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40 1986-2025

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JEE MAIN SESSION 1 JAN 2025

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Congratulations to Students, Parents & Staff

#TransformingYourDreamsIntoReality

*in One or More Subjects

JEE Main – 04th April – 2025 (Shift-1)

[Memory Based Questions]

PHYSICS

1. Find the dimension of $\frac{E}{B}$ where, E represents electric field and B represents magnetic field.

   a) ML^2T^{-1} b) LT^{-2} c) L^2T^{-1} d) LT^{-1}

   Ans: (d)

2. If the object is placed 40cm away to the spherical mirror and produces $-1/2$ magnification image. Then what should be the distance to attain $-1/3$ magnification.

   a) 80 cm b) 320 cm c) $\frac{320}{3}\ cm$ d) $\frac{80}{3}\ cm$

   Ans: (c)

3. A ring and a solid sphere released from rest from same height on rough inclined surface. Ratio of their speed when they reach at bottom is $\sqrt{\frac{7}{x}}$ m/s, then x is

   Ans: 10

4. Mean free path for an ideal gas is to be observed $20\mu m$ while average speed of molecules of gas is observed to be 600 m/s, then frequency of collision is near by

   a) 4×10^7 b) 1.2×10^7 c) 3×10^7 d) 2×10^{-7}

   Ans: (c)

5. The Boolean expression $Y = A\bar{B}C + \bar{A}\bar{C}$ can be realised with which of the following gate configurations

   a) one-3 input AND gate, 3 NOT gate and one -2 input OR gate, one-2 input AND gate

   b) One-3 input AND gate, 1 NOT gate, one-2 input NOR gate and one-2 input OR gate

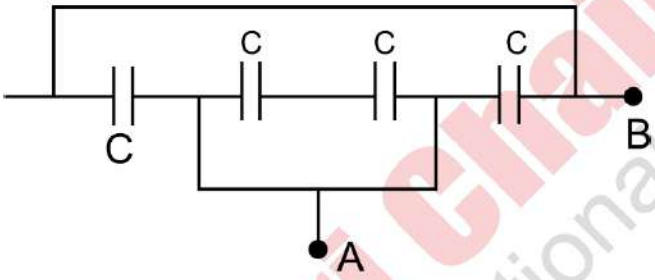
   c) 3-input OR gate, 3 NOT gates and one 2-input AND gate

   d) 3-input AND gate, 3 NOT gates and one 2-input OR gate

   Ans: (a & b)

6. Consider two slabs of thickness t_1 and t_2 having deformation angles θ_1 and θ_2 respectively and having Shearing Modulus S_1 and S_2 such that,
$t_2 = 2t_1; \theta_1 = 2\theta_2; s_1 = 4 \times 10^9$
$s2 = x \times 10^9$
Find the value of ' x ' if same Force is applied on both having equal lengths.
Ans: 4

7. Find the equivalent capacitance between A and B, where C=16 μF



a) 48 μF b) 32 μF c) 8 μF d) 16 μF
Ans: (b)

8. Which of the following is correct expression for torque
a) $\vec{\tau} = \vec{r} \times \vec{L}$ b) $\vec{\tau} = \vec{r} \times \vec{F}$ c) $\frac{d}{dt}(\vec{r} \times \vec{p})$ d) $\vec{r} \times \frac{d}{dt}(\vec{p})$
Ans: (b)

9. if slit width is double then % change in fringe width
a) 50% b) remain same c) 150% d) 75%
Ans: (b)

10. $V = 100\sqrt{2}$ cos ωt then V_{rms} is
a) $100\sqrt{2}$ b) $200\sqrt{2}$ c) 200 d) 100
Ans: (d)

11. If $\frac{1}{5}^{th}$ of volume of closed Organ pipe is filled in water. Then % change in frequency
a) 400% b) 25% c) 100% d) 50%
Ans: (b)

12. A real object placed in front of a spherical mirror forms an Image whose magnification is $-\frac{1}{3}$. If the distance between the image and object is 30 cm . The focal length of the mirror is_____cm.

a) -11.25 cm b) -22.5 cm c) -45 cm d) -60 cm

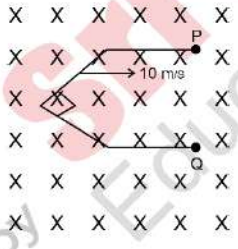
Ans: (a)

13. The current in a AC circuit is given as $i = 100\sqrt{2}\sin\left(\frac{100\pi}{t}\right)A$. Find rms current and frequency is Hertz.

