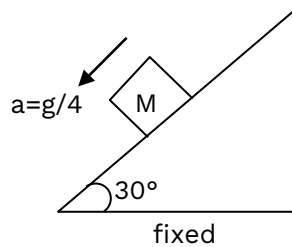


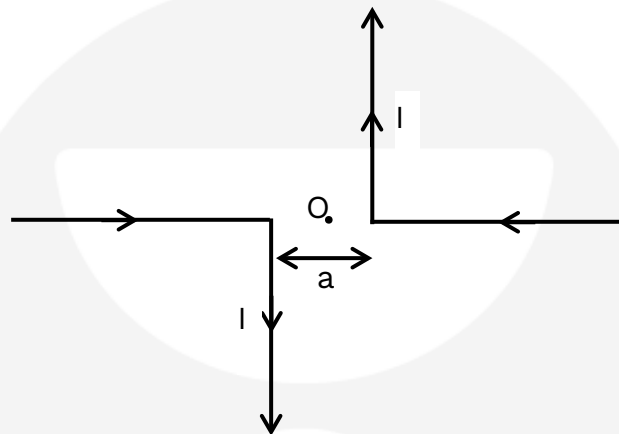


PHYSICS

1. Acceleration of block on the inclined wedge is $g/4$. Find friction coefficient between block & the wedge.



2. Find magnetic field at O.



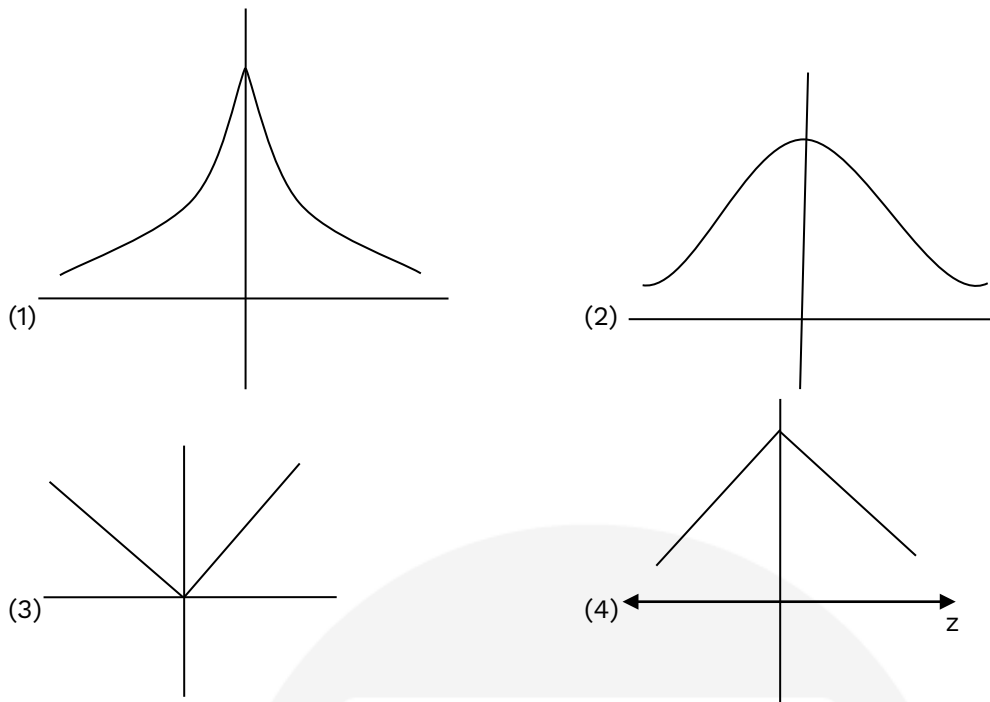
3. A charge $+4q$ is placed at origin and a charge of $-q$ was placed at 12 cm on x-axis. Find the position of charge $+q$ on x-axis such that net force on it is zero.
4. A stone is projected at 30° from horizontal. Find the ratio of kinetic energy at point of projection and at a maximum height.
5. A car is moving on a circular path of radius 50 m. If friction coefficient between car tyres and road is $\mu = 0.33$, Find maximum speed of the car.
6. Half life for a radioactive element is 30 minutes. Find the active nuclei after 90 minutes.
7. An object cools down from 60°C to 40°C in 6 minutes. Find the temperature of the object after another 6 minutes. Temperature of surrounding is 10°C .
8. An object of mass 0.4 kg is released from rest. If it takes 8 sec to reach the ground, then find the loss of potential energy in last second.
9. A meter bridge consists of two resistances, 2Ω & 3Ω . When 3Ω resistance is shunted by a resistance, null point shifts by 22.5 cm, find the value of shunt resistance.



