



YOUR  
**FUTURE**  
DEPENDS ON  
**WHAT YOU DO**  
**TODAY**

**AIR 1**

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**IIT BOMBAY**



**Sri Chaitanya**  
**IIT-JEE | MEDICAL | FOUNDATION**



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## Memory Based Questions and Answers

### JEE MAIN 2026

#### SESSION 1

Test Date: 22<sup>nd</sup> January 2026 | Shift 1

#### Instructions

- The test is of **3 hours** duration.
- This test paper consists of 75 questions. Each subject (PCM) has 25 questions. The maximum marks are 300.
- This question paper contains Three Parts. Part-A is Physics, Part-B is Chemistry and Part-C is Mathematics. Each part has only two sections: Section-A and Section-B.
- Section - A: Attempt all questions.
- Section - B: Attempt all questions.
- Section - A (01–20) contains 20 multiple choice questions which have only one correct answer. Each question carries +4 marks for correct answer and –1 mark for wrong answer.
- Section - B (21–25) contains 5 Numerical value based questions. The answer to each question should be rounded off to the nearest integer. Each question carries +4 marks for correct answer and -1 mark for wrong answer.



## JEE Main – 22<sup>nd</sup> January – 2025 (Shift-1)

### [Memory-Based Questions]

### PHYSICS

1. A projectile is thrown upward at an angle  $60^\circ$  with the horizontal. The speed of the projectile is  $20 \text{ m/s}$  when its direction of motion is  $45^\circ$  with the horizontal. The initial speed of the particle is,

- (1)  $40\sqrt{2}$                       (2)  $40$                       (3)  $20\sqrt{2}$                       (4)  $20\sqrt{3}$

Ans:  $(20\sqrt{2})$

2. Match the following

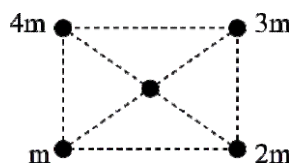
LIST-1	LIST-2
a) Spring constant	i) $\text{ML}^2 \text{T}^{-2} \text{K}^{-1}$
b) Thermal conductivity	ii) $\text{ML}^0 \text{T}^{-2}$
c) Boltzmann constant	iii) $\text{ML}^2 \text{T}^{-2} \text{A}^{-2}$
d) Inductance	iv) $\text{MLT}^{-3} \text{K}^{-1}$

Ans: (a→ii, b→iv, c→i, d→iii)

3. The escape velocity from a spherical planet  $A$  is  $10 \text{ m/sec}$ . The escape velocity, from another  $B$  whose density and radius are  $10\%$  of planet  $A$ . is \_\_\_  $\text{m/s}$

Ans:  $(0.32 \text{ m/s})$

4. Arrangement of four masses is shown in the figure, if we put  $1 \text{ kg}$  mass at the centre than force on  $1 \text{ kg}$  mass is  $F_1$ . Now if  $3\text{m}$  and  $4\text{m}$  masses are interchanged than force on  $1 \text{ kg}$  mass is  $F_2$ . Find the ratio  $\frac{F_1}{F_2}$

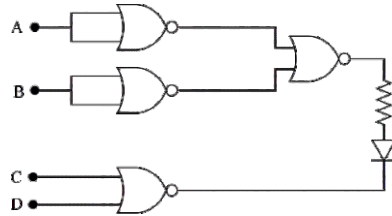


Ans:  $(\frac{2}{\sqrt{5}})$

5. The input which will make the LED glow



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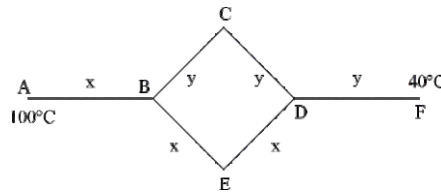
- (1) 1101                      (2) 0010                      (3) 1000                      (4) 0001

Ans: (1)

6. Two disc having same moment of inertia of about their axis. Thickness is  $t_1$  &  $t_2$  and they have same densities. If  $R_1/R_2 = 1/R$  then find  $t_1/t_2$

