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KCET 2023 Question Paper with Solution

The Karnataka Common Entrance Test

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### 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:

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### 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:

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### Question 3

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:

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## 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:

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## 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  $a, x \in (0, 1)$  then the value of  $x$  is

Options:

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

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

C. 0

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

**Answer: B**

**Solution:**

**Solution:**

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## 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:**

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## 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.  $x = 4, y = 3$

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

**Answer: C**

**Solution:**

**Solution:**

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## 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:**

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## 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  $f(x) = 1 + nx + \frac{n(n-1)}{2}x^2 + \frac{n(n-1)(n-2)}{6}x^3 + \dots + x^n$  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:**

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## 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.  $\cos^2 \frac{\alpha}{2} \cdot I$

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

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

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

**Answer: C**

**Solution:**

**Solution:**

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## Question 12

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:

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## Question 13

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

Options:

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

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

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

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

Answer: C

Solution:

Solution:

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## 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

B. II or III

C. I or III

D. II or IV

**Answer: D**

**Solution:**

**Solution:**

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## Question 15

An enemy fighter jet is flying along the curve given by  $y = x^2 + 2$ . A soldier 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:**

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## 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:**



**Solution:**

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## Question 17

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

**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:**

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## Question 18

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

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:**

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## Question 19

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

**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.  $5.05\pi\text{cm}^2 / \text{sec}$
- B.  $0.52\pi\text{cm}^2 / \text{sec}$
- C.  $5.2\pi\text{cm}^2 / \text{sec}$
- D.  $27.4\pi\text{cm}^2 / \text{sec}$

**Answer: B**

**Solution:**

**Solution:**

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## 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.  $12\text{m}^2 / \text{sec}$
- B.  $18\text{m}^2 / \text{sec}$
- C.  $3\text{m}^2 / \text{sec}$
- D.  $10\text{m}^2 / \text{sec}$

**Answer: A**

**Solution:**

**Solution:**

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## Question 21

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

**Options:**

- A.  $\pi / 2$
- B.  $\pi^2 / 2$
- C.  $\pi / 4$

D.  $\pi^2 / 4$

**Answer: D**

**Solution:**

**Solution:**

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## Question 22

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

**Options:**

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

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

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

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

**Answer: B**

**Solution:**

**Solution:**

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## 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:**

**Solution:**

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## 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:**

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## Question 25

**The degree of the differential equation**

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

**Options:**

A. 1

B. 2

C. 6

D. 3

**Answer: C**

**Solution:**

**Solution:**

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## Question 26

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

**Options:**

- A.  $\vec{a}$  and  $\vec{b}$  are coincident
- B. Inclined to each other at  $60^\circ$
- C.  $\vec{a}$  and  $\vec{b}$  are perpendicular
- D.  $\vec{a}$  and  $\vec{b}$  are parallel

**Answer: C**

**Solution:**

**Solution:**

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## 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:**

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## Question 28

In the interval  $(0, \pi / 2)$ , 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**

**Solution:**

**Solution:**

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## 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:**

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## 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

$$\frac{x}{2} = \frac{y-2}{3} = \frac{z-3}{4} \text{ is}$$

Options:

A.  $\sqrt{33}$

B.  $\sqrt{53}$

C.  $\sqrt{66}$

D.  $\sqrt{29}$

Answer: B

Solution:

Solution:

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## 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:

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## 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.  $(2, 6, -4)$

B. (2, 6, 4)

C. (-2, 6, -4)

D. (2, -6, -4)

**Answer: A**

**Solution:**

**Solution:**

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## 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:**

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## Question 35

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

**Options:**

A. 8

B. 4

C. 12

D. 3

**Answer: D**

**Solution:**

**Solution:**



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## Question 36

If  $\vec{a} + 2\vec{b} + 3\vec{c} = \mathbf{0}$  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  $\lambda$  is equal to

Options:

- A. 4
- B. 6
- C. 2
- D. 3

Answer: B

Solution:

Solution:

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## 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:

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## Question 38

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

**Options:**

- A.  $\frac{5}{8}$
- B.  $\frac{1}{35}$
- C.  $\frac{7}{8}$
- D.  $\frac{1}{8}$

**Answer: B**

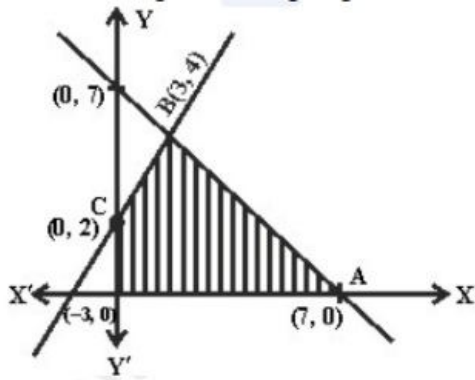
**Solution:**

**Solution:**

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## 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:**

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## Question 40

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:**

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## 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:**

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## Question 42

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:

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## 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:

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## Question 44

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

Options:

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

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:**

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## 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.  ${}^6C_3 \times {}^4P_2$

B.  ${}^6P_3 \times {}^4C_2$

C.  ${}^6C_3 \times {}^4C_2$

D.  ${}^6P_3 \times {}^4P_2$

**Answer: D**

**Solution:**

**Solution:**

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## Question 46

Which of the following is an empty set?

**Options:**

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

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

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

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

**Answer: D**

**Solution:**

**Solution:**

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## 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:**

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## Question 48

The value of  $e^{\log_{10} \tan 10^\circ + \log_{80} \tan 22^\circ + \log_{10} \tan 3^\circ + \dots + \log_{10} \tan 89^\circ}$  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  $3x + y = 3$ .

