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## ACADEMY

JEE Main – 24<sup>th</sup> January – 2025 (Shift-1)

[Memory Based Questions]

### PHYSICS

1. Body projected with initial velocity  $v_0$  at  $45^\circ$  angle in  $X - Y$  Plane. Angular momentum at highest point is.

- a)  $mv_0^3/4\sqrt{2}g$       b)  $mv_0^3/8\sqrt{2}g$       c)  $mv_0^3/2\sqrt{2}g$       d)  $mv_0^3/6\sqrt{2}g$

Ans: (a)

2. A solid cylinder rolling on the inclined plane at an angle  $30^\circ$  without slipping. The acceleration is

- a)  $\frac{g}{3}$       b)  $\frac{g}{2}$       c)  $g$       d)  $2g$

Ans: (a)

3. A wire of resistance 9 ohm is bent into a form of equilateral triangle the equivalent resistance between any two points of its vertex will be

Ans:  $2\Omega$

4. A big spherical drop break down to 27 drops the work done to break is 10 J and the same drop break into 64 droplets of same radius find the work done.

Ans: 15J

5. An alternating current is given by  $I = I_1\cos \omega t + I_2\sin \omega t$ . The RMS value of current is given by?

- a)  $\frac{I_1+I_2}{\sqrt{2}}$       b)  $\frac{I_1+I_2}{\sqrt{2}}$       c)  $\sqrt{\frac{I_1^2+I_2^2}{2}}$       d)  $\frac{\sqrt{I_1^2+I_2^2}}{2}$

Ans: (c)

6. What is relative shift of focal length of a lens when optical power is increased from 0.1 D to 2.5 D?

- a)  $\frac{24}{25}$       b)  $\frac{13}{10}$       c)  $\frac{21}{25}$       d)  $\frac{11}{10}$

Ans: (a)

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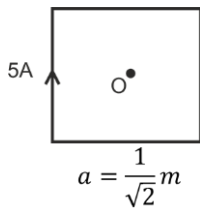
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## ACADEMY

7. A particle execute shm with time 2 s and has amplitude of 1 cm. What is the ratio of total distance and displacement in 12.5 sec i.e. D/d
- a) 25/4                      b) 25/3                      c) 25/1                      d) 25/2

**Ans: (c)**

8. Find magnetic field at the center O of the given square



**Ans:  $8\mu T$**

9.  $F = \alpha + \beta x^2$ ,  $\alpha = 1$  (constant)

Distance travelled is (1 m) & work done is (5 J). find ?

- a) 15                      b) 12                      c) 10                      d) 11

**Ans: (b)**

10. Radius of Curvature of plano convex lens is 2 cm and refractive index is 1.5 has focal length  $f_1$  in air and  $f_2$  in a medium of refractive index 1.2. Calculate  $f_1/f_2$  ?

- a) 1/4                      b) 1/3                      c) 1/6                      d) 1/2

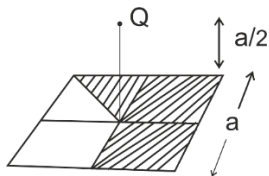
**Ans: (d)**

11. Radius of curvature of two lenses are  $R_1$  and  $R_2$  whose refractive index  $\mu_1$  and  $\mu_2$ . Ratio of focal length is

- a)  $\frac{(\mu_1-1)R_2}{(\mu_2-1)R_1}$                       b)  $\frac{\mu_1R_2}{\mu_2R_1}$                       c)  $\frac{(\mu_2-1)R_1}{(\mu_1-1)R_2}$                       d)  $\frac{R_2}{R_1}$

**Ans: (c)**

12. The electric flux through the shaded area of square plate of side a due to point charge placed at distance of  $a/2$  from it as shown in fig is  $\frac{NQ}{48G_0}$ , then N is



**Ans: 5**

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13. Time period of planet A of radius R is  $T_1$  and time period of planet B of radius  $1.3R$  is  $T_2$ . Then find the ratio of  $T_1$  and  $T_2$
- a)  $2/3$                       b)  $3/2$                       c)  $3/4$                       d)  $4/3$