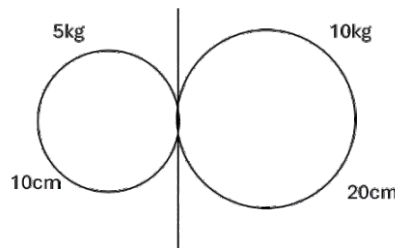
Ans: (16)

7. Six identical Metal rods are arranged as shown, find the temperatures at junction at  $B$  &  $D$ .



Ans: ( $T_B=80^\circ\text{C}$ ,  $T_D=60^\circ\text{C}$ )

8. Two solid spheres masses 5 kg and 10 kg with radius 10 cm and 20 cm respectively are kept in contact as Shown. Find the moment of Inertia of the system about Common tangent



Ans: (**0.63 kg-m<sup>2</sup>**)

9. A simple pendulum has a bob with mass  $m$  and charge  $q$ . The pendulum string has negligible mass. when a uniform a horizontal electric field  $\vec{E}$  is applied, the tension in the string changes, the final tension in the string, when pendulum attains equilibrium

Ans: ( $T = \sqrt{(mg)^2 + (qE)^2}$ )



10. The minimum frequency of photon required to break a particle of mass 15.348 amu into  $4\alpha$ -particle is \_\_\_\_

Ans:  $(1.5 \times 10^{23} \text{ Hz})$

11. 7.9 Mev  $\alpha$ -particle scatters from a target material of atomic number 79 . Estimate the distance of closest approach.

Ans:  $(2.88 \times 10^{-14} \text{ m})$

12. In series  $R - L$  circuit voltage of battery is 10 V. Resistance and inductance are  $10\Omega$  and 10 mH respectively. Find the energy stored in inductor when current reaches  $\frac{1}{e}$  times of max value

(1) 0.67 mJ                      (2) 1.33 mJ                      (3) 0.33 mJ                      (4) 0.50 mJ

Ans: (1)

13. Electric field in a region is given by  $\vec{E} = Ax\hat{i} + By\hat{j}$ , where  $A = 10\text{v}/\text{m}^2$ ,  $B = 5\text{v}/\text{m}^2$ . If the electric potential at a point (10,20) is 500v, then the electric potential at origin is (in V)

(1) 2000                      (2) 1000                      (3) 500                      (4) 0

Ans: (1)

14. During an adiabatic expansion the volume increases to 8 times and temp reduces to  $1/4^{\text{th}}$ , What is the adiabatic constant for the gas.

Ans:  $(\frac{5}{3})$

15. Six point charges are kept 60 degree apart from each other on a circumference of a circle of radius R as shown in figure, the electric field at the center of the circle



Ans:  $(\frac{\sqrt{3}q}{2\pi\epsilon_0 r^2} (-i))$



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16. The electric field of a plane EM wave travelling in an unknown non-magnetic medium is given by  $E_y = 20\sin(3 \times 10^6 x - 4.5 \times 10^{14} t) V/m$ . The dielectric constant of the medium is –

Ans: (4)

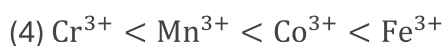
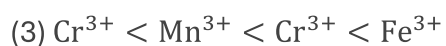
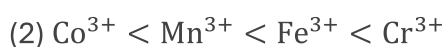
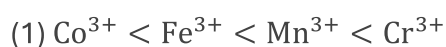


## CHEMISTRY

1. Find the energy to excite electron from first Bohr orbit of hydrogen atom to 2nd Bohr's orbit. (in eV)

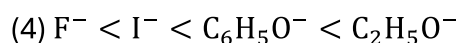
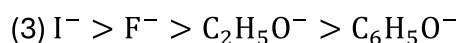
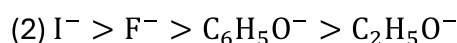
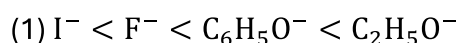
Ans: (10.2 eV)