**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:**

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## Question 51

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

**Options:**

A. 2, 1

B. 1, 1

C. 2, 2

D. 1, 2

**Answer: C**

**Solution:**

**Solution:**

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## 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

$n^{\text{th}}$  term of the series  $1 + \frac{3}{7} + \frac{5}{7^2} + \frac{1}{7^2} + \dots$  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:**



**Solution:**

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## 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:**

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## Question 55

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

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## Question 56

**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:**

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## Question 57

**Let  $f(x) = \sin 2x + \cos 2x$  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:**

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## 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

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

**$f : \mathbb{R} \rightarrow \mathbb{R}$  and  $g : [0, \infty) \rightarrow \mathbb{R}$  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.  $(g \circ f)(-2) = 2$

C.  $(g \circ f)(4) = 4$

D.  $(f \circ g)(-4) = 4$

**Answer: D**

**Solution:**

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.  $60^\circ$

B.  $90^\circ$

C. Zero

D.  $45^\circ$

Answer: C

Solution:

Solution:

---

### Question 2

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

Options:

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

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

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

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

Answer: B

Solution:

Solution:

---

### 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  $90\Omega$  and the shunt resistance has a value of  $10\Omega$ . If there are 50 divisions in the galvanometer-turnedammeter on either sides of zero, its current sensitivity is

Options:

- A.  $2 \times 10^4 \text{A} / \text{div}$
- B.  $1 \times 10^5 \text{div} / \text{A}$
- C.  $2 \times 10^4 \text{div} / \text{A}$
- D.  $1 \times 10^5 \text{A} / \text{div}$

**Answer: B**

**Solution:**

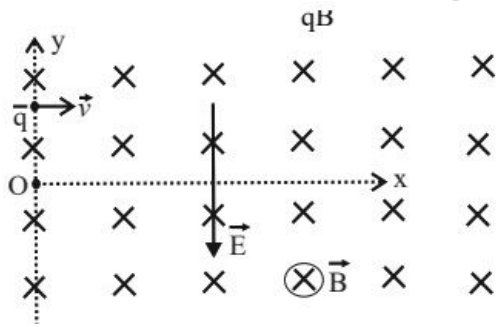
Solution:

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### Question 5

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

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  $t = \frac{mv}{qB}$  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:**

---

## Question 7

An ideal transformer 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.  $\frac{1}{10^{\text{th}}}$  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  $B_H = 3 \times 10^{-5} \text{T}$ . The emf induced in the rod at an instant  $t = 2 \text{ s}$  after it

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

Options:

- A.  $3 \times 10^{-4}\text{V}$
- B.  $6 \times 10^{-3}\text{V}$
- C.  $6 \times 10^{-4}\text{V}$
- D.  $3 \times 10^{-3}\text{V}$

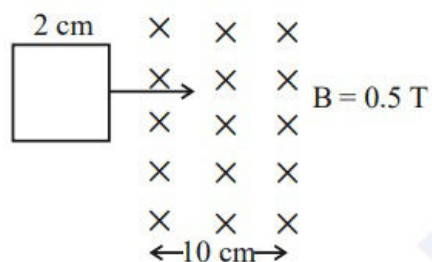
Answer: C

Solution:

Solution:

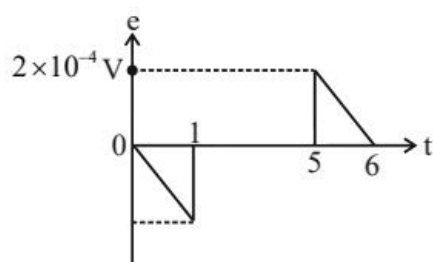
## Question 10

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

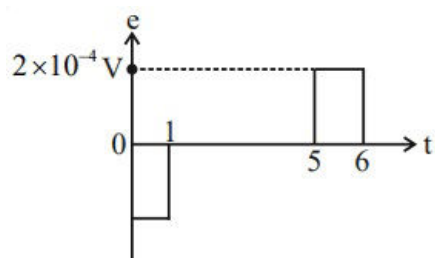


Options:

A.

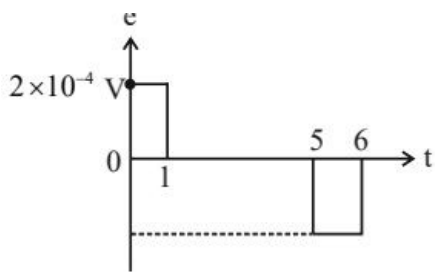


B.

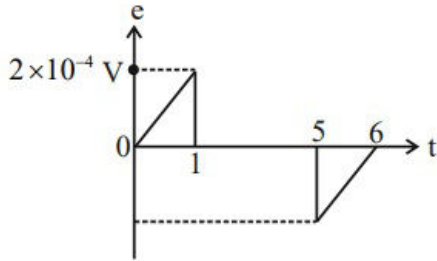


C.





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.  $\pi$

**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**

**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  $1\text{ms}^{-1}$  along the principal axis of a convex lens of focal length 10 cm. The speed of the image is also  $1\text{ms}^{-1}$ , 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

D. Primary wavefronts are lesser than those of secondary wavelets

**Answer: B**

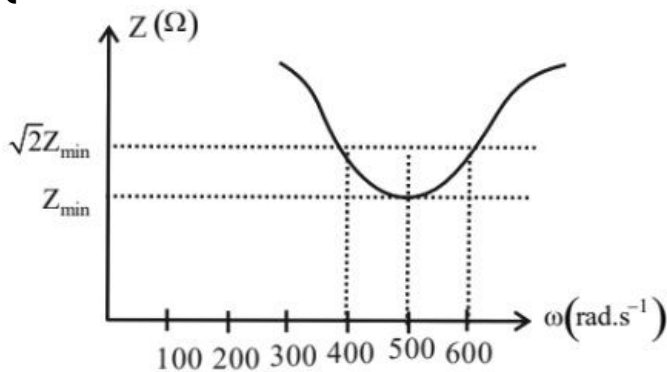
**Solution:**

**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.  $10^{-5}\text{ms}^{-1}$
- B.  $10^8\text{ms}^{-1}$
- C.  $10^{-8}\text{ms}^{-1}$

