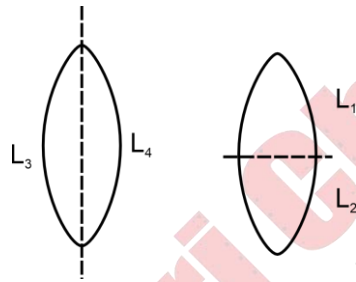# JEE Main – 29th January – 2025 (Shift-2)

[Memory Based Questions]

PHYSICS

1. An equiconvex lens is cut in two ways as shown. If the focal length of the parts are as mentioned in the diagram. Find $\frac{L1}{L3}$

   a) 4   b) 2   c) $\frac{1}{4}$ d) $\frac{1}{2}$

   Ans: (d)

2. A solenoid of radius 10 cm carrying current 0.29 A and having total 200 turns. If magnetic field inside solenoid is 2.9×10^{-4} T. Find length of solenoid.

   a) 8π cm   b) 6π cm   c) 16 cm   d) 4.5 cm

   Ans: (a)

3. If refractive index of the lens is 1.5 in air and if it is immersed in liquid of refractive index 1.33 then find it's focal length if it's focal length in air is 24 cm

   a) 48 cm   b) 96 cm   c) 24 cm   d) 12 cm

   Ans: (b)

4. Three identical particles, each of mass m move under the influence of mutual gravitational attraction forces. Initially they are on the vertices of an equilateral triangle of side 'a' and have equal speed v directed towards the adjacent particle as shown. Find net angular momentum about the center just before collision.

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

   Ans: (c)

5. A physical quantity Q is given as $Q = \dfrac{ab^4}{cd}$ if the percentage error in a, b, c and d are $2\%, 1\%, 2\%$ and 1%, then % error in Q will be

   a) 5% b) 2% c) 9% d) 15%

   Ans: (c)

6. Two particles of same mass are performing SHM vertically with two different springs of spring constants K_1 and K_2. If amplitude of both is same. Find ratio of the maximum speed of two particles.

   a) $\sqrt{\dfrac{K_1}{K_2}}$
   b) $\sqrt{K_2 K_1}$
   c) $\sqrt{\dfrac{K_2}{K_1}}$
   d) $\sqrt{\dfrac{K_1+K_2}{K_1-K_2}}$

   Ans: (a)

7. Match the following

Column-I		Column-II	
A	Magnetic Flux	P	Gauss
B	Magnetic Moment	Q	Amp-m^{-1}
C	Magnetising Intensity	R	Amp-m^2
D	Magnetic Field	S	Weber

   a) A-R, B-S, C-Q, D-P b) A-S, B-R, C-Q, D-P

   c) A-Q, B-P, C-S, D-R d) A-P, B-Q, C-S, D-R

   Ans: (b)

8. Two planet A and B are revolving around a massive star such that $r_A = 2r_B$ and $m_A = 4\sqrt{3}m_B$. Find ratio of angular momentum of planet B to planet A.

   a) $6\sqrt{3}$
   b) $\dfrac{1}{4\sqrt{6}}$
   c) $\dfrac{1}{4\sqrt{3}}$
   d) $\dfrac{1}{3\sqrt{3}}$

   Ans: (b)

9. **Assertion (A):** On increasing the pressure, the volume decrease is more in an isothermal process than in an adiabatic process.

   Reason (R): Adiabatic process is given by $PV^{\gamma} = $ constant

   a) Assertion is true and Reason is wrong

   b) Assertion is true and Reason is true

c) Assertion is wrong and Reason is true

d) Assertion is wrong and Reason is wrong

Ans: (b)

10. Match the following

	Column-I		Column-II
A	Young's modulus	P	$M^1 L^{-1} T^{-1}$
B	Torque	Q	$M^{-1} L^3 T^{-2}$
C	Co-efficient of viscosity	R	$M^1 L^{-1} T^{-2}$
D	Gravitational constant	S	$M^1 L^2 T^{-2}$

a) A-R, B-S, C-P, D-Q   b) A-S, B-R, C-Q, D-P

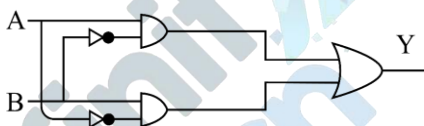c) A-Q, B-P, C-S, D-R   d) A-P, B-Q, C-S, D-R

Ans: (a)

11. A capacitor $C_1 = 6\mu$ F, initially charged with a cell of emf 5 V is disconnected and connected to another capacitor $C_2 = 12\mu$ F which is initially neutral. The final charges on C_1 and C_2 after connection is made are.