2. Arrange the given metal ions in number in increasing order of unpaired electrons low spin complex formed by  $Mn^{3+}$ ,  $Cr^{3+}$ ,  $Fe^{3+}$ ,  $Co^{3+}$



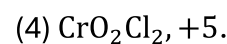
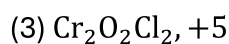
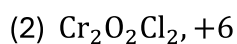
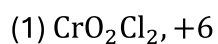
Ans: (1)

3. The order of electrophilic substitution when  $CHCl_3$  and Methanol is added.



Ans: (3)

4.  $K_2Cr_2O_7$  is heated with KCl in presence of conc.  $H_2SO_4$ . Find the correct match of product with their oxidation State



Ans: (1)

5. Match the following Column-I with Column-II and choose the correct option.

Column-I		Column-II	
(a)	$[Ag(NH_3)_2]^+$	(i)	Fehling's solution
(b)	Zn – Hg/HCl	(ii)	Clemmenson's reduction
(c)	$NH_2 - NH_2/KOH$	(iii)	Tollen's reagent
(d)	$Cu^{2+}/OH^-$	(iv)	Wolff-Kishner reduction



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(1) a(i), b(ii), c(iii), d(iv)

(2) a(iv), b(iii), c(ii), d(i)

(3) a(iii), b(ii), c(iv), d(i)

(4) a(i), b(ii), c(iv), d(iii)

Ans: (3)

6. Given below are two statements.

**Statement I :** Sucrose is dextrorotatory and upon hydrolysis it becomes levorotatory.

**Statement II :** Sucrose on hydrolysis gives glucose and fructose such that the levorotation of glucose is more than the dextrorotation of fructose.

In the light of the above statements, which is the correct option.

1) Both statement-I and statement-II are correct

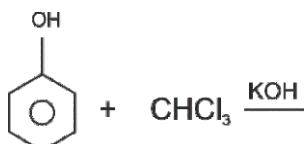
2) Both statement-I and statement-II are incorrect

3) Statement-I is correct and statement-II is incorrect

4) Statement-I is incorrect and statement-II is correct

Ans: (3)

7. Given below are two statements.

**Statement I :**  Major + Minor Major product is ortho substituted and minor product is para substituted.

**Statement II :** Ortho and para can be separated by steam distillation.

In the light of the above statements, which is the correct option.

1) Both statement-I and statement-II are correct

2) Both statement-I and statement-II are incorrect

3) Statement-I is correct and statement-II is incorrect

4) Statement-I is incorrect and statement-II is correct

Ans: (1)



8. **Statement I** : Otho & Para nitro phenol can be differentiated by steam distillation.

**Statement II** : Glycerol is separated from spent lie by distillation under reduced pressure

**Statement III** : Chromatography separation based on differential affinities of components for a Stationary phase.

**Statement IV** : Aniline is commonly separated from mixture of water by crystallization

Select correct options

- (1) Only I & IV      (2) Only I, II & III      (3) Only I & III      (4) All of the above

Ans: (2)

9. Given below are two statements.

**Statement I** : HX bond length is higher in HCl than HF.

**Statement II** : The lowest boiling point in hydride of group 15 element is having covalency 4.

In the light of the above statements, which is the correct option.

- 1) Both statement-I and statement-II are correct  
2) Both statement-I and statement-II are incorrect  
3) Statement-I is correct and statement-II is incorrect  
4) Statement-I is incorrect and statement-II is correct

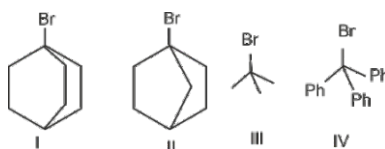
Ans: (3)

10. When X and Y react with fluorine then it forms  $EF_3$ . The  $XF_3$  is a Lewis acid and  $YF_3$  is a Lewis base. Then hybridization of  $XF_3$  and  $YF_3$  is :

- (1) both  $sp^2$       (2) both  $sp^3$       (3)  $sp^2$  and  $sp^3$       (4)  $sp^3$  and  $sp^2$

