

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Question 8

In one of the hybridisation experiments, a homozygous dominant parent and a homozygous recessive parent are crossed for a trait. (Plant shows Medelian inheritance pattern)

Options:

A. Dominant parent trait appears in F_1 generation and recessive parent trait appears in F_1 and F_2 generations.

B. Dominant parent trait appears in F_1 generation and recessive parent trait appears in F_2 generation.

C. Dominant parent trait appears in F_2 generation and recessive parent trait appears only in F_1 generation

D. Dominant parent trait appears in both F_1&F_2 generations, recessive parent trait appears in only F_2 generation.

Answer: D

Solution:

Solution:

Question 9

Histone proteins are positively charged because they are rich in basic amino acid residues

Options:

A. Arginine and Phenylalanine

B. Arginine and Alanine

C. Arginine and Proline

D. Arginine and Lysine

Answer: D

Solution:

Solution:

Question 10

Eukaryotic genes are monocistronic but they are split genes because

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Options:

A. Exons are interrupted by Introns.

B. They contain Exons only.

C. Introns are interrupted with Mutons.

D. They contain Introns only.

Answer: A

Solution:

Solution:

Question 11

The Lac-Operon model was elucidated by

Options:

A. Hershey and Chase

B. Watson and Crick

C. Jacob and Crick

D. Francois Jacob and Jaques Monad

Answer: D

Solution:

Solution:

Question 12

Which of these is NOT an example for Adaptive radiation?

Options:

A. Placental mammals

B. Darwin's finches

C. Long-necked Giraffe

D. Australian marsupials

Answer: C

Solution:

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Solution:

Question 13

In a population of 800 rabbits showing Hardy-Weinberg equilibrium, the frequency of recessive individuals was 0.16 . what is the frequency of heterozygous individuals?

Options:

A. 0.84

B. 0.4

C. 0.36

D. 0.48

Answer: D

Solution:

Solution:

Question 14

In male heterogametic type of sex determination

Options:

A. Male parent produces dissimilar gametes.

B. Male parent produces similar gametes.

C. Males do not produce gametes.

D. Female parent produces dissimilar gametes.

Answer: A

Solution:

Solution:

Question 15

Identify the symptoms of pneumonia.

Options:

A. Constipation, Abdominal pain, cramps, blood clots

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B. Difficulty in breathing, fever, chills, cough, headache

C. High fever, weakness, stomach pain, loss of appetite

D. Nasal congestion and discharge, cough, sore throat, headache

Answer: B

Solution:

Solution:

Question 16

THe variety of Okra, Pusa Sawani is resistant to which of the following insect pests?

Options:

A. Shoot & Fruit borer

B. Aphids

C. Cereal leaf beetle

D. Jassids

Answer: A

Solution:

Solution:

Question 17

With respect to Inbreeding, which among the following is not true?

Options:

A. It helps in elimination of less desirable genes.

B. Inbreeding decreases homozygosity.

C. It helps to evolve a pure line in an animal.

D. It helps in accumulation of superior genes.

Answer: B

Solution:

Solution:

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Question 18

Identify from the following a pair of better yielding semi dwarf varieties of rice developed in India.

Options:

A. Jaya and Kalyan Sona

B. Jaya and Ratna

C. Kalyan Sona and Sonalika

D. Sonalika amd Ratna

Answer: B

Solution:

Solution:

Question 19

In MoET technique fertilized eggs are transferred into surrogate mother in which of the following stage?

Options:

A. 8 − 32 celled stage

B. 2 − 4 celled stage

C. 16 − 32 celled stage

D. 8 − 16 celled stage

Answer: A

Solution:

Solution:

Question 20

Roquefort cheese is ripened by

Options:

A. Virus

B. Bacterium

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C. Yeast

D. Fungi

Answer: D

Solution:

Solution:

Question 21

Four students were assigned a science project to find out the pollution levels of lakes in their surrounding. AFter analysing the quality of water samples, the BOD values were found as follows : Which among the following water samples is highly polluted?

Options:

A. 6 mg / L

B. 0.6 mg / L

C. 0.16 mg / L

D. 0.06 mg / L

Answer: A

Solution:

Solution:

Question 22

The toxic substance 'haemozoin' responsible for high fever and chill, is released in which of the following diseases?

Options:

A. Malaria

B. Dengue

C. Typhoid

D. Pneumonia

Answer: A

Solution:

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Solution:

Question 23

Which of these is NOT a method to make host cells 'component' to take up DNA?

