



YOUR
FUTURE
DEPENDS ON
WHAT YOU DO
TODAY

AIR 1

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IIT-JEE | MEDICAL | FOUNDATION



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[Memory Based Questions]

MATHEMATICS

1. $\operatorname{cosec}10^\circ - \sqrt{3}\sec 10^\circ =$

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

Ans: (c)

2. $6\int_0^\pi |\sin 3x + \sin 2x + \sin x|dx =$

Ans: (17)

3. The Hyperbola and ellipse $\frac{x^2}{36} + \frac{y^2}{16} = 1$ have same foci and eccentricity of Hyperbola is 5 then length of latus rectum of hyperbola is

Ans: $(96/\sqrt{5})$

4. The sum of all roots of equation $(x - 1)^2 - 5|x - 1| + 6 = 0$ is

- a) 4 b) 1 c) 5 d) 3

Ans: (a)

5. $x^2 + x + 1 = 0$, value of $\left(x + \frac{1}{x}\right)^4 + \left(x^2 + \frac{1}{x^2}\right)^4 + \left(x^3 + \frac{1}{x^3}\right)^4 + \dots + \left(x^{25} + \frac{1}{x^{25}}\right)^4$ is

- a) 175 b) 162 c) 145 d) 128

Ans: (c)

6. Let a_1, a_2, a_3, \dots be a G.P of increasing + ve terms such that

$a_2 \cdot a_3 \cdot a_4 = 64$ & $a_1 + a_3 + a_5 = \frac{813}{7}$ then $a_3 + a_5 + a_7$ is

- a) 3256 b) 3252 c) 3248 d) 3244

Ans: (b)

7. The number of relations, defined on the set $\{a, b, c, d\}$ which are both reflexive & symmetric is equal to

- a) 16 b) 1024 c) 64 d) 256

Ans: (c)



8. For some $\alpha, \beta \in R$ let $A = \begin{bmatrix} \alpha & 2 \\ 1 & 2 \end{bmatrix}$ & $B = \begin{bmatrix} 1 & 1 \\ 1 & \beta \end{bmatrix}$ be such that $A^2 - 4A + 2I = B^2 - 3B + I = 0$ then $(\det(\text{adj}(A^3 - B^3)))^2$ is equals to

Ans: (225)

9. Let $y(x)$ be solution curve of differential equation

$(1 + x^2)dy + (y - \tan^{-1} x)dx = 0, y(0) = 1$ then value $y(1)$ is

- a) $\frac{\pi^2}{32} + \frac{\pi}{4} + 1$ b) $\frac{\pi^2}{32} - \frac{\pi}{4} + 1$ c) $\frac{\pi^2}{32} - \frac{\pi}{2} - 1$ d) $\frac{\pi^2}{32} - \frac{\pi}{2} + 1$

Ans: (b)

10. Area of region, inside ellipse $x^2 + 4y^2 = 4$ and outside region bounded by curves $y = |x| - 1$ and $y = 1 - |x|$ is

Ans: $(2\pi - 2)$

11. Domain of function $f(x) = \cos^{-1}\left(\frac{2x-5}{11-3x}\right) + \sin^{-1}(2x^2 - 3x + 1)$ is interval $[\alpha, \beta]$, the $\alpha + 2\beta$

Ans: (3)

12. Let $\vec{a} = -2\hat{i} + 2\hat{j} + 2\hat{k}, \vec{b} = 8\hat{i} + 7\hat{j} - 3\hat{k}$ and \vec{c} be a vector such that $\vec{a} \times \vec{c} = \vec{b}$. If $\vec{c} \cdot (2\hat{i} + \hat{j} + \hat{k}) = 4$, then $|\vec{a} + \vec{c}|^2 = ?$

Ans: (55)

13. Let $a_1 = 1$ and for $n \geq 1, a_{n+1} = \frac{1}{2}a_n + \frac{n^2 - 2n - 1}{n^2(n+1)^2}$ then $\left| \sum_{n=1}^{\infty} \left(a_n - \frac{2}{n^2} \right) \right|$

Ans: (2)

14. Let (α, β, γ) be co ordinates of foot of perpendicular drawn from point $(5, 4, 2)$ on line $\vec{r} = (-2\hat{i} + 3\hat{j} + \hat{k}) + \lambda(2\hat{i} + 3\hat{j} - \hat{k})$ Length of projection of vector $\alpha\hat{i} + \beta\hat{j} + \gamma\hat{k}$ on vector $6\hat{i} + 2\hat{j} + 3\hat{k}$ is

Ans: $\left(\frac{18}{7}\right)$

15. Value of $\int_{-\pi/6}^{\pi/6} \left(\frac{\pi + 4x^{11}}{1 - \sin(|x| + \pi/6)} \right) dx = ?$

Ans: (4π)



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16. L_1 & L_2 are two parallel lines. A point 'A' lie between 2 parallel lines L_1 & L_2 . The distance from 'A' to L_1 is 6 units & L_2 is 3 units. Then the area of equilateral triangle ABC is where 'B' & 'C' are the points on L_1 & L_2 .