Ans: (3)

11. Reactivity of following on the basis of  $SN_1$  mechanism.

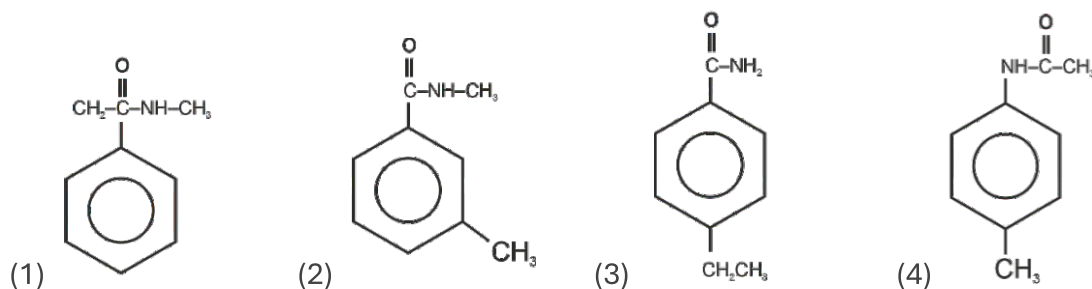


- (1)  $IV > III > I > II$       (2)  $II > IV > III > I$       (3)  $III > IV > I > II$       (4)  $IV > III > II > I$



Ans: (1)

12. A compound 'A' with molecular formula  $C_9H_{11}NO$  reacts with  $Br_2/NaOH$  to give (X). (X) on reaction with  $NaNO_2$  in dil. HCl gives compound (Y). When (Y) is treated with  $CuCN$ , followed by hydrolysis gives (Z). The compound (A) on hydrolysis also gives compound (Z). Identify compound (A).



Ans: (3)

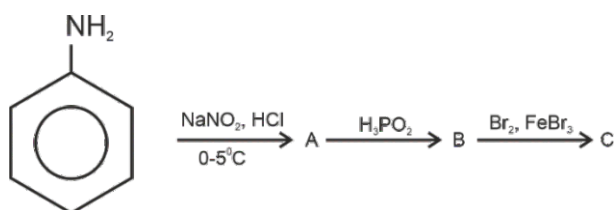
13. Which of the following statement is correct regarding the nature and directive influence of  $-NO_2$  group in nitration of benzene.

- 1) It is an activating group and ortho/para director
- 2) It is a deactivating group and ortho/para director
- 3) It is a deactivating group and meta director
- 4) It is an activating group and meta director

(1) Only I                      (2) Only II & III                      (3) Only III                      (4) Only IV

Ans: (3)

14. Consider the following sequence of reaction and identify A, B and C respectively.



- (1)  $C_6H_5OH$ ,  $C_6H_6$ ,  $C_6H_4Br_2$                       (2)  $C_6H_5N_2^+Cl^-$ ,  $C_6H_6$ ,  $C_6H_5Br$
- (3)  $C_6H_5NO_2$ ,  $C_6H_5OH$ ,  $C_6H_5Br$                       (4)  $C_6H_5Cl$ ,  $C_6H_5OH$ ,  $C_6H_6$

Ans: (2)



15. Four elements from Boron to Oxygen have the following  $IE_1$  values (in  $\text{KJmol}^{-1}$ ):  
1086.5, 800.6, 1313.9, 1402.3  
The value of  $IE_1$  for "Nitrogen" is \_\_\_\_\_ .

Ans: (1402.3)

16. If for two reactions first reaction have  $K_1 = 10^6 e^{\frac{-30000}{T}}$  & for second reaction  $K_2 = 10^4 e^{\frac{-24000}{T}}$   
then at which temperature both reactions have same value of rate constant. (Report your  
answer in nearest integer)

Ans: (1303)

17. Given below are two statements.

**Statement I :**  $K_H$  is constant with change in concentration of gas till solution is dilute at given temperature.

**Statement II :** According to Henry's Law, partial pressure of gas in vapour phase is inversely proportional to mole fraction of gas in solution.