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

**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:**

---

## 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  $90^\circ$

Answer: A

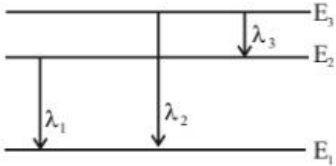
Solution:

Solution:

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## 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

**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.  $60^\circ$
- B.  $30^\circ$
- C.  $45^\circ$
- D.  $0^\circ$

**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  $2 \times 10^{-2} \text{Wm}^{-2}$ . The screen-slit distance is very large in comparison with slit-slit distance. The fringe width is  $\beta$ . 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.  $2 \times 10^{-2} \text{Wm}^{-2}$
- B.  $16 \times 10^{-2} \text{Wm}^{-2}$
- C.  $8 \times 10^{-2} \text{Wm}^{-2}$
- D.  $4 \times 10^{-2} \text{Wm}^{-2}$

**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**

**Options:**

- A.  $5 \times 10^{26}$
- B.  $2 \times 10^{29}$
- C.  $5 \times 10^{17}$
- D.  $2 \times 10^{20}$

**Answer: D**

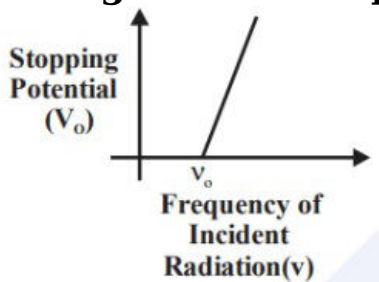
**Solution:**

**Solution:**

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## 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.  $\frac{h\nu}{e}, -\frac{h}{e}$
- B.  $h\nu, -h\nu_0$
- C.  $\frac{h}{e}, -\frac{h\nu_0}{e}$
- D.  $\frac{h\nu}{e}, \nu_0$

**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

**second.**

**Options:**

- A. 75
- B. 50
- C. 100
- D. 25

**Answer: B**

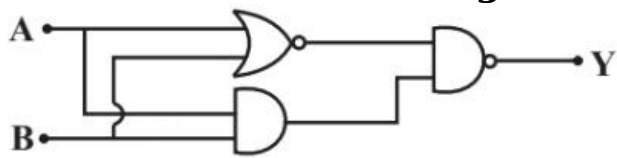
**Solution:**

**Solution:**

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## 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.



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.  $1.28 \times 10^{-11} \text{ kg} \cdot \text{m} \cdot \text{s}^{-1}$
- B.  $0.64 \times 10^{-27} \text{ kg} \cdot \text{m}^{-1}$
- C.  $1.28 \times 10^{-27} \text{ kg} \cdot \text{m} \cdot \text{s}^{-1}$
- D.  $2.56 \times 10^{-27} \text{ kg} \cdot \text{m} \cdot \text{s}^{-1}$

**Answer: C**

**Solution:**

**Solution:**

---

## Question 28

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

**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

**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.  $196\text{ms}^{-1}$
- B.  $20\text{ms}^{-1}$
- C. Zero
- D.  $14\text{ms}^{-1}$

**Answer: D**

**Solution:**

**Solution:**

---

## 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

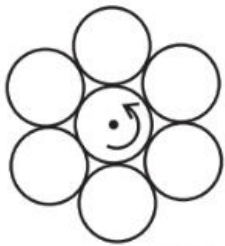
Solution:

Solution:

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## 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:

---

## 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

**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.  $6\text{ms}^{-2}$
- B. Zero
- C.  $1\text{ms}^{-2}$
- D.  $5\text{ms}^{-2}$

**Answer: C**

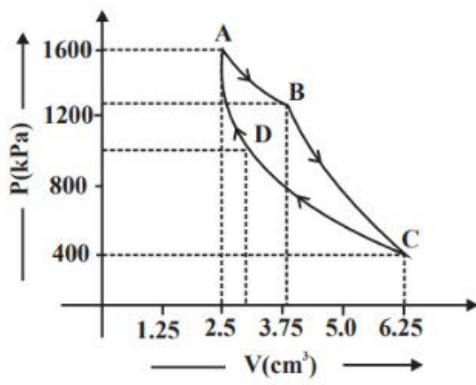
**Solution:**

**Solution:**

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## **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 ]**



**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  $Y = 2 \times 10^{11} \text{Nm}^{-2}$  has Poisson's ratio 0.25 . Its lateral strain  $\epsilon_l = 10^{-3}$ . The elastic energy density of the wire is**

**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**

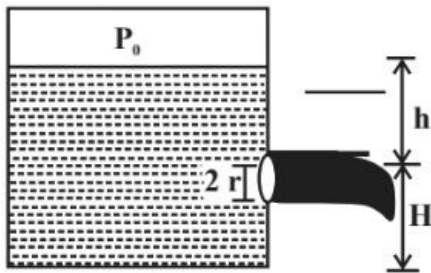
**Solution:**

**Solution:**

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## 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  $r \ll \sqrt{\frac{A}{\pi}}$ . 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 [  $\rho$  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:**

---



## Question 43

100g of ice at  $0^\circ\text{C}$  is mixed with 100g of water at  $100^\circ\text{C}$ . The final temperature of the mixture is

[Take  $L_f = 3.36 \times 10^5 \text{Jkg}^{-1}$  and  $S_w = 4.2 \times 10^3 \text{Jkg}^{-1}\text{k}^{-1}$  ]

Options:

A.  $50^\circ\text{C}$

B.  $1^\circ\text{C}$

C.  $40^\circ\text{C}$

D.  $10^\circ\text{C}$

Answer: D

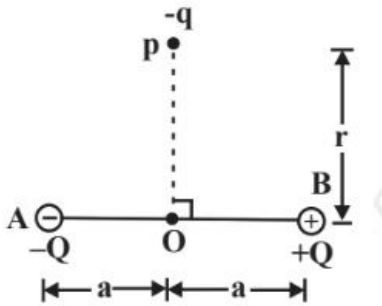
Solution:

Solution:

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## Question 44

In the situation shown in the diagram, magnitude of  $q \ll |Q|$  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.  $-\frac{1}{4\pi\epsilon_0} \frac{pq}{r^2} \hat{k}, -\frac{1}{4\pi\epsilon_0} \frac{pq}{r^3} \hat{i}$

B.  $\frac{1}{4\pi\epsilon_0} \frac{pq}{r^3} \hat{i}, +\frac{1}{4\pi\epsilon_0} \frac{pq}{r^2} \hat{k}$

C.  $\frac{1}{4\pi\epsilon_0} \frac{pq}{r^3} \hat{i}, -\frac{1}{4\pi\epsilon_0} \frac{pq}{r^2} \hat{k}$

D.  $\frac{1}{4\pi\epsilon_0} \frac{pq}{r^2} \hat{k}, \frac{1}{4\pi\epsilon_0} \frac{pq}{r^3} \hat{i}$

Answer: C

Solution:

**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  $\omega'$  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.  $x = Ae^{-\frac{b}{m}t} \cos(\omega't + \varphi)$
- D.  $\omega' = \sqrt{\frac{k}{m} - \frac{b^2}{4m^2}}$

**Answer: C**

**Solution:**

**Solution:**

---

## 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  $v_{\text{rms}}$ . The ratio of the velocities  $v$  and  $v_{\text{rms}}$  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.  $1.6 \times 10^{-19}\text{C}$

B. Positive charge

C. Negative charge

D. Zero

**Answer: D**

**Solution:**

Solution:

---

## Question 49

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.  $V_1 > V_2, C_1 > C_2$

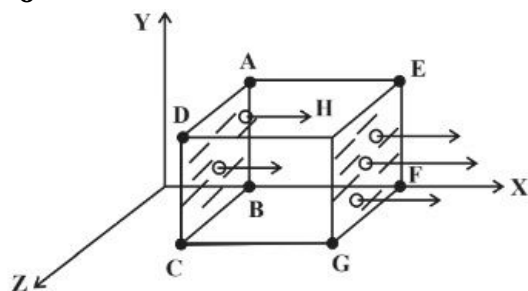
Answer: B

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  $6\text{kNC}^{-1}$  and  $9\text{kNC}^{-1}$  respectively. Then the total charge enclosed by the cube is [ . Take  $\epsilon_0 = 9 \times 10^{-12}\text{Fm}^{-1}$  ]



Options:

- A.  $-1.35$  nC
- B.  $0.27$  nC
- C.  $-0.27$  nC
- D.  $1.35$  nC

Answer: B

Solution:

Solution:

---

## Question 51

Electric field at a distance ' r ' from an infinitely long uniformly charged straight conductor, having linear charge density  $\lambda$  is  $E_1$ . Another uniformly charged conductor having same linear charge density  $\lambda$  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

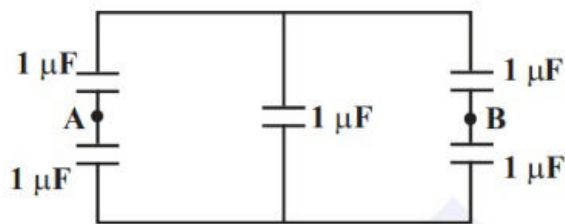
Solution:

Solution:

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## Question 52

Five capacitors each of value  $1\mu\text{F}$  are connected as shown in the figure. The equivalent capacitance between A and B is



Options:

- A.  $2\mu\text{F}$
- B.  $5\mu\text{F}$
- C.  $3\mu\text{F}$
- D.  $1\mu\text{F}$

Answer: D

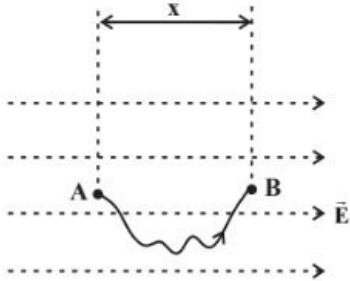
Solution:

Solution:

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## 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  $1\Omega$  are connected in series with two cells wrongly connected. A resistor of  $10\Omega$  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

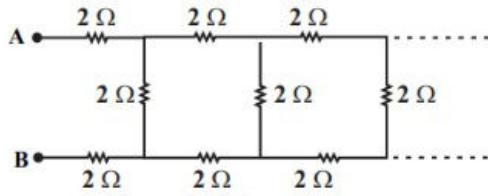
**Solution:**

**Solution:**

---

## Question 55

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



**Options:**

- A.  $0.05\Omega$
- B.  $5\Omega$
- C.  $0.5\Omega$
- D.  $5.5\Omega$

**Answer: D**

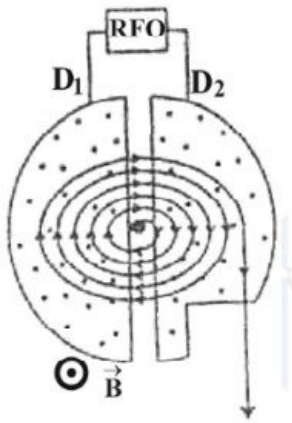
**Solution:**

**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  $D_1$

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  $4.7\text{k}\Omega \pm 5\%$ . 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.  $8.2\Omega \pm 5\%$

B.  $82\Omega \pm 5\%$

C.  $5.2\Omega \pm 5\%$

D.  $82\Omega \pm 10\%$

**Answer: A**

**Solution:**

**Solution:**



---

## Question 59

A wire of resistance  $R$  is connected across a cell of emf  $\varepsilon$  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.  $\varepsilon It$
- 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  $\mu$ . When the current is increased at constant temperature