a) 100A, 100 Hz b) 50A, 100 Hz c) 200A, 50 Hz d) 100A, 50 Hz

Ans: (d)

14. Rods of equal length are joined as shown in the figure. Combined system is moving with speed 10 m/s in a perpendicular magnetic field of $\frac{1}{\sqrt{2}}$ tesla. Find emf induced between point P and $Q(l = 10$ cm).



a) 1V b) 0.1 V c) 2 V d) $\sqrt{2}$ V

Ans: (a)

15. An electric dipole with charges 2μC and a separation 20 cm is placed close to an Infinitely charge non-conducting sheet with surface charge density 100C/m^2. Find the torque acting on the dipole if the dipole makes an angle 30° with the normal to the sheet.

a) $\frac{12}{\varepsilon_0} \times 10^{-5}$ N − m b) $\frac{2}{\varepsilon_0} \times 10^{-5}$ N − m c) $\frac{4}{\varepsilon_0} \times 10^{-5}$ N − m d) $\frac{1}{\varepsilon_0} \times 10^{-5}$ N − m

Ans: (d)

16. Longitudinal sound waves travel in three different gases namely helium, methane and carbon dioxide. Mean temperature of three gases are equal then ratio of speeds of wave in 3 gases respectively is

a) $\sqrt{5}:\sqrt{7}:\frac{1}{\sqrt{11}}$ b) $\sqrt{3}:\sqrt{5}:\frac{1}{\sqrt{11}}$ c) $\sqrt{5}:1:\sqrt{\frac{21}{55}}$ d) $\frac{1}{\sqrt{3}}:\frac{1}{\sqrt{5}}:\frac{1}{2}$

Ans: (c)

CHEMISTRY

1. In the following, the number of paramagnetic molecules are:

   O_2, S_2, N_2, F_2 and Cl_2

   a) S_2 and N_2 b) O_2 and Cl_2 c) O_2 and S_2 d) N_2, F_2 and Cl_2

   Ans: (c)

2. Which of the following is the ratio of 5^{th} Bohr orbit (r_5) of He^+ & Li^{2+} ?

   a) $\frac{2}{3}$ b) $\frac{3}{2}$ c) $\frac{9}{4}$ d) $\frac{4}{9}$

   Ans: (b)

3. A weak acid (HA)[0.01M] having $p^H = 5$. This solution is diluted till the p^H becomes 6. Find the new concentration of HA:

   (Given; pka $= 4 \times 10^{-10}$)

   a) 0.002M b) 0.005M c) 0.007M d) 0.001M

   Ans: (d)

4. Incorrect order of Atomic radius is

   a) B < Al b) In < TI c) Al < Ga d) Ga < ln

   Ans: (c)

5. Which of the following pair of ions have equal number of unpaired electrons

   a) V^{2+} and Ni^{2+} b) Cr^{2+} and Mn^{2+} c) Fe^{2+} and Sc^{2+} d) Mn^{3+} and Fe^{2+}

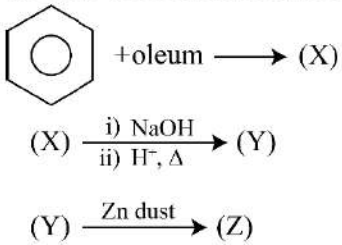
   Ans: (d)

6. One mole of an ideal gas expands from $10dm^3$ to $20dm^3$ through isothermal reversible process. Find $\Delta U, q$ & w

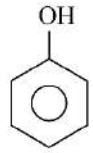
   a) $\Delta U = 0, q = 0, w = 0$ b) $\Delta U = 0, q \neq 0, w \neq 0$
   c) $\Delta U \neq 0, q = 0, w \neq 0$ d) $\Delta U \neq 0, q \neq 0, w = 0$

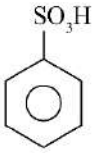
   Ans: (b)

7. In the reaction sequence,

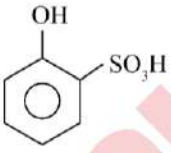


The compound Z is

a) 

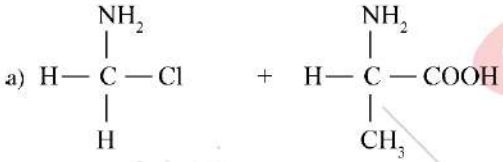
b) 

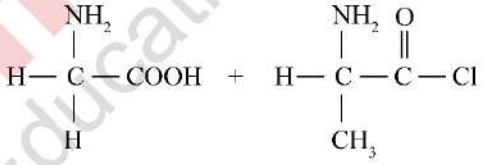
c) 

d) 

