FINAL DESTINATION FOR SCIENCE STUDENTS

JEE Main – 24th January – 2025 (Shift-2)

[Memory Based Questions]

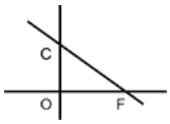
PHYSICS

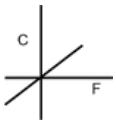
1. Arrange the following wavelengths in ascending order. Ultra violet ($\lambda 1$) Radio wave ($\lambda 2$) and X-ray ($\lambda 3$) and gamma rays ($\lambda 4$)

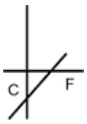
Ans: (b)

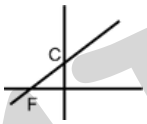
a) $\lambda_1 > \lambda_4 > \lambda_2 > \lambda_3$ b) $\lambda_2 > \lambda_3 > \lambda_1 > \lambda_4$ c) $\lambda_2 > \lambda_4 > \lambda_1 > \lambda_3$ d) $\lambda_4 > \lambda_3 > \lambda_2 > \lambda_1$

2. Which graph shows a relation between Celsius scale & Fahrenheit scale



b) 

c) 

d) 

a) Ans: (c)

3. Power of two sources $S1$ & $S2$ are in ratio 2:1 and 2×10^{15} photons per sec of 600 nm from S1 are emitted and find the number of photons per second emitted of 300 nm from $S2$

a) 1.5 × 1014 b) 7 × 1014 c) 6 × 1014 d) 5 × 1014

Ans: (d)

4. If the given acceleration due to gravity of earth is g, and its radius is reduced to $\frac{1}{3}rd$ of the original, mass remains unchanged. Now find the acceleration due to gravity

a) 9g0 b) 8g0 c) 6g0 d) 4g0

Ans: (a)

5. A solid sphere, hollow sphere rolls down purely equal distances on same inclined plane then time $t1$ and $t2$

a) $t1 > t2$ b) $t2 > t1$ c) $t1 = 2t2$ d) $t1 = t2$

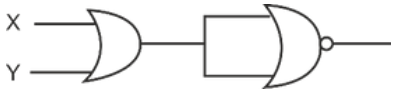
Ans: (b)

6. Find the ratio of translational kinetic energy to rotational kinetic energy of a solid sphere rolling on a horizontal surface is

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

Ans: (b)

7. The following gate represents which logic gate



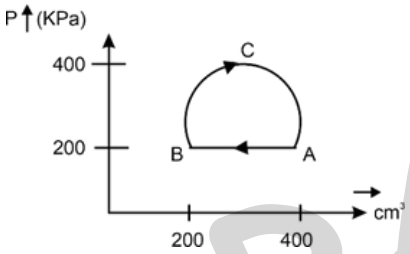
a) NOR b) OR c) AND d) NAND

Ans: (a)

8. A conical pendulum is rotating with an angular speed ω of mass m and length l. Find the tension in the string

Ans: $m\omega^2 l$

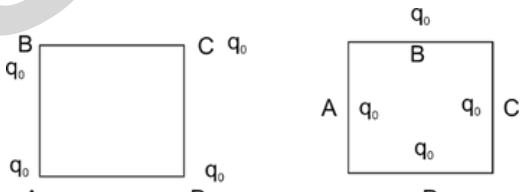
9. Find the magnitude of work done



a) 10π b) 20π c) 5π d) 15π

Ans: (a)

10. Find the change in potential energy of system of side length a in configuration 1 and 2



a) $\left(2-3\sqrt{2}\right)\frac{kq_0^2}{a}$ b) $\left(3\sqrt{2}-2\right)\frac{kq_0^2}{a}$ c) $\left(1-3\sqrt{2}\right)\frac{kq_0^2}{a}$ d) $\left(1-3\sqrt{2}\right)\frac{kq}{a}$

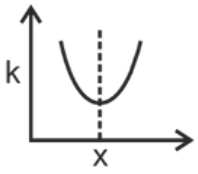
Ans: (b)

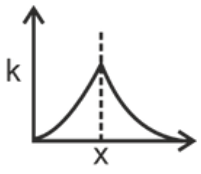
11. The position of a particle varies with time as $\vec{r} = (5t^2\hat{\imath} - 5t\hat{\jmath})$m. The magnitude and direction of velocity at $t = \frac{1}{2}$ s is