Options:

A. Biolistics

B. Micro-injection

C. Use of disarmed pathogen vectors

D. Elution

Answer: D

Solution:

Solution:

Question 24

Select the correct statement from the following:

Options:

A. The first step in PCR is heating which is used to separate both the strands of gene of interest.

B. Genetic engineering works only on animals and not yet successfully used on plants.

C. DNA from one organism will not band to DNA from other organism.

D. There are no risk factors associated with r-DNA technology.

Answer: A

Solution:

Solution:

Question 25

Choose the incorrect statement with reference to Kangaroo rat.

Options:

A. Uses minimal water to remove excretory products.

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B. Found in North American desert.

C. Eliminates dilute urine.

D. Meets is water requirements through internal fat oxidation.

Answer: C

Solution:

Solution:

Question 26

Generally, bears avoid winter by undergoing

Options:

A. Aestivation

B. Diapause

C. Migration

D. Hibernation

Answer: D

Solution:

Solution:

Question 27

Match Column - I with Column - II. Select the option with correct combination.

Column - I	Column - II
1. Standing state	p. quad Mass of living material at a given time.
2. Pioneer species	q. Amount of nutrients in the soil at a given time.
3. Detritivores	r. quad Species that invade a bare area.
4. Standing crop	s. quad Breakdown detritus into smaller particles.

Options:

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A. 1 – q, 2 – r, 3 – s, 4 – p

B. 1 – q, 2 – r, 3 – p, 4 – s

C. 1 – p, 2 – s, 3 – r, 4 – q

D. 1 – p, 2 – r, 3 – s, 4 – q

Answer: A

Solution:

Solution:

Question 28

PCR is used for

Options:

A. DNA digestion

B. DNA isolation

C. DNA amplification

D. DNA ligation

Answer: C

Solution:

Solution:

Question 29

The toxic heavy metals from various industries which cause water pollution, normally have a density

Options:

A. more than 7.5g / cm^3

B. more than 5g / cm^3

C. more than 12.5g / cm^3

D. more than 15g / cm^3

Answer: C

Solution:

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Solution:

Question 30

Identify the correct option showing the relative contribution of different green house gases to the total global warming.

Options:

A. CFC − 6%, CO_2 − 60%, Methane −20%, N_2O − 14%

B. CFC − 14%, CO_2 − 60%, Methane −20%, N_2O − 6%

C. CFC − 14%, CO_2 − 60%, Methane −6%, N_2O − 20%

D. CFC − 20%, CO_2 − 60%, Methane −14%, N_2O − 6%

Answer: B

Solution:

Solution:

Question 31

A flower has 10 stamens each having bilobed dithecous anther. If each microsporangium has 5 pollen mother cells, how many pollen grains would be produced by the flower?

Options:

A. 800

B. 200

C. 1600

D. 400

Answer: A

Solution:

Solution:

Question 32

During transcription the DNA stand with 3′ → 5′ polarity of the structural gene always acts as a template because

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Options:

A. Enzyme DNA dependent RNA polymerase always catalyse polymerisation in bioth the directions.

B. Enzyme DNA dependent RNA polymerase always catalyse the polymerisation $5^{'} \rightarrow 3^{'}$ directions.

C. Nucleotides of DNA strand with $5^{'} \rightarrow 3^{'}$ are transferred to mRNA.

D. Enzyme DNA dependent RNA polymerase always catalyse the polymerisation $3^{'} \rightarrow 5^{'}$ directions.

Answer: B

Solution:

Solution:

Question 33

According to David Tilman's long term ecosystem experiments, the total biomass in plots with more species shows,

Options:

A. Average variation from year-to-year.

B. Less variation from year-to-year.

C. No variation from year-to-year.

D. High variation from year-to-year.

Answer: B

Solution:

Solution:

Question 34

Identify the incorrect statement regarding the flow of energy between various components of the food chain.

Options:

A. Green plants capture about 10% of the solar energy that falls on leaves.

B. The amount of energy available at each trophic level is 10% of previous trophic level.

C. Each trophic level loses some energy as heat to the environment.

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D. Energy flow is unidirectional.

Answer: A

Solution:

Solution:

Question 35

Find out the correct match.

Options:

A.

	Disease	Pathogen	Main organ affected
(A)	Filariasis	Common round worm	Smallintestine

B.

	Disease	Pathogen	Main organ affected
(B)	Ringworm	Fungus	Skin

C.

	Disease	Pathogen	Main organ affected
(C)	Dysentery	Protozoa	Liver

D.