In the light of the above statements, which is the correct option.

- 1) Both statement-I and statement-II are correct
- 2) Both statement-I and statement-II are incorrect
- 3) Statement-I is correct and statement-II is incorrect
- 4) Statement-I is incorrect and statement-II is correct

Ans: (3)

18. An element of p-block forms a hydride  $\text{EH}_4^+$ .  
Gas of hydride is passed through a basic solution of  $\text{K}_2[\text{HgI}_4]$ .  
Then a brown ppt. is formed.  
Select **correct** option(s):

- 1) Element E has maximum covalency equal to 5.
- 2) Brown ppt. of  $\text{HgO} \cdot \text{Hg}(\text{NH}_2)\text{I}$  is formed.
- 3) Element E has maximum Electron affinity in its group.
- 4) Gas is phosphine.



- (1) Only II                      (2) Only I, II & III                      (3) Only I & III                      (4) Only I

Ans: (1)

19. Consider a first order reaction:

$A \rightarrow \text{products}$

3 different solutions are taken rate of reaction

**Solution 1:** 100 mL 10M' A'  $- r_1$

**Solution 2:** 200 mL 10M' A'  $- r_2$

**Solution 3:** 100 mL 10M' A' + 100 mL water  $- r_3$

The correct order of the rates of reactions is,

- (1)  $r_1 = r_2 = r_3$                       (2)  $r_1 = r_2 < r_3$                       (3)  $r_1 = r_2 > r_3$                       (4)  $r_1 < r_2 = r_3$

Ans: (3)

20. Bohr's radius of H -atom is  $2.12 \times 10^{-10}$  m. Calculate the energy at this level.

- (1)  $-5.44 \times 10^{-19}$ J    (2)  $-2.176 \times 10^{-18}$ J    (3)  $-54.4 \times 10^{-19}$ J    (4)  $-2.3 \times 10^{-19}$ J

Ans: (1)



## MATHEMATICS

1.  $\frac{\cos^2 48 - \sin^2 12}{\sin^2 24 - \sin^2 6} = \frac{\alpha + \beta\sqrt{5}}{2}$  where  $\alpha, \beta \in \mathbb{N}$  then  $\alpha + \beta$  \_\_\_\_\_

Ans: (4)

2. Random variable  $x$  has the probability distribution.

$x$	0	1	2	3	4	5	6	7
$P(x)$	0	$2k$	$k$	$3k$	$2k^2$	$2k$	$k^2 + k$	$7k^2$

Then  $P(3 < x < 6)$  is equal to

- (1) 0.22                      (2) 0.64                      (3) 0.34                      (4) 0.33

Ans: (1)

3. If  $A = \begin{bmatrix} 2 & 3 \\ 3 & 5 \end{bmatrix}$ , then the determinant of the matrix  $(A^{2025} - 3A^{2024} + A^{2023})$  is

- (1) 12                      (2) 16                      (3) 24                      (4) 28

Ans: (2)

4. The coefficient of  $x^{48}$  in  $(1+x) + 2(1+x)^2 + 3(1+x)^3 + \dots + 100(1+x)^{100}$  is equal to.

- (1)  $100 \cdot {}^{101}C_{49} - {}^{101}C_{50}$                       (2)  ${}^{100}C_{50} + {}^{101}C_{49}$   
(3)  $100 \cdot {}^{100}C_{49} - {}^{100}C_{48}$                       (4)  $100 \cdot {}^{100}C_{49} - {}^{100}C_{50}$

Ans: (1)

5. If the sum of the first 4 terms of an AP is 6 and the sum of 6 terms is 4, then the sum of the first 12 terms of an AP is

- (1) -22                      (2) -21                      (3) -23                      (4) -24

Ans: (1)

6. The number of real solutions of the equation:  $x|x+4| + 3|x+2| + 10 = 0$  is

- (1) 1                      (2) 4                      (3) 3                      (4) 2

Ans: (1)