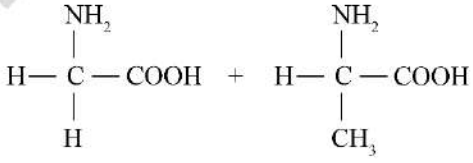
Ans: (c)

8. Which of the following on reaction HCl yield a peptide Gly-Ala?

a) 

b) 

c) 

d) 

Ans: (d)

9. Which of the following is correct option regarding 1s orbital?

a) It is symmetrical
b) It is non-symmetrical
c) It is directional
d) It has two radial nodes

Ans: (a)

10. Number of stereoisomers possible for the complexes $[CrCl_3(py)_3]$ and $[CrCl_2(ox)_2]^{-3}$ are respectively.

a) 1, 2
b) 2, 2
c) 3, 3
d) 2, 3

Ans: (d)

11. **Statement -I** - Nitrogen forms oxides with +1 and +5 state due to formation of Pπ – Pπ bond with oxygen

Statement -II - Nitrogen does not form halides with +5 oxidation state due to absence of d-orbital in it

In the light of above statements, choose the correct option.

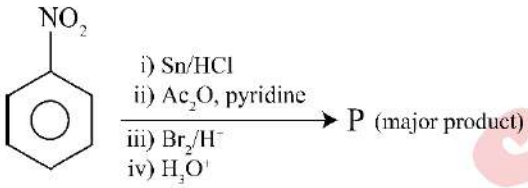
a) Statement I and statement II both are correct

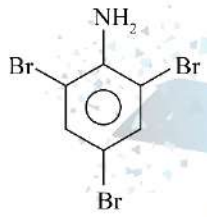
b) Statement I and statement II both are incorrect

c) Statement I is correct statement II is incorrect

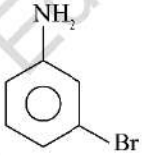
d) Statement I is incorrect statement II is correct

Ans: (d)

12. 

a) 

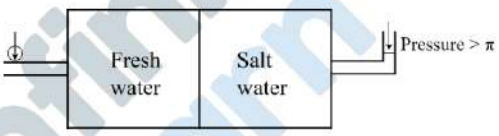
b) 

c) 

d) 

Ans: (b)

13. Observe the following diagram.



For reverse osmosis, which of the following can be used for porous membrane?

a) Cellulose acetate

b) Porous silicate

c) Silicone

d) Glass membrane

Ans: (a)

14. In Lead storage battery during charging oxidation state of lead shows changes at anode from x_1 to y_1 at cathode from x_2 to y_2. Find value of x_1, y_1, x_2 and y_2

a) $x_1 = +2, y_1 = 0$ $x_2 = +2, y_2 = +4$

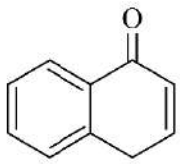
b) $x_1 = +4, y_1 = 0$ $x_2 = +2, y_2 = +4$

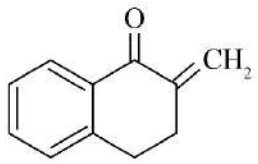
c) $x_1 = 0, y_1 = +2$ $x_2 = +4, y_2 = +2$

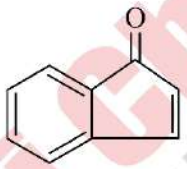
d) $x_1 = +2, y_1 = 0$ $x_2 = +2, y_2 = +4$

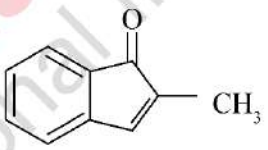
Ans: (a)

15. Which of the following compound is not a product of intramolecular aldol condensation reaction?

a) 

b) 

c) 

d) 

Ans: (b)

16. **Statement -I** - The dipole moment of is $CH_3-CH=CH-CH=O$ greater than $CH_3-CH_2-CH_2-CH=O$

Statement -II - C_1-C_2 bond length of $CH_3-CH=CH-CH=O$ is greater than C_1-C_2 bond length of $CH_3-CH_2-CH_2-CH=O$

a) Statement I and statement II both are correct

b) Statement I and statement II both are incorrect

c) Statement I is correct statement II is incorrect

d) Statement I is incorrect statement II is correct

Ans: (c)