Options:

- A.  $v_d$  decreases,  $\mu$  remains the same
- B.  $v_d$  remains the same,  $\mu$  decreases
- C.  $v_d$  increases,  $\mu$  remains the same
- D.  $v_d$  remains the same,  $\mu$  increases

**Answer: C**

**Solution:**

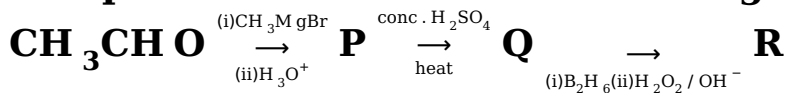
**Solution:**

---

**Chemistry**

## Question 1

**Compounds P and R in the following reaction are**



**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<sub>3</sub> gives B. A and B respectively are,**

**Options:**

- A. Iodobenzene, 1-Iodo-4-nitrobenzene
- B. Phenol, Picric acid
- C. Methanol, Ethanoic acid

D. Picric acid, Phenol

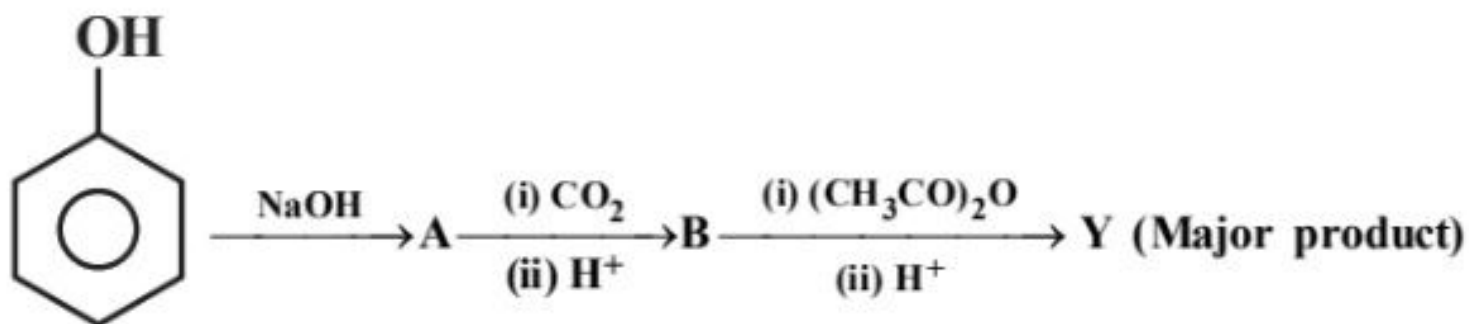
**Answer: B**

**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<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>
- B. CrO<sub>3</sub>
- C. PCC
- D. Alkaline KMnO<sub>4</sub>

**Answer: C**

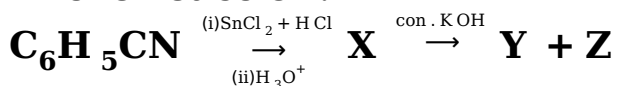
**Solution:**

**Solution:**

---

## Question 6

**In the reaction:**



**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.

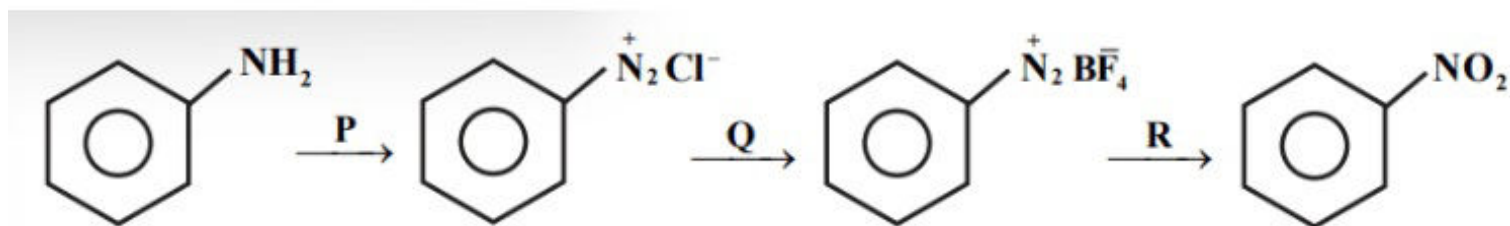
**Answer: B**

**Solution:**

**Solution:**

---

## Question 7



**P, Q and R respectively are :**

**Options:**

- A.  $\text{NaNO}_2 + \text{dil. HCl}$ ,  $\text{BF}_3$ ,  $\text{Cu} + \text{NaNO}_2$
- B.  $\text{NaNO}_3 + \text{dil. HCl}$ ,  $\text{F}_2$ ,  $\text{Cu} + \text{NaNO}_3$
- C.  $\text{NaNO}_2 + \text{dil. HCl}$ ,  $\text{HBF}_4$ ,  $\text{Cu} + \text{NaNO}_2$
- D.  $\text{NaNO}_2 + \text{con. HCl}$ ,  $\text{F}_2$ ,  $\text{Cu} + \text{NaNO}_3$

**Answer: C**

**Solution:**

**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. Racemic 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 :**

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**

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:**

- 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  $\frac{2^{\text{rd}}}{3}$  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  $+788 \text{ kJ mol}^{-1}$  and  $\Delta_{\text{Hyd}}^{\text{H}} = -784 \text{ kJ mol}^{-1}$ .**

**Enthalpy of solution of NaCl is**

**Options:**

- A.  $-572 \text{ kJ mol}^{-1}$
- B.  $-4 \text{ kJ mol}^{-1}$
- C.  $+572 \text{ kJ mol}^{-1}$
- D.  $+4 \text{ kJ mol}^{-1}$