Ans: (a)

14. De Broglie wavelength of electron when it moves from A to C is  $2000\text{Å}$  and becomes  $6000\text{Å}$  when it moves from B to C. Then wavelength when it moves from A to B

Ans:  $3000\text{Å}$

15. If the distance between two parallel plates of a capacitor is  $d$ ,  $A$  is the area of each plate, and  $E$  is the electric field. Find the energy stored in capacitor
- a)  $\frac{1}{2} E^2 A \epsilon_0 d$                       b)  $\frac{1}{4} E^2 A \epsilon_0 d$                       c)  $\frac{3}{4} E^2 A \epsilon_0 d$                       d)  $E^2 A \epsilon_0 d$

Ans: (a)

16. One mole of monoatomic gas is heated at constant pressure. If the ratio of Heat absorbed to change in internal energy is  $\frac{x}{9}$ , then find the value of  $x$ .

Ans: 15

17. A man is taking a turn across a banked road. with friction coefficient ( $\mu$ ) & Banking angle  $\theta$ . Find the value of max speed with he can take the turn without slipping?

Ans:  $V_{\max} = \sqrt{\frac{\mu + \tan \theta}{1 - \mu \tan \theta}}$

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## ACADEMY

### CHEMISTRY

1. Which of the following strong oxidizing agent?

- a)  $\text{Eu}^{2+}$                       b)  $\text{Ce}^{2+}$                       c)  $\text{Ce}^{4+}$                       d)  $\text{Eu}^{4+}$

Ans: (c)

2. Process is non-spontaneous at freezing point but spontaneous at boiling point, find  $\Delta H$  and  $\Delta S$ .

- a) Both are Positive                      b) Both are Negative  
c)  $\Delta S$  Positive,  $\Delta H$  Negative                      d)  $\Delta S$  Negative,  $\Delta H$  Positive

Ans: (a)

3. If 10 mol CO and 10 mol of  $\text{Fe}_3\text{O}_4$  reacts according to  $\text{Fe}_3\text{O}_4 + 4\text{CO} \rightarrow 4\text{CO}_2 + 3\text{Fe}$ . What is the weight of Fe produce?

- a) 420g                      b) 540g                      c) 340g                      d) 620g

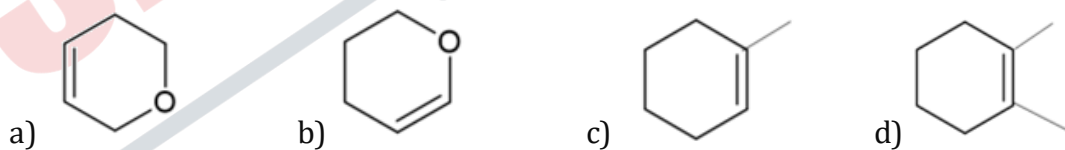
Ans: (a)

4. The difference in melting point and boiling point of oxygen and sulphur can be explained by

- a) Electronegativity                      b) Electron gain enthalpy  
c) Atomicity                      d) Ionization energy

Ans: (c)

5. Which of the following will react with HBr faster ?



Ans: (b)

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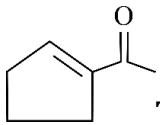
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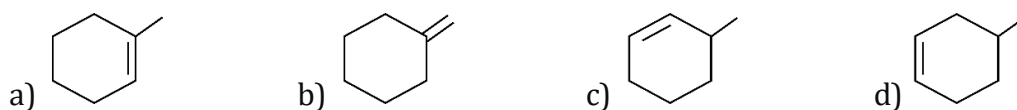
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10.  This compound is aldol condensation product of which of the following alkene after ozonolysis ?