10. For a hydrogen atom, maximum wavelength of Lyman series is $(\lambda_{\text{Lyman}})_{\text{max}}$. Find the minimum wavelength of balmer series for Helium atom.
11. An observer is at station. Find the difference in frequencies as heard by observer between (1) when train is approaching the station with speed of 30 m/s and (2) when train is leaving the station with speed of 30 m/s.
12. Two resistances, R and 3R are connected in parallel to each other. Find the ratio of power consumed by R and 3R, respectively
13. In YDSE, first minima is found in front of one of the slits. If separation between slits and screen is 5 cm and wavelength of light is 800 nm, then the separation between slits.
14. Mutual inductance of a small circular ring of radius r which is kept at the centre of a large square loop of side L is:
15. Two stars of mass m are revolving around each other due to their mutual attraction. If distance between them is 2R, then find the speed of any of the star.
16. A soap bubble having radius R = 3.5 cm is expanded by an external agent so that its radius becomes 2R. Find the change in surface energy of the soap bubble if surface tension, $T = 2 \times 10^{-2}$ N/m. (Take $\pi = \frac{22}{7}$).
17. A tennis ball is dropped from a height of 9.8 m. It hits the ground and rebounds to 5 m. Calculate average acceleration during the collision with ground if time of contact is 0.2 sec.
18. Match the following:
- | | |
|-----------------------|--------------------------|
| (A) Pressure gradient | (P) $M^0L^2T^{-2}$ |
| (B) Electric field | (Q) $M^1L^{-1}T^{-2}$ |
| (C) Latent heat | (R) $M^1L^1T^{-3}I^{-1}$ |
| (D) Energy density | (S) $M^1L^{-2}T^{-2}$ |
19. A charge q is placed on the centre of surface having area $(4L^2)$ of a cuboid of dimension $(2L \times 2L \times L)$. Find the value of electric flux passing through the surface that is just opposite to the surface having charge.
20. Find the range to which an antenna of height, $h = 80$ m can transmit signals on earth. Radius of earth is 6400 km.



21. Variation of magnetic field due to a ring in XY plane., at point $(0,0,z)$ is best represented by:



22. A particle having atomic number 92 is unstable so it emits 2 α particles and 1 β^{-1} particle. Then find the atomic number of stable daughter nuclei.

23. **Assertion:** $dQ = dU - dw$, here dQ = heat supplied, dU = change in internal energy, dw = work done by gas.

Reason : Law of conservation of energy

- (1) **A** is correct, **R** is correct and **R** is correct explanation of **A**.
- (2) **A** is correct, **R** is correct and **R** is not a correct explanation of **A**.
- (3) **A** is correct, **R** is incorrect.
- (4) **A** is incorrect.

24. Two polarizer P_1 and P_2 are placed such that their transmission axis are at 45° from each other. When ordinary light is passed through P_1 , I_1 intensity is observed and when this light is passed through P_2 , I_2 intensity is observed. Find the I_1/I_2 .