- a) $21\sqrt{3}$ b) $27\sqrt{3}$ c) $19\sqrt{3}$ d) $13\sqrt{3}$

Ans: (a)

17. Number of strictly increasing function f from set $\{1,2,3,4,5,6\}$ to set $\{1,2,3, \dots, 9\}$ such that $f(i) \neq i$ for $1 \leq i \leq 6$. equal to?

- a) 22 b) 28 c) 21 d) 27

Ans: (b)

18. $f(0) = 1$ & $f(x+y) = f(x)f'(y) + f'(x)f(y)$, $f(x)$ be a real differential function such that $x, y \in R$, then $\sum_{n=1}^{100} \log_e f(n) = ?$

Ans: (2525)

19. Sum of rational terms of $(2 + \sqrt{3})^8$

Ans: (18817)

20. The locus of the point of intersection of the tangent drawn to the circle

$(x - 2)^2 + (y - 3)^2 = 16$, which subtends an angle of 120° , is:

- a) $3x^2 + 3y^2 - 12x - 18y - 25 = 0$ b) $x^2 + y^2 - 12x - 18y - 25 = 0$
c) $3x^2 + 3y^2 + 12x + 18y - 25 = 0$ d) $x^2 + y^2 + 12x + 18y - 25 = 0$

Ans: (a)



PHYSICS

1. A conducting circular loop of area 1.0 m^2 is placed Perpendicular to a magnetic field which varies as $B = \sin(100t)$ tesla. If the resistance of the 100 ohm they average thermal energy dissipated in the loop in one period is - J

Ans: (π)

2. In a double slit experiment the distance b/w the Slits 0.1 cm and the screen is placed at 50 cm from the slit plane. when one slit is covered with a transparent sheet having thickness t and refractive index $n=1.5$ the central fringe shifts by 0.2 cm . The value of t is

Ans: ($8\mu\text{m}$)

3. A current carrying solenoid is placed vertically and a particle of mass m with charge Q is released from rest. The particle moves along the axis of solenoid. If g is acc due to gravity than the acc of the charge particle.

a) $a=g$ b) $a = 0$ c) $0 < a < g$ d) $a > g$

Ans: (a)

4. A point source of 10^{-8} C is placed at the origin. Work done in moving a point charge of 2 uC from $A(4,4,2)$ to $B(2,2,1)$ is

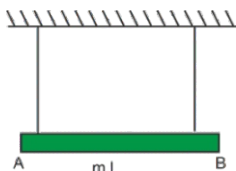
a) 45×10^{-6} b) 30×10^{-6} c) 15×10^{-6} d) 0

Ans: (b)

5. In a microscope the objective is having a focal length $f_o = 2 \text{ cm}$ and eye piece is having focal length is 4 cm , the tube length is 32 cm the magnification produced by it for normal adjustment is

Ans: (100)

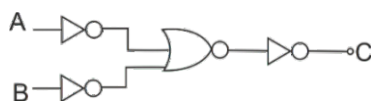
6. A rod of mass m and length l is attached to two ideal strings, find tension in left string just after right string is cut.



Ans: ($mg/4$)



7. Which logic gate is given in the figure?



- a) XOR b) NOR c) NAND d) OR

Ans: (c)

8. Find dimensions of $\frac{A}{B}$ if $(P + \frac{At^2}{B}) + \frac{1}{2}\rho V^2 = \text{constant}$, where $P \rightarrow$ pressure, $\rho \rightarrow$ density, $V \rightarrow$ speed.