7. If the domain of the function  $f(x) = \sin^{-1} \left( \frac{5-x}{3+2x} \right) + \frac{1}{\log_e (10-x)}$  is  $(-\infty, \alpha] \cup [\beta, \gamma) - \{\delta\}$ , then  $6(\alpha + \beta + \gamma + \delta) =$

- (1) 67                      (2) 68                      (3) 66                      (4) 70

Ans: (4)

8. Two distinct numbers  $a$  and  $b$  are selected at random from  $1, 2, 3, \dots, 50$ . The probability that their product  $ab$  is divided by 3 is

- (1)  $\frac{8}{25}$                       (2)  $\frac{664}{1225}$                       (3)  $\frac{561}{1225}$                       (4)  $\frac{272}{1225}$

Ans: (2)

9. If the image of the point  $P(1, 2, a)$  in the line  $\frac{x-6}{3} = \frac{y-7}{2} = \frac{7-z}{2}$  is  $Q(5, b, c)$  then  $a^2 + b^2 + c^2 =$

- (1) 293                      (2) 298                      (3) 283                      (4) 264

Ans: (2)

10. Let  $M = \{1, 2, 3, \dots, 16\}$  and  $R$  be a Relation on  $M$  defined by  $xRy$ . If and only if  $4y = 5x - 3$  Then, the number of elements required to be added in  $R$  to make it symmetric is

Ans: (2)

11.  $xdy - ydx = (\sqrt{x^2 + y^2})dx, y(1) = 0, y = y(x)$  find  $y(3) =$

- (1) 3                      (2) 2                      (3) 1                      (4) 4

Ans: (4)

12. Chord joining at two points  $(x_1, y_1)(x_2, y_2)$  on the parabola  $y^2 = 12x$ . Intersect at right angle at the vertex then  $x_1x_2 - y_1y_2 =$

Ans: (288)

13. If the line  $\alpha x + 2y = 1$ , where  $\alpha \in \mathbb{R}$  does not meet the hyperbola  $x^2 - 9y^2 = 9$  then the possible value of  $\alpha$  is

- (1) 0.5                      (2) 0.7                      (3) 0.8                      (4) 0.6

Ans: (3)

14. Let  $p(\alpha, \beta, \gamma)$  be point on line  $\frac{x-1}{2} = \frac{y+1}{-3} = z$  at a distance  $4\sqrt{14}$  from point  $(1, -1, 0)$  and nearer to origin. Then the shortest distance between lines  $\frac{x-\alpha}{1} = \frac{y-\beta}{2} = \frac{z-\gamma}{3}$  &  $\frac{x+5}{2} = \frac{y-10}{1} = \frac{z-3}{1}$  is equal to



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(1)  $4\sqrt{\frac{7}{5}}$

(2)  $7\sqrt{\frac{5}{4}}$

(3)  $4\sqrt{\frac{5}{7}}$

(4)  $2\sqrt{\frac{7}{4}}$

Ans: (1)

15. Let line  $x = -1$  divide the area of the region  $\{(x, y): 1 + x^2 \leq y \leq 3 - x\}$  in ratio  $m : n$ . Where  $\gcd(m, n) = 1$ , Then  $m + n$  is =

(1) 27

(2) 26

(3) 25

(4) 28

Ans: (1)

16. Let  $f: [1, \infty] \rightarrow R$  be a differentiable function. If  $6\int_1^x f(t)dt = 3xf(x) + x^3 - 4$  for all  $x \geq 1$ , then the value of  $f(2) - f(3)$  is

(1) -3

(2) 4

(3) -4

(4) 3

Ans: (4)

17. The number of solutions of  $\tan^{-1} 4x + \tan^{-1} 6x = \frac{\pi}{6}$ , where  $\frac{-1}{2\sqrt{6}} < x < \frac{1}{2\sqrt{6}}$  is equal to

(1) 0

(2) 2

(3) 1

(4) 3

Ans: (3)

18. The value of  $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \frac{dx}{[x]+4}$  is where  $[.]$  denotes greatest integer function

Ans:  $(\frac{7}{60}(3\pi - 1))$

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