25. Magnetic field through a circular loop is 0.8 T. The radius of loop is expanding at a rate of 2 cm/s. The induced emf in the loop, when radius of the loop is 10 cm, is $x\pi \times 10^{-4}$ volts. Find x :

26. Two coherent waves of amplitude 8 cm each are superimposed on one another. If the amplitude of resultant wave is 8 cm then the phase difference between two waves is equal to :



CHEMISTRY

1. What is the ratio of the longest wavelength in Lyman Series for hydrogen is λ and shortest wavelength in Balmer Series for He^+ is?
- (1) $\frac{4}{3}$ (2) $\frac{3}{4}$ (3) $\frac{20}{27}$ (4) 1
2. The bluish green colour is due to which of the following compound when Borax is reacted with copper sulphate
- (1) CuO (2) $\text{Cu}(\text{BO}_2)_2$ (3) CuBO_2 (4) Cu
3. Arrange the following incorrect order of pK_a values?
- (i) Phenol (ii) 2,4,6-trimethyl Phenol
 (iii) 4-Nitrophenol (iv) 2,4,6-trinitro Phenol
- (1) $2 > 1 > 3 > 4$ (2) $1 > 2 > 3 > 4$ (3) $2 > 1 > 4 > 3$ (4) $4 > 3 > 1 > 2$
4. **Column-I** **Column-II**
- (a) Broad spectrum (p) Furacin
 (b) Narrow spectrum (q) Penicillin G
 (c) Antibiotic (r) SO_2
 (d) Antiseptic (s) Chloramphenicol
- (1) (a) – s, (b)- q, (c) – p, (d) – r (2) (a) – p, (b)- s, (c) – r, (d) – q
 (3) (a) – r, (b)- s, (c) – p, (d) – r (4) (a) – s, (b)- r, (c) – q, (d) – p
5. What is the order of hydration energy
 Ca, Mg, K, Rb, Cs
- (1) $\text{Mg} > \text{Ca} > \text{K} > \text{Rb} > \text{Cs}$ (2) $\text{Ca} > \text{Mg} > \text{K} > \text{Rb} > \text{Cs}$
 (3) $\text{Ca} > \text{Mg} > \text{Rb} > \text{K} > \text{Cs}$ (4) $\text{Mg} > \text{Ca} > \text{K} > \text{Cs} > \text{Rb}$
6. What is the correct bond dissociation energy order for F_2 , Cl_2 , Br_2 , I_2 ?
- (1) $\text{Cl}_2 > \text{Br}_2 > \text{F}_2 > \text{I}_2$ (2) $\text{Cl}_2 > \text{F}_2 > \text{Br}_2 > \text{I}_2$ (3) $\text{Cl}_2 > \text{F}_2 > \text{I}_2 > \text{Br}_2$ (4) $\text{F}_2 > \text{I}_2 > \text{Br}_2 > \text{Cl}_2$
7. Find the major product
- $$\text{Ph}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_2-\overset{\text{O}}{\parallel}{\text{C}}-\text{NH}_2 \xrightarrow[\text{(ii) LiAlH}_4/\text{H}_3\text{O}^+]{\text{(i) Zn-Hg/HCl}}$$
- (1) $\text{Ph}-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_2-\text{CH}_2-\text{NH}_2$ (2) $\text{Ph}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{NH}_2$
 (3) $\text{Ph}-\text{CH}_2-\text{CH}_2-\overset{\text{O}}{\parallel}{\text{C}}-\text{NH}_2$ (4) $\text{Ph}-\overset{\text{OH}}{\text{C}}-\text{CH}_2-\text{CH}_2-\text{NH}_2$



8. Column-I	Column-II
Reactions	Reagents
(a) Hoffmann Bromamide	(p) Zn-Hg / Conc. HCl
(b) Cannizzarro Reaction	(q) KOH and Br ₂
(c) Clemmensen Reduction	(r) CHCl ₃ + KOH
(d) Reimer – Tiemann Reaction	(s) Conc. NaOH
(1) (a) – q, (b)- s, (c) – p, (d) – r	(2) (a)–s, (b)–p, (c)–r, (d)–q
(3) (a)–p, (b)–q, (c)–s, (d)–r	(4) (a)–r, (b)–p, (c)–q, (d)–s

9. Which of the following compound is / are paramagnetic

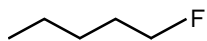
NO₂, NO, K₂O, Na₂O₂

- (1) NO₂ & NO (2) NO₂, NO & K₂O
 (3) NO₂, NO, K₂O & Na₂O₂ (4) NO₂, NO & Na₂O₂

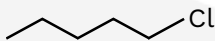
10. Select the correct statement among the following

- (1) Photochemical smog has high concentration of oxidising agent
 (2) Classical smog has high concentration of oxidising agent
 (3) Classical smog contains NO₂
 (4) None of these

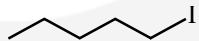
11. Arrange of the following in the increasing order of their boiling point.