- a) $ML^1 T^{-4}$ b) $ML^{-1} T^{-4}$ c) $ML^2 T^{-4}$ d) $ML^{-1} T^{-2}$

Ans: (b)

9. A light wave described by $E=60(\sin(3 \times 10^{15}) + \sin(12 \times 10^{15})t)$ (in SI unit), fall on a metal surface of work function 2.8 eV. The maximum KE of ejected photo electron is approximate (in eV) $h=6.6 \times 10^{-34}$ Js

- a) 7.8 b) 6.0 c) 3.8 d) 5.1

Ans: (d)

10. A collimated beam of light of diameter 2 mm is propagating along the x-axis, the beam is required to be expanded in a collimated beam of diameter 14 mm using a system of 2 convex lenses. If the first lens has the focal length of 40 mm, then the focal length of second lens is

Ans: (280 mm)

11. 10 moles of oxygen is heated at constant vol from 30 degree Celsius to 40 degree Celsius. The change in internal energy of the gas is ___ cal
 $C_p = 7 \text{ cal/molC}$, $R = 2 \text{ cal/molC}$

Ans: (500)

12. $\vec{F} = 4t^3\hat{i} - 3t^2\hat{j}$ m = 4 kg at $t = 0$ particle is at rest and at origin then find velocity and position at $t = 2$ sec.

Ans: Velocity $4\hat{i} - 2\hat{j}$ m s⁻¹

Position $\frac{8}{5}\hat{i} - \hat{j}$ m

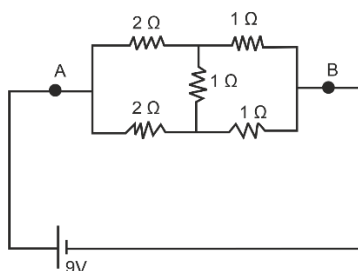


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13. Satellite mass = 100 kg orbiting at a radius of $1.5 R_e$ (R_e = radius of earth), energy required to reach to the orbit of radius $3R_e$ is

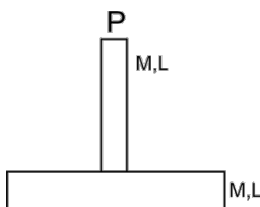
Ans: $(50gR_e/3)$

14. Find the heat produced in external circuit (AB) in one second.



Ans: $(54J)$

15. Find the moment of inertia about P.



Ans: $(17/12ML^2)$

16. Kinetic energy of an α -particle is 7.7 MeV, which is approaching towards a fixed gold nucleus (atomic number is 79).

What is the distance of closest approach.

- a) 1.72 nm b) 6.2 nm c) 16.8 nm d) 0.2 nm

Ans: (a)

17. Spring constant $k_1 = 2 \pm 0.1$ N/m, $k_2 = 4 \pm 0.1$ N/m are parallel so find % error.

Ans: (3.33%)

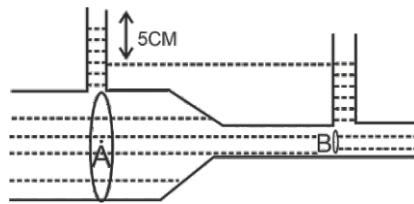
18. In a vacuum capacitor of capacitance C and width d, a dielectric of dielectric constant of k and width $d/3$ is inserted. If the dielectric has the same area as the capacitor than the new capacitance of the capacitor?

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



Ans: (b)

19. In a venturi meter if the ratio of areas of cross-section is $\frac{A}{B} = 2$ and area of $A = \sqrt{3} \text{ m}^2$. If the density of fluid is 1000 kg/m^3 , what is the rate of volume flow through the venturi meter.

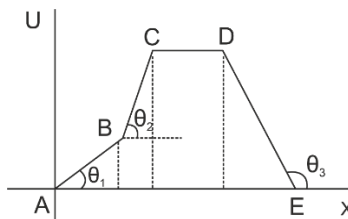


- a) $\sqrt{2}$ b) 2 c) $\sqrt{3}$ d) 1

Ans: (d)

20. A curve is given between potential energy of a particle and its position on x -axis. Given: $\tan \theta_1 = 1, \tan \theta_2 = 3, \tan \theta_3 = \frac{-1}{2}$

If F_{AB} be force acting on the particle during A to B similarly F_{BC}, F_{CD} and F_{DE} are the forces during B to C, C to D and D to E respectively. Arrange magnitudes of these forces in decreasing order



- a) $F_{BC} > F_{AB} > F_{CD} > F_{DE}$ b) $F_{BC} > F_{DE} > F_{AB} > F_{CD}$
 c) $F_{AB} > F_{BC} > F_{DE} > F_{CD}$ d) $F_{BC} > F_{AB} > F_{DE} > F_{CD}$

Ans: (d)



CHEMISTRY

1. In Carius method, 0.75 g of an organic compound gave 1.2 g of barium sulphate, Find % of sulphur (molar mass 32 g mol^{-1} .)