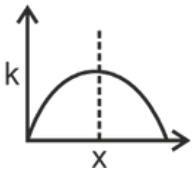
a) $5\sqrt{2}$ m/s, $-45°$ with $+X$ axis
b) 5 m/s, $-45°$ with $+X$ axis
c) $5\sqrt{2}$ m/s, $-45°$ with $+Y$ axis
d) 5 m/s, $+45°$ with $+Y$ axis

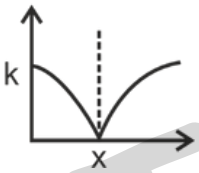
Ans: (a)

12. A particle oscillates along x-axis according to law $x = x_0\sin^2(t/2)$ where $x_0 = 1$. Variation of kinetic energy (k) with position (x) is given by graph

a) 

b) 

c) 

d) 

Ans: (c)

13. **Assertion(A):-** In a region of uniform magnetic field, an e^- is moving with constant velocity in straight line

Reason(R) :- Direction of magnetic field is along the direction of velocity

a) A and R both are true and R is correct explanation of A

b) 1A and R both are true but R is not correct explanation of A

c) A is true and R is false

d) A is false and R is true

Ans: (a)

CHEMISTRY

1. Statement – 1: First ionization energy Ge is greater than Si

Statement – 2: First ionization energy Pb is greater than Sn a)

a) Statement – 1 is true Statement – 2 is false

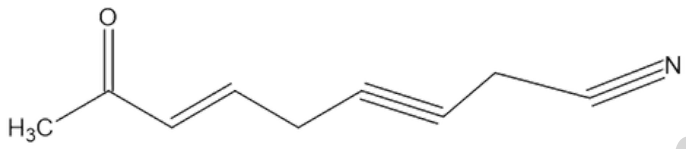
b) Statement – 1 & Statement – 2 are false

c) Both the Statements are true

d) Statement – 1 is false Statement – 2 is true

Ans: (c)

2. Find the number of sp and sp^2 are carbon atoms



Ans: (d)

Ions	μ(B.M)
(A) Ti+3	(p) 3.87
(B) Sc+3	(q) 0
(C) V+2	(r) 1.73
(D) Ni+2	(s) 2.82

a) A-s, B-q, C-p, D-r

b) A-r, B-q, C-p, D-s

c) A-r, B-p, C-q, D-s

d) A-s, B-q, C-r, D-p

Ans: (b)

4. Match the following reactions with respective reagents

Reactions	Reagents
a) Etard reaction	p) $SnCl_2+HCl$
b) Gattermann reaction	q) CrO_2Cl_2
c) Gattermann-Koch reaction	r) Cu + HCl
d) Stephen reduction	s) CO +HCl, Anhyd.$AlCl_3/CuCl$

a) a-p, b-r, c-s, d-q
b) a-q, b-s, c-r, d-p
c) a-s, b-r, c-q, d-p
d) a-q, b-r, c-s, d-p

Ans: (d)

5. The correct order of melting point of 14th group elements is :

a) C>Si>Ge>Pb>Sn
b) Sn>Pb>Ge>Si>C
c) C>Si>Ge>Sn>Pb
d) C>Ge>Si>Pb>Sn

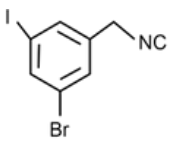
Ans: (a)

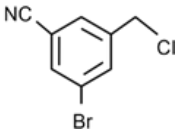
6. The conditions and Consequences that favours t_2g^3 eg^1 configuration In

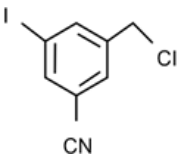
a) Strong field ligand : High spin complex
b) Strong field ligand : Low spin complex
c) Weak field ligand : High spin complex
d) Weak field ligand : Low spin complex

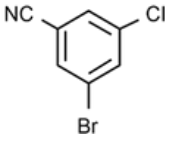
Ans: (c)

7.

a) 

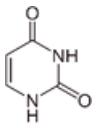
b) 

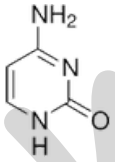
c) 