**Answer: D**



**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.  $2 \times 10^{-10}$
- B.  $2 \times 10^{-5}$
- C.  $2 \times 10^{-4}$
- D.  $2 \times 10^{-6}$

**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:**

---

## 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  ${}_{16}^{32}\text{S}^{2-}$  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

D.  $\text{Be} < \text{Li} < \text{B} < \text{C}$

**Answer: C**

**Solution:**

**Solution:**

---

## Question 22

**Which of the following statement is INCORRECT?**

**Options:**

- A. Bond length of  $\text{O}_2 < \text{Bond length of } \text{O}_2^{2-}$
- B. Bond order of  $\text{O}_2 > \text{Bond order of } \text{O}_2^{2-}$
- C. Bond length of  $\text{O}_2 > \text{Bond length of } \text{O}_2^{2+}$
- D. Bond order of  $\text{O}_2^+ < \text{Bond order of } \text{O}_2^{2-}$

**Answer: D**

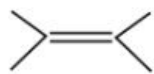
**Solution:**

**Solution:**

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## 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**

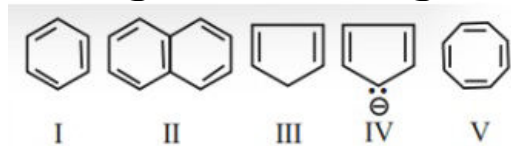
**Solution:**

**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<sub>2</sub>
- C. CO
- D. O<sub>2</sub>

Answer: C

Solution:

Solution:

---

## Question 26

What is the oxidation number of S in H<sub>2</sub>S<sub>2</sub>O<sub>8</sub> ?

**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<sub>2</sub>O<sub>3</sub>, Li<sub>2</sub>O
- D. BeO, BO<sub>3</sub>

**Answer: B**

**Solution:**

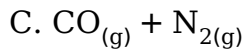
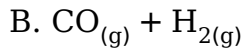
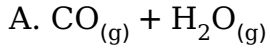
**Solution:**

---

## Question 29

**The composition of water gas is**

**Options:**



**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**

58.5 ) and 9.50%  $\left( \frac{w}{w} \right)$  XY (molecular mass 95 ). Assuming 80% ionisation of AB and 60% ionisation of XY<sub>2</sub>, the freezing point of water sample is  
 [Given : K<sub>f</sub> for water 1.86K kg mol<sup>-1</sup>, Freezing point of pure water is 273K and A, B and Y are 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 <sub>2</sub> O
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:**

---

## Question 33

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

Options:

- A.  $6.4 \times 10^{-29}$
- B.  $4 \times 10^{-10}$
- C.  $64 \times 10^{-29}$
- D.  $4 \times 10^{-29}$

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:



**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  $6.0 \times 10^5 \text{ s}^{-1}$ . The value of Arrhenius factor A at infinitely high temperature is :**

**Options:**

- A.  $\frac{6 \times 10^{-5}}{300}$
- B.  $6 \times 10^5$
- C.  $6 \times 10^5 \times e^{-E_a / 300R}$
- D.  $e^{-E_a / 300R}$

**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.  $\frac{1000}{2.303} \text{K}$
- B. 1000K
- C.  $\frac{2000}{2.303} \text{K}$

D. 2000K

**Answer: A**

**Solution:**

**Solution:**

---

## Question 38

**During the electrolysis of brine, by using inert electrodes,**

**Options:**

- A. Na deposits on cathode
- B.  $\text{Cl}_2$  liberates at anode
- C.  $\text{O}_2$  liberates at anode
- D.  $\text{H}_2$  liberates at anode

**Answer: B**

**Solution:**

**Solution:**

---

## Question 39

**Consider the following 4 electrodes**

**A :  $\text{Ag}^+(0.0001\text{M}) / \text{Ag}_{(s)}$ ; B :  $\text{Ag}^+(0.1\text{M}) / \text{Ag}_{(s)}$**

**C :  $\text{Ag}^+(0.01\text{M}) / \text{Ag}_{(s)}$ ; D :  $\text{Ag}^+(0.001\text{M}) / \text{Ag}_{(s)}$ ;  $E_{\text{Ag}^+ / \text{Ag}}^\circ = +0.80\text{V}$ .**

**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:**

---

## Question 40

The resistance of 0.1M weak acid HA in a conductivity cell is  $2 \times 10^3 \text{ Ohm}$ . The cell constant of the cell is  $0.78 \text{ Cm}^{-1}$  and  $\lambda_m^\circ$  of acid HA is  $390 \text{ Scm}^2 \text{ mol}^{-1}$ . 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  $\text{mol L}^{-1} \text{ s}^{-1}$ .

Options:

- A.  $2\text{NO}_{(g)} + \text{O}_{2(g)} \rightarrow 2\text{NO}_{2(g)}$
- B. Decomposition of HI on the surface of Gold
- C. Acid catalysed hydrolysis of  $\text{CH}_3\text{COOCH}_3$
- D.  $\text{CHCl}_3 + \text{Cl}_2 \rightarrow \text{CCl}_4 + \text{HCl}$

Answer: B

Solution:

Solution:

---

## Question 42

For the formation of which compound in Ellingham diagram  $\Delta G^\circ$  becomes more and more negative with increase in temperature?

**Options:**

- A. ZnO
- B. Cu<sub>2</sub>O
- C. CO
- D. FeO

**Answer: C**

**Solution:**

**Solution:**

---

## Question 43

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

**Options:**

- A. NH<sub>4</sub>NO<sub>3</sub>
- B. (NH<sub>4</sub>)<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>
- C. Ba(N<sub>3</sub>)<sub>2</sub>
- D. NH<sub>4</sub>NO<sub>2</sub>

**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.

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

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

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

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

**Answer: D**

**Solution:**

**Solution:**

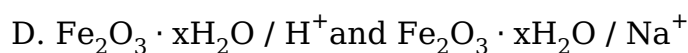
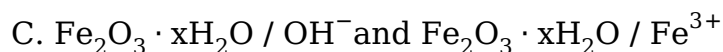
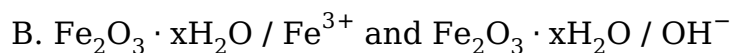
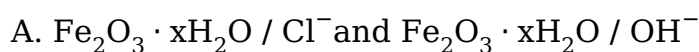
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## Question 46

When  $\text{FeCl}_3$  is added to excess of hot water gives a sol ' X '. When  $\text{FeCl}_3$  is added to  $\text{NaOH}_{(\text{aq})}$  solution, gives sol ' Y '.