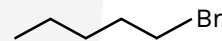
(I)



(II)



(III)



(IV)

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

12. Cannizzaro reaction is an example of disproportionation reaction. What is the catalyst used in Cannizzaro reaction.

- (1) FeCl₃ (2) conc. NaOH / H₂O
 (3) ZnCl₂ / H⁺ (4) H₂/ Pd / BaSO₄

13. Number of cyclic tripeptides formed with two amino acids A and B are:

- (1) 2 (2) 3 (3) 4 (4) 5

14. Which of the following will give positive lassaigne test

- (1) NH₄OH (2) NH₄Cl (3) N₂H₄ (4) CH₃—NH₂



15. Which of the following reaction corresponding to Mond process.

- (1) $ZrI_4 \xrightarrow{1800K} Zr + 2I_2$
- (2) $Ni(CO)_4 \xrightarrow{450-470K} Ni + 4CO$
- (3) $2[Au(CN)_2]^- + Zn(s) \longrightarrow 2Au(s) + [Zn(CN)_4]^{2-}$
- (4) $2Al_2O_3 + 3C \longrightarrow 4Al + 3CO_2$

16. **Assertion:** First law of thermodynamics has equation: $\Delta U = q + W$

Reason: First law of thermodynamics is based on the law of conservation of energy

- (1) A is correct and R is correct and R is the correct explanation of A.
- (2) A is correct and R is correct and R is not the correct explanation of A.
- (3) A is correct while R is incorrect.
- (4) A is incorrect while R is correct.

17. Match the column

Column – I		Column – II	
(i)	Siderite	(a)	ZnCO ₃
(ii)	Galena	(b)	FeCO ₃
(iii)	Calamine	(c)	PbS

- (1) i-(a), ii-(b), iii-(c)
- (2) i-(b), ii-(c), iii-(a)
- (3) i-(c), ii-(b), iii-(a)
- (4) i-(b), ii-(a), iii-(c)

18. Find out the magnetic character of Li₂O, KO₂ and MgO in that order.

- (1) Diamagnetic, paramagnetic and diamagnetic
- (2) Paramagnetic, paramagnetic and diamagnetic
- (3) Diamagnetic, paramagnetic and paramagnetic
- (4) Diamagnetic, diamagnetic and diamagnetic

19. Which of the following complex is optically active:

- (1) Cis-[Pt(NH₃)₂Cl₂]
- (2) Trans-[Pt(NH₃)₂Cl₂]
- (3) Cis-[Pt(en)₂Cl₂]
- (4) Trans-[Pt(en)₂Cl₂]

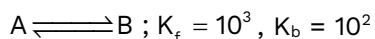
20. X : No : of bridge bonds present in compound Mn₂(CO)₁₀

Y : No : of bridge bonds present in compound W(CO)₆

Find out (X + Y).



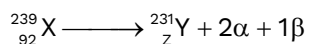
21. For the hypothetical reaction :



Use $T = 27^\circ\text{C}$, $R = 8.3 \text{ J K}^{-1} \text{ mol}^{-1}$; If the value of ΔG° for the above reaction is $x \text{ kJ}$, find the value of $2x$ (round off to nearest integer)

22. Number of millimoles of Ca(OH)_2 in 100 mL solution, given $\text{pH} = 12$.

23. An element ${}_{92}^{239}\text{X}$ decays as :



Then find the value of Z in the above reaction.

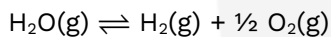
24. How many elements can liberate H_2 from dilute acids ?