17. Consider the reaction $A + B \rightarrow$ Product

$R = k[A]^m[B]^n$

When concentration of A & B taken are A_1 & B_1 respectively, then rate of reaction is R_1. When concentration of A & B taken are $2A_1$ & $\frac{B_1}{2}$, then rate of reaction is R_2. Find $\frac{R_2}{R_1}$?

a) 2^{m+n} b) 2^{n-m} c) 2^{m-n} d) 1

Ans: (c)

18. The complex ion having crystal field stabilization energy zero and value of spin only magnetic moment is 5.92 BM.

a) $[FeF_6]^{4-}$ b) $[Mn(SCN)_6]^{4-}$ c) $[Co(NH_3)_6]^{3+}$ d)$[Fe(CN)_6]^{3-}$

Ans: (b)

MATHEMATICS

1. Foci of ellipse are (2, 5) and (2, –3), eccentricity is 4/5. Find the length of latus rectum.

   Ans: 18/5

2. $\int_{-1}^{1} \frac{1+2x}{e^{-x}+e^{x}}dx$

   a) $2\left(\tan^{-1}e-\frac{\pi}{4}\right)$ b) $2\left(\tan^{-1}e-\frac{\pi}{3}\right)$ c) $2\left(\tan^{-1}e-\frac{\pi}{3}\right)$ d) $2\left(\tan^{-1}e-\frac{\pi}{2}\right)$

   Ans: (a)

3. The sum of the series $1+3+5^2+7+9^2+\cdots$ upto 80 terms is ____

   a) 326870 b) 328160 c) 339400 d) 338160

   Ans: (d)

4. If the equation of an ellipse E is $\frac{x^2}{9}+\frac{y^2}{16}=1$, the length of latus rectum of 'E' is _____.

   Ans: 9/2

5. In 10 balls, 3 are defective. If 2 are chosen at random, find variance (σ^2) of the defective balls.

   Ans: 56/150

6. Probability of forming a committee of 12 members from 4 engineers, 2 doctors, 10 professors such that there are at least 3 engineers & 1 doctor.

   Ans: 1290

7. Let $A=\begin{bmatrix}\cos\theta & 0 & -\sin\theta\\ 0 & 1 & 0\\ \sin\theta & 0 & \cos\theta\end{bmatrix}$. Here $A^2=A^{\top}$. Then find Trace $[(A+I)^3+(A-I)^3-6A]$.

   Ans: 6

8. $\int_{-1}^{1} \frac{[1+\sqrt{|x|-x}]e^{x}+(\sqrt{|x|-x})e^{-x}}{e^{x}+e^{-x}}$

   Ans: $1+\frac{2\sqrt{2}}{3}$

9. Let there be two AP's with each having 2025 terms. Find the number of distinct terms in union of these two AP's, if first AP is 1,6,11,.... and second AP is 9,16,23....

a) 3761 b) 4035 c) 3022 d) 2025

Ans: (a)

10. In the expansion of $\left(\sqrt[3]{2}+\frac{1}{\sqrt[3]{3}}\right)^n$, $n \in N$. If the ratio of 15^{th} term from the beginning to the 15^{th} term from the end is 1/6 then the value of n_{C_3} is

Ans: 2300

11. let $f, g:(1, \infty) \to R$ be defined as $f(x)=\frac{2x+3}{5x+2}$ and $g(x)=\frac{2-3x}{1-x}$. If the range of the function fog : $[2, 4] \to R$ is $[\alpha, \beta]$ then $\frac{1}{\beta-\alpha}$ is equal to

Ans: 56

12. If $10\sin^4\theta + 15\cos^4\theta = 6$, then the value of $\frac{27\text{cosec}^6\theta+8\sec^6\theta}{16\sec^8\theta}$ is

a) $\frac{3}{4}$ b) $\frac{1}{5}$ c) $\frac{2}{5}$ d) $\frac{3}{5}$

Ans: (c)

13. $\lim_{x\to1^+}\frac{(x-1)(6+\lambda\cos(x-1))+\mu\sin(1-x)}{(x-1)^3}=-1$, where $\lambda, \mu \in R$. Then $\lambda+\mu$ is equal to

a) 18 b) 19 c) 20 d) 17

Ans: (a)

14. $f(x)=\max\{x, x^3, x^5 \ldots\ldots, x^{21}\}$, number of points where $f(x)$ is discontinuous $= P$ Number of points where $f(x)$ is not differentiable $= q$. Find $p+q=$?

Ans: 3

15. The number of integral values of $n \in N$ for which the equation $x^2+4x-n=0$, $n \in [20,100]$ have integral roots, is

a) 4 b) 5 c) 6 d) 7

Ans: (c)

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