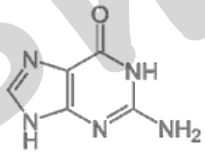
d) 

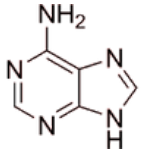
Ans: (a)

8. Match the following Nitrogenous bases with their respective structures

A) Adenine p) 

B) Guanine q) 

C) Cytosine r) 

D) Uracil s) 

a) A-p, b-r, c-q, d-s b) A-s, b-r, c-q, d-p

c) A-s, b-q, c-r, d-p d) A-r, b-s, c-q, d-p

Ans: (b)

9. When ethane 1,2-diamine is progressively added to aqueous solution of Ni(II) chloride the sequence of the colour change observed will be:

a) Violet → Blue → Pale blue → Green

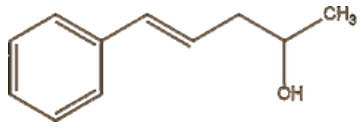
b) Pale blue → Blue → Green → Violet

c) Green → Pale blue → Blue → Violet

d) Pale blue → Blue → Violet → Green

Ans: (c)

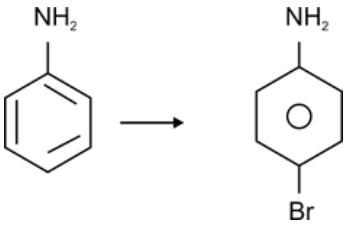
10. Number of stereoisomers for given compound?



a) 2 b) 4 c) 6 d) 8

Ans: (b)

11. Above conversion can be done by using which reagents among the following



a) Fe/Br2, H2O(Δ), H2SO4

b) Ac2O, H2SO4, Br2, NaOH

c) Ac2O, Fe/Br2, H2O/H+

d) Ac2O, Br2/Fe, NaOH

Ans: (c)

12. In a compound contains 54.2% carbon, 9.2% of hydrogen and rest are oxygen. What is molecular formula of compound, if molecular mass is 132 g/mol.

a) C6H12O3 b) C4H12O3 c) C4H12O6 d) C6H13O6

Ans: (a)

13. A hydrocarbon X which has molar mass 80 g contains 90% carbon. Find degree of unsaturation in X

a) 1 b) 5 c) 7 d) 3

Ans: (d)

14. Which of the following yellow coloured

a) NiS b) CdS c) MnS d) ZnS

Ans: (b)

15. Consider the following statements :

Statement-1 : Oxygen-oxygen bond length in O3 is greater than O2.

Statement-II : O – O bond order in O3 is 1.5 and O – O bond order in O2 is 2 .

a) Both Statement-I and Statement-II are correct

b) Both Statement-I and Statement-II are incorrect

c) Statement-I is correct, Statement-II is incorrect

d) Statement-I is incorrect, Statement-II is

Ans: (a)

16. The successive ionisation energy (I.E.) of an element 'X' is given

	I. E1	I. E2	I. E3	I. E4	I. E5
X	500	600	2000	2200	2600

Data given in KJ/mol.

Find out the group number of element X .

a) Group → 3 b) Group → 14 c) Group → 2 d) Group → 13

Ans: (c)

17. Let $k1$, $k2$ and $k3$ be the rate constant of reaction and $k = \sqrt{\frac{k1k3}{k2}}$. Then find activation energy of overall reaction.

(Given : E_{a_1}= 10 kJ/mol, E_{a_2} = 30 kJ/mol, E_{a_3}= 60 kJ/mol)

a) 20 b) 15 c) 30 d) 12

Ans: (a)

18. In Carius method of estimation of halogen, 0.25 g of an organic compound gave 0.16 g of AgBr. What is the percentage of bromine in the compound
(Given molar mass of Ag = 108, Br = 80)

a) 1.53 b) 12.32 c) 18.15 d) 27.23

Ans: (d)

19. The reaction between 1M base and 1M acid. In which of the following temperature rises more

a) 30mL CH_3COOH + 30 mL NaOH

b) 45mL CH_3COOH + 25 mL NaOH

c) 30mL HCl + 30 mL NaOH

d) 50mL HCl + 20 mL NaOH

Ans: (C)