X and Y formed in the above processes respectively are

**Options:**



**Answer: B**

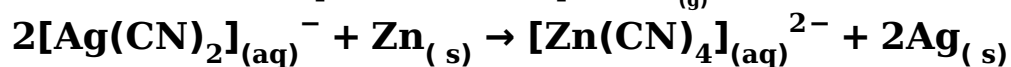
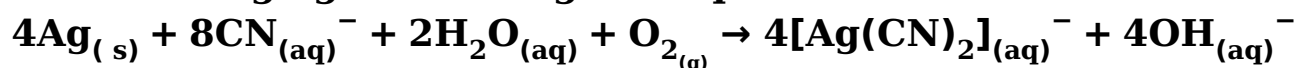
**Solution:**

**Solution:**

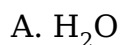
---

## Question 47

The reducing agent in the given equations :



**Options:**



D. O<sub>2</sub>

**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

$a\text{MnO}_4^- + b\text{S}_2\text{O}_3^{2-} + \text{H}_2\text{O} \rightarrow x\text{MnO}_2 + y\text{SO}_4^{2-} + z\text{OH}^-$  a and y respectively are

**Options:**

A. 3; 6

B. 8; 8

C. 8; 3

D. 8; 6

**Answer: D**

**Solution:**

**Solution:**

---

## Question 50

Which formula and name combination is INCORRECT?

Options:

- A.  $[\text{CoCl}_2(\text{en})_2]\text{Cl}$ -Dichloridodiethylenediammine cobalt (II) chloride
- B.  $[\text{Co}(\text{NH}_3)_4(\text{H}_2\text{O})\text{Cl}]\text{Cl}_2$  - Tetraammineaquachloridocobalt (III) chloride
- C.  $\text{K}_3[\text{Al}(\text{C}_2\text{O}_4)_3]$  - Potassium trioxalatoaluminate (III)
- D.  $[\text{Pt}(\text{NH}_3)_2\text{Cl}(\text{NO}_2)]$  - 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.  $\text{AsH}_3 > \text{SbH}_3 > \text{NH}_3 > \text{PH}_3$
- B.  $\text{NH}_3 > \text{PH}_3 > \text{AsH}_3 > \text{SbH}_3$



C.  $\text{SbH}_3 > \text{AsH}_3 > \text{PH}_3 > \text{NH}_3$

D.  $\text{PH}_3 > \text{AsH}_3 > \text{SbH}_3 > \text{NH}_3$

**Answer: B**

**Solution:**

**Solution:**

---

## Question 53

**Which one of the following oxoacids of phosphorus can reduce  $\text{AgNO}_3$  to metallic silver?**

**Options:**

A.  $\text{H}_4\text{P}_2\text{O}_6$

B.  $\text{H}_3\text{PO}_4$

C.  $\text{H}_3\text{PO}_2$

D.  $\text{H}_4\text{P}_2\text{O}_7$

**Answer: C**

**Solution:**

**Solution:**

---

## Question 54

**In solid state,  $\text{PCl}_5$  is a/an**

**Options:**

A. Ionic solid with  $[\text{PCl}_4]^+$  and  $[\text{PCl}_6]^-$

B. Covalent solid present in the form of  $\text{P}_2\text{Cl}_{10}$

C. Octahedral structure

D. Ionic solid with  $[\text{PCl}_6]^+$  and  $[\text{PCl}_4]^-$

**Answer: A**

**Solution:**

**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



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

the molar ratio en : Ni: : 1 : 1, 2 : 1, 3 : 1 to  $[\text{Ni}(\text{H}_2\text{O})_6]^{2+}$  aq solution, following co-ordination entities are formed.

I.  $[\text{Ni}(\text{H}_2\text{O})_4\text{en}]_{(\text{aq})}^{2+}$  -pale blue

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

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

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

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.  $(\text{CH}_3\text{COO})_2\text{Ca}$

B.  $\text{CH}_3\text{ONa}$

C.  $\text{CH}_3\text{COONa}$

D.  $\text{CH}_3\text{CH}_2\text{MgBr}$

Answer: D

Solution:

Solution:

---

## Question 59

A pair of compounds having the same boiling points are

Options:

- A. Benzene and naphthalene
- B. (+) butan -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:**



**Options:**

- A.  $\text{CH}_3\text{CH}_2\text{CN}$ ,  $\text{C}_2\text{H}_5\text{OH}$ ,  $\text{C}_2\text{H}_5\text{N}_2\text{Cl}$
- B.  $\text{CH}_3\text{CH}_2\text{CN}$ ,  $\text{CH}_3\text{CH}_2\text{NH}_2$ ,  $\text{C}_2\text{H}_5\text{OH}$
- C.  $\text{CH}_3\text{CH}_2\text{CN}$ ,  $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$ ,  $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
- D.  $\text{CH}_3\text{CH}_2\text{NC}$ ,  $\text{CH}_3\text{CH}_2\text{OH}$ ,  $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$

**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

**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?**

**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.

**Answer: B**

**Solution:**

**Solution:**

---

## Question 7

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

**Options:**

A.

	<b>Menstruation phase</b>	<b>Follicular phase</b>	<b>Luteal phase</b>
A	Menses	L.H. Surge	Regeneration of endometrium

B.