	Disease	Pathogen	Main organ affected
(D)	Typhoid	Bacteria	Lungs

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Answer: B

Solution:

Solution:

Question 36

Match the following columns and choose the correct option:

Column - I	Column - II
1. Haemophilus influenzae	p. Malignant malaria
2. Entamoeba histolytica	q. Elephantiasis
3. Plasmodium falciparum	r. Pneumonia
4. Wuchereria bancrofti	s. Amoebiasis

Options:

A. 1 – s, 2 – p, 3 – q, 4 – r

B. 1 – q, 2 – r, 3 – s, 4 – p

C. 1 – r, 2 – p, 3 – q, 4 – s

D. 1 – r, 2 – s, 3 – p, 4 – q

Answer: D

Solution:

Solution:

Question 37

From the following tools / techniques of genetic engineering, identify those which are required for cloning a bacterial gene in animal cells and choose the correct option :

I. Endonuclease
II. Ligase
III. A. tumefaciens
IV. Microinjection
V. Gene gun
VI. Lysozyme
VII. Cellulase
VIII. Electrophoresis

Options:

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A. I, III, IV, V, VII

B. II, III, V, VII, VIII

C. II, III, IV, VI, VII, VIII

D. I, II, IV, VI, VIII

Answer: D

Solution:

Solution:

Question 38

Match the column-I with column-II and choose the correct option from the following:

Column - I(Plant groups)	Column - II (Examples)
1. Bryophyta	p. Pinus
2. Gymnosperm	q. Adiantum
3. Algae	r. Sphagnum
4. Pteridophyta	s. Ectocarpus

Options:

A. 1 – q, 2 – p, 3 – s, 4 – r

B. 1 – s, 2 – r, 3 – q, 4 – p

C. 1 – q, 2 – s, 3 – p, 4 – r

D. 1 – r, 2 – p, 3 – s, 4 – q

Answer: D

Solution:

Solution:

Question 39

Flame cells present in the members of platyhelminthes are specialized to perform,

Options:

A. Respiration and Excretion

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B. Osmoregulation and Circulation

C. Respiration and Osmoregulation

D. Osmoregulation and Excretion

Answer: D

Solution:

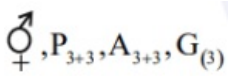
Solution:

Question 40

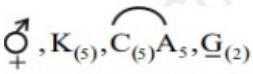
Identify the floral formula of plant belonging to potato family.

Options:

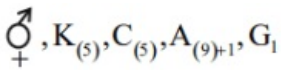
A.



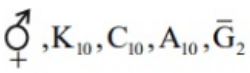
B.



C.



D.



Answer: B

Solution:

Solution:

Question 41

When the vascular cambium is present between the xylem and phloem, then the vascular bundle is called

Options:

A. Endarch

B. Exarch

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C. Closed

D. Open

Answer: D

Solution:

Solution:

Question 42

The function of Typhlosole in earthworm is

Options:

A. Transportation

B. Grinding of soil particles

C. Increasing the effective area of absorption in the intestine

D. Grinding of decaying leaves

Answer: C

Solution:

Solution:

Question 43

Select the correctly matched pair of organisms with their order.

Options:

A. Homo, sapiens : Poales

B. Triticum, aestivum : Sapindales

C. Mangifera, indica : Primata

D. Musa, domestica : Diptera

Answer: D

Solution:

Solution:

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Question 44

Match List-I and List-II with respect to proteins and their functions and select the correct option.

List - I	List - II
1. Collagen	p. Fights infectious agents
2. Trypsin	q. Hormone
3. Insulin	r. Enzyme
4. Antibody	s. Intercellular ground substance

Options:

A. 1 – s, 2 – r, 3 – q, 4 – p

B. 1 – q, 2 – r, 3 – q, 4 – s

C. 1 – s, 2 – p, 3 – r, 4 – p

D. 1 – s, 2 – q, 3 – r, 4 – p

Answer: A

Solution:

Solution:

Question 45

The complex formed by a pair of synapsed homologous chromosomes is called,

Options:

A. Bivalent

B. Pentavalent

C. Univalent

D. Triad

Answer: A

Solution:

Solution:

Question 46

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Match column-I with column-II. Select the option with correct combination.

Column - I	Column - II
1. Hypertonic	p. Two molecules move in the same directiona across the membrane.
2. Capillarity	q. External solution is more concentrated than cellsap.
3. Symport	r. Water loss in the form of droplets.
4. Guttation	s. Ability of water to rise in thin tubes.

Options:

A. 1 – q, 2 – p, 3 – s, 4 – r

B. 1 – q, 2 – s, 3 – r, 4 – p

C. 1 – q, 2 – s, 3 – p, 4 – r

D. 1 – q, 2 – r, 3 – p, 4 – s

Answer: C

Solution:

Solution:

Question 47

Toxicity of which micronutrient induces deficiency of iron, magnesium and calcium?