Molar mass of barium sulphate is 233 mol^{-1}

- a) 16.48% b) 4.55% c) 21.97% d) 10.30%

Ans: (a)

2. 80 ml of a hydrocarbon on mixing with 264 ml of oxygen. in a closed U-tube undergoes complete combustion. The residual gas after cooling to 273 k occupy 224 ml , when the system is treated with KOH solution The volume decreases to 64 ml : The formula of hydrocarbon is

- a) C_4H_{10} b) C_2H_4 c) C_2H_2 d) C_2H_6

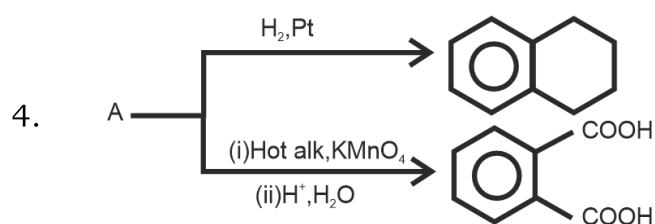
Ans: (b)

3. 14.0 g of calcium metal is allowed to react with excess HCl at 1.0 atm pressure & 273 K . Which of the following statement is incorrect?

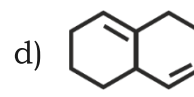
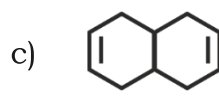
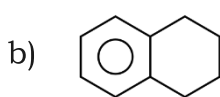
(Molar Mass in g mol^{-1} Ca = 40, Cl = 35.5)

- a) 0.35 mol of H_2 gas is evolved. b) The limiting reagent is calcium metal.
c) 33.3 g of CaCl_2 is produced. d) 7.84 L of H_2 gas is evolved.

Ans: (c)



which of the following is A:



Ans: (a)



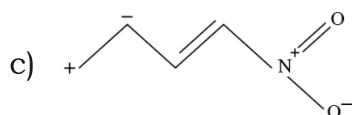
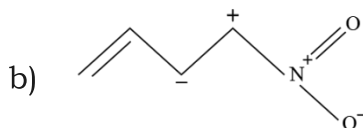
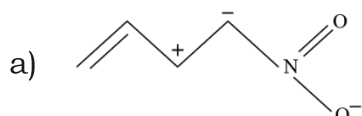
5. MnO_4^{2-} in acidic medium, disproportionates to
a) Mn_2O_7 & MnO b) MnO_4^- & MnO c) MnO_4^- & MnO_4 d) MnO_4^- & MnO_2

Ans: (d)

6. For two chemical reactions A and B, if the difference between their activation energy is 20 kJ at 300 K ($R = 8.3 \text{ J K}^{-1} \text{ mol}^{-1}$). Determine $\ln \frac{k_2}{k_1}$.

Ans: (8.0)

7. The least stable structure in the given options below



Ans: (b)

8. Which of the following is the correct order with respect to the property indicated?
a) $\text{Cl} > \text{F}$ (ionisation energy) b) $\text{K}_2\text{O} > \text{Na}_2\text{O} > \text{Al}_2\text{O}_3$ (Basic nature)
c) $\text{K} > \text{Na} > \text{Al} > \text{Mg}$ (Metallic character) d) None of these

Ans: (b)

9. Given below are two statements.

Statement I : Arginine and Tryptophan are essential amino acids.

Statement II: Glycine does not have any chiral carbon.

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

- a) Both statement-I and statement-II are correct
b) Both statement-I and statement-II are incorrect



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

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

Ans: (a)