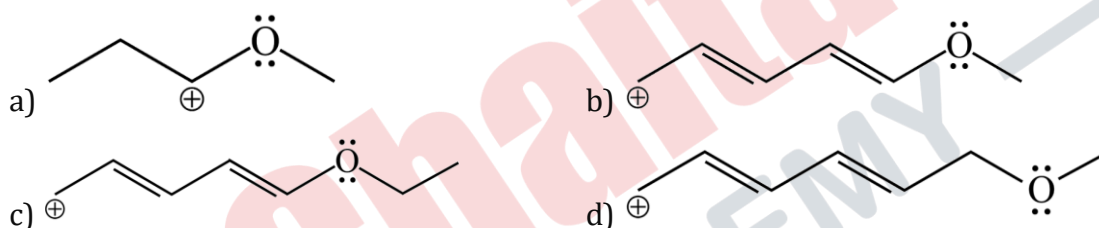
Ans: (a)

11. In Duma's method, which gas is evolved?



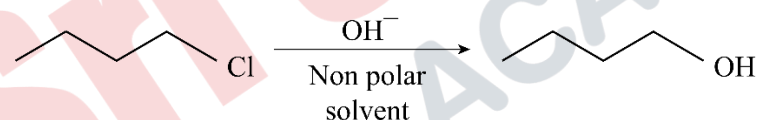
Ans: (a)

12. Stability of carbocation is maximum in ?

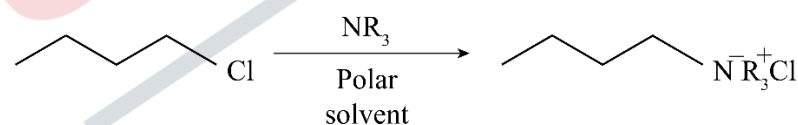


Ans: (c)

13. **Statement-1**



**Statement-2**



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

Ans: (b)

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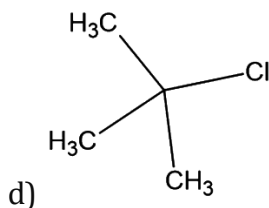
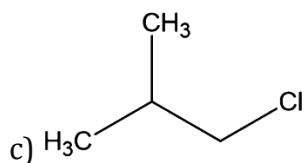
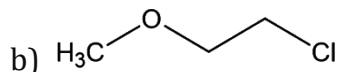
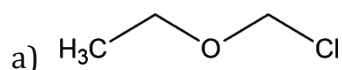




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## ACADEMY

18. Which of the following give nucleophile substitution reaction fastest?



Ans: (a)

19.  $\text{Ag}^+ + e^- \rightarrow \text{Ag}$   $E^0 = xV$

$\text{Fe}^{+2} + 2e^- \rightarrow \text{Fe}^0 = yV$

$\text{Fe}^{+3} + 3e^- \rightarrow \text{Fe}^0 = zV$

Then Find the  $E_{\text{cell}}^0$  for  $\text{Fe}^{+2} + \text{Ag} \rightarrow \text{Fe}^{+3} + \text{Ag}^+$

a)  $x - 2y$

b)  $x + 2y - 3z$

c)  $x + y - z$

d)  $x + y + z$

Ans: (b)