a) $20\mu C, 20\mu C$ b) $20\mu C, 30\mu C$ c) $30\mu C, 10\mu C$ d) $10\mu C, 20\mu C$

Ans: (d)

12. The truth table for the logical circuit shown below is

a)

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

b)

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

c)

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

d)

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

Ans: (b)

13. Figure shows two spherical surfaces of radius R having common centre. If the object is placed at O, find the distance between the first images formed by both the surfaces
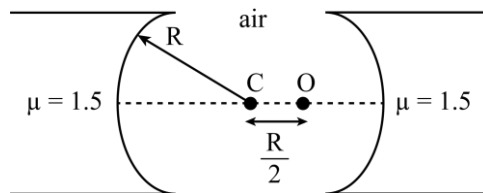
a) $\dfrac{4R}{70}$ b) $\dfrac{4R}{27}$ c) $\dfrac{4R}{35}$ d) $\dfrac{2R}{35}$

Ans: (c)

CHEMISTRY

1. Which of the following compound will form the most stable carbocation?

   a) $(Ph)_3C - Br$ b) $C_6H_5CH_2Br$ c) $C_6H_5CH(Br)CH_3$ d) $CH_3CH_2CH_2CH_2Br$

   Ans: (a)

2. Number of σ and π bonds respectively in hex-1-en-4-yne are

   a) $13,\ 3$ b) $14, 3$ c) $3, 14$ d) $14, 13$

   Ans: (a)

3. 0.41 g of $BaSO_4$ is obtained from 0.2 g of organic compound in Carius method. What is the percentage of Sulphur present in organic compound? (nearest integer) (Molecular weight of $BaSO_4$ is 233 g/mol)

   Ans: 28

4. Which element in group 15 has lowest ionization energy?

   a) As   b) P   c) Bi   d) Sb

   Ans: (c)

5. The number of benzenoid structural isomers having molecular formula C_9H_{12} which do not give Baeyer's reagent test is?

   Ans: 8

6. Total number of non-bonding electrons in NO_2^- are?

   Ans: 12

7. Which of the following is an essential amino acid?

   a) Alanine   b) Glycine   c) Valine   d) Aspartic acid

   Ans: (c)

8. Which of the following ether react with HBr to form phenol?

   a) $Ph - CH_2 - O - CH_2 - CH_3$ b) $Ph - CH_2 - OCH_3$

   c) $Ph - O - C\begin{smallmatrix} CH_3 \\ - CH_3 \\ CH_3 \end{smallmatrix}$ d) $Ph - CH_2 - O - CH_2 - Ph$

   Ans: (c)

9. A drug becomes ineffective when it decomposes to 50% of its concentration. If 16 mg of said drug becomes 4 mg in 12 months, find the time in which drug becomes ineffective given that decomposition of drug follows first order kinetics.

   a) 6 months b) 3 months c) 2 months d) 12 months

   Ans: (a)

10. Number of spectral lines in the 4th excited state of hydrogen atom

    a) 3   b) 10   c) 6   d) 2

    Ans: (b)

11. Which of the following will give azo dye test?

    a) Anisole b) Aniline c) Benzene d) Benzaldehyde

    Ans: (b)

12. Which of the following gives predominantly O_2 on electrolysis among the following:

    A. Aq. $AgNO_3$ (Pt electrodes)
    B. Aq. $AgNO_3$ (Ag electrodes)
    C. Conc. H_2SO_4 (Pt electrodes)
    D. Dilute H_2SO_4 (Pt electrodes)

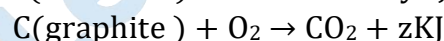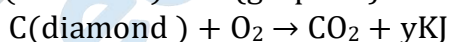   a) AB   b) BC   c) ABD   d) AD

    Ans: (d)

13. Determine the type of oxide formed by an element (A) which has smallest size among following.
    Li, Na, K, Be, B, Mg

    a) A_2O_3 b) A_2O c) AO_2 d) A_2O_2

    Ans: (a)

14. Consider the following thermochemical reactions and choose the correct option.

    $C(\text{diamond}) \rightarrow C(\text{graphite}) + xKJ$
    $C(\text{diamond}) + O_2 \rightarrow CO_2 + yKJ$
    $C(\text{graphite}) + O_2 \rightarrow CO_2 + zKJ$

    a) $x = y + z$ b) $x = y - z$ c) $x + y = z$ d) $x + y = -z$

    Ans: (b)

15. Given below are two statements:

Statement-I : In partition chromatography a thin film of liquid acts as stationary phase.

Statement-II : Paper chromatography is not a type of partition chromatography.