Options:

A. Manganese

B. Zinc

C. Boron

D. Molybdenum

Answer: A

Solution:

Solution:

Question 48

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Considering the stroke volume of an adult healthy being is 70 mL, identify the cardiac output in one hour from the following:

Options:

A. 302.4 Lit/ hour

B. 5.04 Lit/ hour

C. 50.40 Lit/ hour

D. 30.24 Lit/ hour

Answer: A

Solution:

Solution:

Question 49

Function of contractile vacuole in Amoeba is

Options:

A. Osmoregulation and movements

B. Excretion and osmoregulation

C. Digestion and excretion

D. Digestion and respiration

Answer: B

Solution:

Solution:

Question 50

Atrial Natriuretic Factor (ANF) acts as a

Options:

A. Vasoconstricter

B. Check on Renin-Angiotension mechanism

C. Hypertension inducer

D. Promoter on Renin-Angiotensiion mechanism

Answer: B

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Solution:

Solution:

Question 51

The vibrations from the ear drum are tansmitted through ear ossicles to

Options:

A. Tectorial membrane

B. Cochlea

C. Auditory nerves

D. Oval window

Answer: D

Solution:

Solution:

Question 52

Bamboo species flowers

Options:

A. Once in lifetime

B. Every year

C. Twice in 50 − 100 years

D. Once in 12 years

Answer: A

Solution:

Solution:

Question 53

In Bryophyllum, the adventitious buds arise from

Options:

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A. Shoot apex

B. Leaf axil

C. Leaf base

D. Notches in the leaf margin

Answer: D

Solution:

Solution:

Question 54

Primary endosperm nucleus is formed by fusion of

Options:

A. One polar nucleus and male gamete

B. Two polar nuclei and one male gamete

C. Two polar nuclei and two male gamete

D. Ovum and male gamete

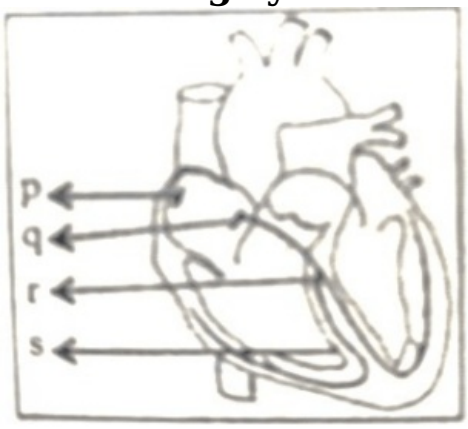
Answer: B

Solution:

Solution:

Question 55

Identify the option showing the correct labelling for mathrm p, mathrm q, mathrm r and mathrm s with reference to the conducting system of the human heart.



Options:

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A. p-Bundle of His, q-SAN, r-Interventicular septum, s-AVN

B. p-SAN, q-AV N, r-Bundle of His, s-Interventicular septum

C. p-Interventicular septm, q-AVN, r-Bundle of His, s-SAN

D. p-AVN, q-SAN, r-Interventicular septum, s-Bundle of His

Answer: B

Solution:

Solution:

Question 56

In the female reproductive system, a tiny finger like structure which lies at the upper junction of the two labia minora above the urethral opening is called

Options:

A. Clitoris

B. Hymen

C. Vagina

D. Mons pubis

Answer: A

Solution:

Solution:

Question 57

Consider the following statements with reference to female reproductive system:
Statement 1: The presence or absence of hymen is not a reliable indicator of virginity or sexual experience
Statement 2: The sex of the foetus is determined by the father and not by the mother.
Choose the correct option from the following:

Options:

A. Statement 1 is wrong and Statement 2 is corret

B. Statement 1 is correct and Statement 2 is wrong

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C. Both Statement 1 and Statememt 2 are wrong

D. Both Statement 1 and Statement 2 are correct

Answer: D

Solution:

Solution:

Question 58

The male sex accessory ducts include,

Options:

A. Rete testis, vasa efferentia, seminal vesicle and vas deferens

B. Rete testis, vasa efferentia, epididymis and seminal vesicle

C. Rete testis, vasa efferentia, epididymis and vas deferens

D. Rete testis, urethra, epididymis and vas deferens

Answer: C

Solution:

Solution:

Question 59

With reference to human sperm, match the List - I with List - II.

List - I	List - II
1. Head	p. Filled with enzyme
2. Acrosome	q. Contains mitochondria
3. Middle piece	r. Sperm mobility
4. Tail	s. Contains haploid nucleus

Choose the correct option from the following:

Options:

A. 1 – q, 2 – s, 3 – r, 4 – p

B. 1 – s, 2 – p, 3 – q, 4 – r

C. 1 – r, 2 – q, 3 – s, 4 – p

D. 1 – s, 2 – r, 3 – p, 4 – q

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Answer: B

Solution:

Solution:

Question 60

Which pair of the following cells in the embryo sac are destined to change their ploidy after fertilization?

Options:

A. Central cell and antipodals

B. Antipodals and synergids

C. Egg cell and central cell

D. Synergids and egg cell

Answer: C

Solution:

Solution:

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