V, Cr, Mn, Fe, Co, Ni, Cu

25. How many of the following compounds are odd electrons species

NO_2 , NO_2^+ , ICl_4^- , NO , BrF_3

26. Consider the following reaction.



If $K_p = 2 \times 10^{-3}$ at 2300 K and initial pressure of $\text{H}_2\text{O(g)}$ is 1 atm, then degree of dissociation of above reaction will be $x \times 10^{-2}$, the value of x is:



MATHEMATICS

1. If the product of real part of z_1z_2 is 0 i.e. $\text{Re}(z_1z_2) = 0$ & $\text{Re}(z_1 + z_2) = 0$ Then $\text{Im}(z_1)$ & $\text{Im}(z_2) =$
 - (1) $> 0, > 0$
 - (2) $< 0, < 0$
 - (3) $> 0, < 0$
 - (4) $0, 0$

2. If $f(x)$ is a differentiable function such that $f(x + y) = f(x) + f(y) - 1$ and $f'(0) = 2$ then $|f(-2)|$ is

3. Five digit number from 1, 2, 3, 5, 7 with repetition are formed then number 35337 lies at which number when counting is from backwards

4. $x^2 dy - y(1 + x)dx = 0, y(1) = e, \lim_{x \rightarrow 0^+} y(x)$ is

5. $f(x) = \frac{\log_{(x-1)}(x-2)}{e^{2\log_e x}(x^2 - 2x + 3)}$ find domain of $f(x)$

6. $f(x) = \max(x^2, 1 + [x])$ then $\int_0^2 f(x)dx =$

7. If $A^2 = A + \alpha I$ and $A^4 = 27A + \beta I$ then α, β is

8. If A_1 is the area bounded by $2x \leq y \leq \sqrt{4(x-1)^2}$ in 1st Quadrant & A_2 is the area bounded by $y = \min(2x, \sqrt{4(x-1)^2})$ and x axis. Find $\frac{A_1}{A_2}$

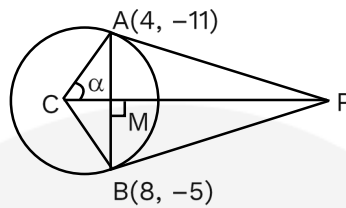
9. There are 7 rotten apples and 4 good apples placed in a basket, apples are drawn one by one without replacement till all good apples are drawn find the probability that, in all 5 five apples are drawn

10. If a_1, a_2, a_3, \dots are positive numbers in G.P. such that $a_5 + a_7 = 12$ and $a_4 a_6 = 9$ find the value of $a_7 + a_9$

11. Consider a function $f(x) = \frac{2x^2 + x + 1}{x^2 + 1}$ then which of the following is correct
 - (1) $f(x)$ is one to one $\forall x \in (0, 2)$
 - (2) $f(x)$ is many to one $\forall x \in (0, 2)$
 - (3) $f(x)$ is one to one $\forall x \in (0, \infty)$
 - (4) $f(x)$ is one to one $\forall x \in (1, \infty)$



12. A function satisfy the relation $f(x + y) = f(x) + f(y), \forall x, y \in W$ and $\sum_{n=1}^m \frac{f(n)}{n(n+1)(n+2)} = \frac{1}{12}, f(1) = 1/5$ then, find m
13. In the expansion of $(1 + 2x)^n$, ratio of 3 consecutive coefficient is $2 : 5 : 8$. find the middle term of $(1 + 2x)^n$.
14. Two tangent are drawn at $A(4, -11)$ and $B(8, -5)$ to the circle $x^2 + y^2 - 3x + 10y - 15 = 0$. These tangent meet at P. Radius of circle centered at P and touching AB, is $\frac{\lambda\sqrt{13}}{3}$ find λ



15. Consider $\left(\alpha x - \frac{1}{\beta x}\right)^{11}$ if coefficient of x^9 is equal to coefficient of x^{-9} find $(\alpha\beta)^2$
16. Find the area common to following region $x^2 + y^2 \leq 21, x \geq 1$ and $y^2 \leq 4x$.
17. In a football club there are 15 players, each player has a T-shirt of their own name. Find the number of ways such that atleast thirteen players pick the correct T-shirt of their own name.
18. Consider three coplanar vectors $\vec{a} = 3\hat{i} - 4\hat{j} + \lambda\hat{k}, \vec{b} = 4\hat{i} + 3\hat{j} - \hat{k}, \vec{c} = \hat{i} + 3\hat{j} - 4\hat{k}$ then 9λ is -