In the light of the above statements, choose the most appropriate answer from the options given below:

(a) Both Statement I and Statement II are incorrect

(b) Statement I is correct but Statement II is incorrect

(c) Both Statement I and Statement II are correct
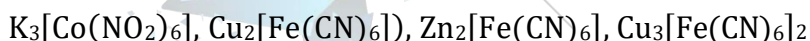
(d) Statement I is incorrect but Statement II is correct

Ans: (b)

16. 7.3 g Benzalacetone is synthesized from 10.6 g of benzaldehyde using acetone as other reactant. Percentage yield of Benzalacetone is?

a) 50%   b) 27%   c) 90%   d) 40%

Ans: (a)

17. Find spin only magnetic moment of yellow coloured complex compound

$K_3[Co(NO_2)_6]$, $Cu_2[Fe(CN)_6]$), $Zn_2[Fe(CN)_6]$, $Cu_3[Fe(CN)_6]_2$

Ans: 0

MATHEMATICS

1. A is 3×3 matrix, $a_{ij} = (\sqrt{2})^{i+j}$ sum of elements of 3rd row of A^2 is in the Form of $\alpha + \beta\sqrt{2}$ then $\alpha + \beta = ?$

   a) 125   b) 224   c) 254   d) 280

   Ans: (b)

2. If 7^{103} is divided by 23, then remainder is

   a) 11   b) 12   c) 14   d) 16

   Ans: (c)

3. If the letters of the word "KANPUR" are arranged in dictionary, then the 440th word is

   a) PRKAUN   b) PRKUAN   c) PRKNAU   d) PRKUNA

   Ans: (a)

4. $a_1, a_2, a_3, \ldots, a_{2024}$ are in A.P. $a_1 + (a_5 + a_{10} + a_{15} + \cdots + a_{2020}) + a_{2024} = 2233$ then $a_1 + a_2 + a_3 + \cdots + a_{2024} = ?$

   a) 10054   b) 994   c) 12016   d) 11132

   Ans: (d)

5. If $x + y + z = 1; x + 2y + 4z = m \& x + 4y + 10z = m^2$ have infinitely many solutions and m takes 2 values $\alpha \& \beta$ then find $\sum_{r=1}^{10} (r)^\alpha + (r)^\beta$

   a) 210   b) 256   c) 440   d) 356

   Ans: (c)

6. The value of the limit $\lim_{x \to 0}(\operatorname{cosec} x)(\sqrt{2\cos^2 x + 3\cos x} - \sqrt{\cos^2 x + \sin x + 4})$ is

   a) 0   b) 1   c) $\frac{1}{2\sqrt{5}}$ d) $-\frac{1}{2\sqrt{5}}$

   Ans: (d)

7. $f(x) = \int_0^x t(t^2 - 9t + 20)dt, 1 \leqslant x \leqslant 5, f(x) \in [\alpha, \beta]$. Find $4(\alpha + \beta)$

   a) 127   b) 157   c) 720   d) 416

   Ans: (b)

8. Let the line L be $\frac{x-1}{1} = \frac{y-4}{3} = \frac{z-7}{5}$ and foot of perpendicular from $(1, -2, -1)$ to L is $(\alpha, \beta,)$, then $\alpha + \beta + \gamma$ is

a) $-\frac{69}{35}$ b) $\frac{102}{35}$ c) $\frac{69}{35}$ d) $-\frac{102}{35}$

Ans: (d)

9. If area bounded by the curves $|y| = 1 - x^2, x^2 + y^2 = 1$ is α. If $9\alpha = \beta\pi + \gamma$ Then value of $|\beta - \gamma|$ is

a) 33 b) 37 c) 41 d) 45

Ans: (a)

10. If the exhaustive values of a for which the equation $2x^2 + (a - 5)x + 15 = 3a$ hat no real roots if (α, β) then $|4(\alpha + \beta)| =$

a) 47 b) 35 c) 52 d) 56

Ans: (d)

11. If for the solution of the curve $y = f(x)$ differential equation $\frac{dy}{dx} + (\tan x)y = \frac{2 + \sec x}{(1 + 2\sec x)^2} x \in [\frac{-\pi}{2}, \frac{\pi}{2}], f[\frac{\pi}{3}] = \frac{\sqrt{3}}{10}$ then, $f[\frac{\pi}{4}]$ is =

a) $2 + \frac{1}{\sqrt{3}}$ b) $2 - \frac{1}{\sqrt{2}}$ c) $1 - \frac{2}{\sqrt{3}}$ d) $1 + \frac{2}{\sqrt{3}}$

Ans: (b)

12. If $\log y = x \log \frac{2}{5}, x \in N \cup \{0\}$, Then sum of all values of y is equal to

a) 1/3 b) 3/5 c) 5/3 d) 2/3

Ans: (c)

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