MATHEMATICS

1. In Arithmetic Progression, Sn denotes sum of first n terms. If S12 = 57, S40 = 1030. Find S30 − S10 = ?

a) 505 b) 510 c) 501 d) 515

Ans: (d)

2. There is a group A of 5 boys and 3 girls and another group B of 5 boys and 6 girls. How many ways can we invite 4 boys and 4 girls for party with 5 from group A and 3 from group B.

a) 2156 b) 1250 c) 5120 d) 3150

Ans: (d)

3. $7 = 5 + \frac{1}{7}(5 + \alpha) + \frac{1}{72}(5 + 2\alpha) + \ldots \infty$. Then α is

a) 6 b) $6\frac{}{7}$ c) $\frac{1}{7}$ d) 1

Ans: (a)

4. If system of equations $x + 2y - 3z = 2$, $2x + \lambda y + 5z = 5$, $4x + 3y + \mu z = 33$ has infinite solutions, then $\lambda + \mu$ is equal to

a) $\frac{1334}{5}$ b) $\frac{1269}{5}$ c) $\frac{261}{5}$ d) $\frac{1063}{5}$

Ans: (a)

5. Consider an event E such that a matrix of order 2 × 2 is invertible with entries 0 or 1. Then, $P(E)$ is (where $P(X)$ denotes the probability of event X)

a) $\frac{5}{8}$ b) $\frac{3}{8}$ c) $\frac{1}{8}$ d) $\frac{7}{8}$

Ans: (b)

6. Area bounded by the curves $y = ex$, $y = |ex - 1|$ and y-axis

a) 1 b) 1 − ln2 c) 1 + ln2 d) ln2

Ans: (b)

7. The equation of chord of the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ with (3,1) as mid-point is

a) $48x + 25y - 169 = 0$ b) $25x + 5y - 125 = 0$

c) $65x + 2y - 12 = 0$ d) $45x + 4y - 135 = 0$

Ans: (a)

8. 30^{th} & 12^{th} terms of binomial coefficient $(1+x)^{2n-1}$ are in the ratio 5_2, then value of n = ?

a) 20 b) 21 c) 14 d) 22

Ans: (b)

9. If $\int \frac{2x^2+5x+9}{\sqrt{x^2+x+1}}dx = x\sqrt{x^2+x+1} + \alpha\sqrt{x^2+x+1} + \beta\ln\left(x+\frac{1}{2}+\sqrt{x^2+x+1}\right)+C$, then $\alpha + 2\beta$ equals to

a) 16 b) 18 c) 27 d) 11

Ans: (a)

10. $F(x) = \begin{vmatrix} a+\frac{\sin x}{x} & 1 & b \\ a & 1+\frac{\sin x}{x} & b \\ a & 1 & b+\frac{\sin x}{x} \end{vmatrix}$, if $\lim_{x\to 0} f(x) = \lambda + \alpha a + \beta b$ then $(\lambda+\alpha+\beta)2 =$

a) 17 b) 9 c) 13 d) 16

Ans: (d)

11. $2\cos x\frac{dy}{dx} = \sin 2x - 4y\sin x \cdot \theta \in \left(0, \frac{\pi}{2}\right), f\left(\frac{\pi}{3}\right) = 0$. then find $f'\left(\frac{\pi}{4}\right) + f(\pi/4) =$

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

Ans: (c)

12. A function $f: \mathbb{R} \to (-1,1)$ sue that $f(x) = \frac{2^x - 2^{-x}}{2^x + 2^{-x}}$. The function f is

a) Both one-one & onto b) only one one

c) Only onto d) Both many one & into

Ans: (a)

13. The number of real roots of the equation $2^x + 3x + 2 = \text{Min}\{|x+2|, |x-3|\}$ is

a) 0 b) 1 c) 2 d) 3

Ans: (c)

14. Let $a = 3\hat{\imath} + 2\hat{\jmath} - \hat{k}$, $b = a \times (\hat{\imath} - 2\hat{\jmath})$ and $\vec{c} = b \times \hat{k}$, then projection of $\vec{c} - 2\hat{\jmath}$ on a is equal to

a) $\frac{2}{\sqrt{11}}$ b) $\frac{3}{\sqrt{14}}$ c) $\frac{7}{\sqrt{11}}$ d) $\frac{5}{\sqrt{13}}$

Ans: (b