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## ACADEMY

### MATHEMATICS

1. If the 5<sup>th</sup>, 6<sup>th</sup> and 7<sup>th</sup> term of the binomial expansion of  $(1 + x^2)^{n+4}$  are in A.P. Then the greatest binomial coefficient in the expansion of  $(1 + x^2)^{n+4}$  is  
a) 10                      b) 35                      c) 25                      d) 14  
**Ans: (b)**
2. Number of 3 digit number which are divisible by 2 & 3 but not divisible by 4 & 9.  
**Ans: 125**
3. If A is  $3 \times 3$  matrix such that  $\det(A) = 2$ . Then  $\det(\text{adj}(\text{adj}(\text{adj}(\text{adj} A))))$   
a)  $2^{32}$                       b)  $2^{16}$                       c)  $2^8$                       d)  $2^{12}$   
**Ans: (b)**
4. Evaluate  $\lim_{x \rightarrow 0} \text{cosec } x \cdot (\sqrt{2\cos^2 x + 3\cos x} - \sqrt{\cos^2 x + \sin x + 4})$   
a) 0                      b) 1                      c)  $\frac{1}{2\sqrt{5}}$                       d)  $-\frac{1}{2\sqrt{5}}$   
**Ans: (d)**
5. If the images of the points A(1, 3), B(3, 1) and C(2, 4) in the line  $x + 2y = 4$  are D, E and F respectively, then the centroid of the triangle DEF is  
a)  $(1/3, 0)$                       b)  $(0, -1/3)$                       c)  $(2, 4)$                       d)  $(2/3, 0)$   
**Ans: (d)**
6. Let the parabola  $y = x^2 + px - 3$  cuts the coordinate axes at P, Q and R. A circle with centre  $(-1, -1)$  passes through P, Q and R, then the area of triangle PQR.  
a) 6                      b) 8                      c) 9                      d) 11  
**Ans: (a)**
7. The area of the region bounded by  $S(x, y)$  such that  $S = \{(x, y): x^2 + 4x + 2 \leq y \leq |x + 2|\}$  is (in sq. units)  
a)  $\frac{24}{5}$                       b) 5                      c)  $\frac{20}{3}$                       d) 7  
**Ans: (c)**

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## ACADEMY

8. If  $\vec{a} = \hat{i} + 2\hat{j} + 3\hat{k}$ ,  $\vec{b} = 3\hat{i} + \hat{j} - \hat{k}$  and  $\vec{c}$  is coplanar with  $\vec{a}$  and  $\vec{b}$ . Also  $\vec{a} \cdot \vec{c} = 5$  and  $\vec{c}$  is perpendicular to  $\vec{b}$ . Then  $|\vec{c}|$  is

- a) 18                      b) 16                      c)  $\frac{\sqrt{5}}{14}$                       d)  $\frac{\sqrt{11}}{6}$

**Ans: (d)**

9.  $f(x) - 6f\left(\frac{1}{x}\right) = \frac{35}{3x} - \frac{5}{2}$ . If  $\lim_{x \rightarrow 0} \left(\frac{1}{\alpha x} + f(x)\right) = \beta$ . Find  $(\alpha + 2\beta)$

- a) 4                      b) 7                      c) 11                      d) 3

**Ans: (a)**

10. Mean of 10 numbers is 5.5,  $\sum_{i=1}^{10} x_i^2 = 371$ . Two numbers are read wrong of 4 and 5 is instead of 6 and 8. Find correct variance.

- a) 5                      b) 11                      c) 7                      d) 9

**Ans: (c)**

11. If  $\alpha$  and  $\beta$  are real numbers such that  $\sec^2(\tan^{-1}(\alpha)) + \operatorname{cosec}^2(\cot^{-1}(\beta)) = 36$  and  $\alpha + \beta = 8$ , then  $(\alpha^2 + \beta)$  is ( $\alpha > \beta$ )

- a) 23                      b) 28                      c) 24                      d) 27

**Ans: (b)**

12. A and B throws dies. A wins if he get sum of 5 before B gets 8. B wins if he get sum of 8 before A gets. The probability that A wins is

- a) 1/3                      b) 7/11                      c) 9/19                      d) 8/17

**Ans: (c)**

13. If  $\frac{dy}{dx} + \left(\frac{x}{1+x^2}\right)y = \frac{\sqrt{x}}{\sqrt{1+x^2}}$ ;  $y(0) = 0$ , then  $y(1)$  will be

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

**Ans: (c)**

14. Find product of all real roots of equation  $(x^2 - 9x + 11)^2 - (x - 4)(x - 5) = 2$  is

- a) 99                      b) 118                      c) 78                      d) 54

**Ans: (a)**



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15. If  $S$  be the set of 10 distinct primes and let  $A$  be the set of product of two or more elements from the set  $S$ . If  $P = \{(x, y) : x \in S \text{ and } y \in A \text{ and } y \text{ is divided by } x\}$ . Then  $n(P)$  is equal to

a) 5110

b) 5000

c) 5220

d) 5420

Ans: (a)

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