	<b>Menstruation phase</b>	<b>Follicular phase</b>	<b>Luteal phase</b>
B	Matured follicle	Regression of corpus luteum	Ovulation

C.

	<b>Menstruation phase</b>	<b>Follicular phase</b>	<b>Luteal phase</b>
C	Regeneration of endometrium	High level of progesterone	Developing corpus luteum

D.

	<b>Menstruation phase</b>	<b>Follicular phase</b>	<b>Luteal phase</b>
D	Menses	Developing corpus luteum	Follicle maturation

**Answer: A**

**Solution:**

**Solution:**

---

## 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**



**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:**

**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

- 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:**

---

## 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

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:**

**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.

- B. Found in North American desert.
- C. Eliminates dilute urine.
- D. Meets its 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:**

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  $7.5\text{g} / \text{cm}^3$

B. more than  $5\text{g} / \text{cm}^3$

C. more than  $12.5\text{g} / \text{cm}^3$

D. more than  $15\text{g} / \text{cm}^3$

**Answer: C**

**Solution:**



**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<sub>2</sub> – 60%, Methane – 20%, N<sub>2</sub>O – 14%
- B. CFC – 14%, CO<sub>2</sub> – 60%, Methane – 20%, N<sub>2</sub>O – 6%
- C. CFC – 14%, CO<sub>2</sub> – 60%, Methane – 6%, N<sub>2</sub>O – 20%
- D. CFC – 20%, CO<sub>2</sub> – 60%, Methane – 14%, N<sub>2</sub>O – 6%

**Answer: B**

**Solution:**

**Solution:**

---

## Question 31

**A flower has 10 stamens each having bilobed dithecaous 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**

**Options:**

- A. Enzyme DNA dependent RNA polymerase always catalyse polymerisation in both 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.

D. Energy flow is unidirectional.

**Answer: A**

**Solution:**

**Solution:**

---

## Question 35

**Find out the correct match.**

**Options:**

A.

	<b>Disease</b>	<b>Pathogen</b>	<b>Main organ affected</b>
(A)	Filariasis	Common round worm	Smallintestine

B.

	<b>Disease</b>	<b>Pathogen</b>	<b>Main organ affected</b>
(B)	Ringworm	Fungus	Skin

C.

	<b>Disease</b>	<b>Pathogen</b>	<b>Main organ affected</b>
(C)	Dysentery	Protozoa	Liver

D.

	<b>Disease</b>	<b>Pathogen</b>	<b>Main organ affected</b>
(D)	Typhoid	Bacteria	Lungs

**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:**

- 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:**

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## Question 39

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

**Options:**

- A. Respiration and Excretion

- B. Osmoregulation and Circulation
- C. Respiration and Osmoregulation
- D. Osmoregulation and Excretion

**Answer: D**

**Solution:**

**Solution:**

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## Question 40

**Identify the floral formula of plant belonging to potato family.**

**Options:**

A.

$$\frac{\text{♂}}{\text{♀}}, P_{3+3}, A_{3+3}, \underline{G}_{(3)}$$

B.

$$\frac{\text{♂}}{\text{♀}}, K_{(5)}, \overbrace{C_{(5)}}^{\text{---}}, A_5, \underline{G}_{(2)}$$

C.

$$\frac{\text{♂}}{\text{♀}}, K_{(5)}, C_{(5)}, A_{(9)+1}, G_1$$

D.

$$\frac{\text{♂}}{\text{♀}}, K_{10}, C_{10}, A_{10}, \overline{G}_2$$

**Answer: B**

**Solution:**

**Solution:**

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## Question 41

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

**Options:**

- A. Endarch
- B. Exarch

C. Closed

D. Open

**Answer: D**

**Solution:**

**Solution:**

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## 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:**

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## 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:**

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## 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



**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 direction 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:**

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## 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:**

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## Question 48

**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:**

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## **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:**

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## **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**

**Solution:**

**Solution:**

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## Question 51

**The vibrations from the ear drum are transmitted through ear ossicles to**

**Options:**

- A. Tectorial membrane
- B. Cochlea
- C. Auditory nerves
- D. Oval window

**Answer: D**

**Solution:**

**Solution:**

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## 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:**

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## Question 53

**In Bryophyllum, the adventitious buds arise from**

**Options:**

- A. Shoot apex
- B. Leaf axil
- C. Leaf base
- D. Notches in the leaf margin

**Answer: D**

**Solution:**

**Solution:**

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## 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**

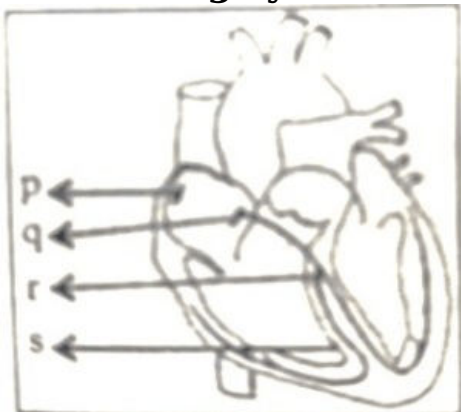
**Solution:**

**Solution:**

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## Question 55

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



**Options:**

- A. p-Bundle of His, q-SAN, r-Interventricular septum, s-AVN
- B. p-SAN, q-AV N, r-Bundle of His, s-Interventricular septum
- C. p-Interventricular septm, q-AVN, r-Bundle of His, s-SAN
- D. p-AVN, q-SAN, r-Interventricular septum, s-Bundle of His

**Answer: B**

**Solution:**

**Solution:**

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## 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:**

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## 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

- C. Both Statement 1 and Statement 2 are wrong
- D. Both Statement 1 and Statement 2 are correct

**Answer: D**

**Solution:**

**Solution:**

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## 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:**

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## 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

**Answer: B**

**Solution:**

**Solution:**

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## **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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