10. Statement A : But-2-ene show Optical Isomer.

Statement B : Propanal & Propanone are Functional Group Isomer

Statement C : Pentane & 2, 2-Dimethyl propane are Chain Isomer

Identify the correct statement

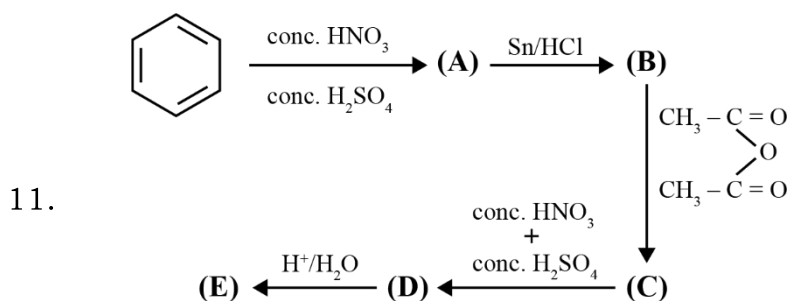
a) Only A & B

b) Only A & C

c) Only B & C

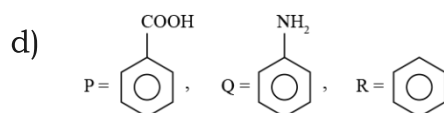
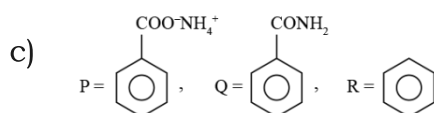
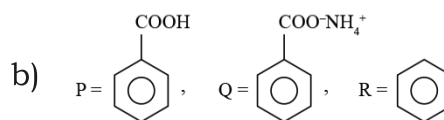
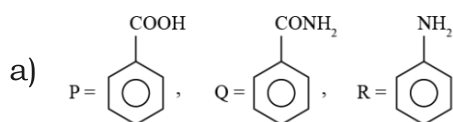
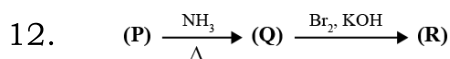
d) All

Ans: (c)



% of N in E=?

Ans: (20.28)



Ans: (a)



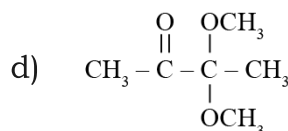
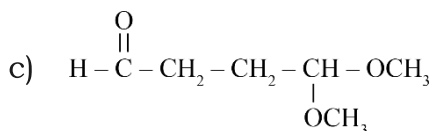
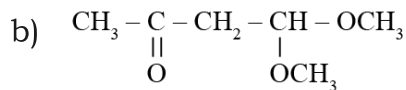
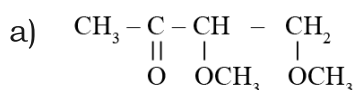
13. **Statement I** : Among $[\text{NiCl}_4]^{2-}$, $[\text{Ni}(\text{CN})_4]^{2-}$, $[\text{Ni}(\text{CO})_4]$ & CH_4 ; the sp^3 hybridised species are 3.

Statement II : Number of Amphoteric pairs among $(\text{SnO}, \text{SnO}_2)$; $(\text{PbO}, \text{PbO}_2)$; $(\text{GeO}, \text{GeO}_2)$ are 3.

- a) Both statement-I and statement-II are correct
b) Both statement-I and statement-II are incorrect
c) Statement-I is correct and statement-II is incorrect
d) Statement-I is incorrect and statement-II is correct

Ans: (c)

14. An organic compound "P" of molecular formula $\text{C}_6\text{H}_{12}\text{O}_3$ gives positive Iodoform test but negative Tollen's test. When "P" is treated with dilute acid, it produces "Q". "Q" give positive Tollen's test & also Iodoform test. The structure of "P" is:



Ans: (b)

15. Given below are two statements.

Statement I : When an electric discharge is passed through gaseous hydrogen, the hydrogen molecules dissociate and the energetically excited hydrogen atoms produce electromagnetic radiation of discrete frequencies.

Statement II: The frequency of second line of Balmer series obtained from He^+ is equal to the first line of Lyman series obtained from hydrogen atom.

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

- a) Both statement-I and statement-II are correct
b) Both statement-I and statement-II are incorrect
c) Statement-I is correct and statement-II is incorrect
d) Statement-I is incorrect and statement-II is correct

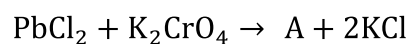


Ans: (a)

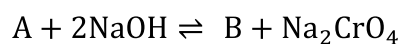
16. 1 g of AB_2 is dissolved in 50 g solvent such that $\Delta T_f = 0.689$. When 1 g AB is dissolved in **50 g** of same solvent, ΔT_f is 1.176. Find molar mass of AB_2 . $K_f = 5 \text{ K kg/mol}$. (Report to nearest integer) AB_2 and AB are non electrolyte.

Ans: (145)

17. Consider the Following reactions,



(hot solution)



In the above reactions, A, B&X are respectively,

- a) $A = PbCrO_4$; $B = Pb(OH)_2$; $X = Pb(CH_3COO)_2$
b) $A = PbCrO$; $B = Pb(OH)_3$; $X = Pb(CH_3COO)_2$
c) $A = PbCrO_4$; $B = Pb(OH)$; $X = Pb(CH_3COO)$
d) $A = PbCrO_4$; $B = Pb(OH)_2$; $X = Pb(CH_3COO)$

Ans: (a)

18. Which of the following compound is paramagnetic in nature?



Ans: (c)
