

PHYSICS

Section A : Objective Type Questions

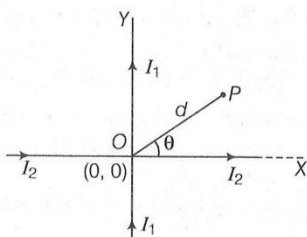
- When a H-atom in ground state is excited by monochromatic radiation of photon energy 12.75 eV. Then, the number of emission lines will be (given its ionisation energy is 13.6 eV)
(a) one (b) two (c) four (d) six
- Statement I** When two charged spheres are connected to each other by thin conducting wire, charge flow from bigger sphere to smaller sphere, if initial charges on them are same.
Statement II Electrostatic energy will be lost in redistribution.
In the light of the above statements, choose the most appropriate answer from the options given below.
(a) Both Statement I and Statement II are incorrect.
(b) Statement I is correct but Statement II is incorrect.
(c) Statement I is incorrect but Statement II is correct.
(d) Both Statement I and Statement II are correct.
- A gaseous mixture enclosed in a vessel consists of 1 gm mole of a gas A with $\gamma = 5/3$ and some amount of gas B with $\gamma = 7/5$ at a temperature T . The gases A and B do not react with each other and are assumed to be ideal. If γ for the gaseous mixture is $19/13$, then the number (in gm moles) of the gas B is
(a) 2 (b) 4 (c) 3 (d) 8
- Match the Column I with Column II and select the correct answer from the codes given below.

Column I	Column II
A. Energy density	1. $C^2/N\text{-m}^2$
B. Young's modulus	2. Jm^{-3}
C. Permittivity of free space	3. Nm^{-2}
D. Force constant of a spring	4. Nm^{-1}

Codes

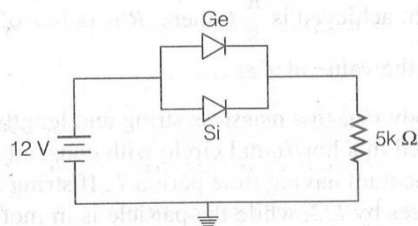
A	B	C	D	A	B	C	D
(a) 2	4	1	3	(b) 1	2	3	4
(c) 3	2	4	1	(d) 2	3	1	4

- Two wires carrying currents I_1 and I_2 are placed in a horizontal plane as given below. Then, magnetic field at point P in the same plane will be (given $OP = d$)



- $\frac{\mu_0}{2\pi d} [-I_1 \sin \theta + I_2 \cos \theta] \hat{k}$
- $\frac{\mu_0}{2\pi d} \left[\frac{I_1}{\sin \theta} + \frac{I_2}{\cos \theta} \right] \hat{k}$
- $\frac{\mu_0}{2\pi d} [-I_1 \sin \theta - I_2 \cos \theta] \hat{k}$
- $\frac{\mu_0}{2\pi d} \left[\frac{-I_1}{\cos \theta} + \frac{I_2}{\sin \theta} \right] \hat{k}$

- Which of the following statement is correct ?
(a) Least count of screw gauge of pitch 0.5 mm and having, 50 divisions on circular scale is 0.02 mm.
(b) Least count of vernier callipers with main scale division value of 1 mm and having 25 divisions on sliding scale is 0.04 mm.
(c) Both (a) and (b).
(d) None of the above
- A gasoline engine takes in 5 moles of air at 20°C and 1 atm and compresses it adiabatically to $(1/10)$ of the original volume. Assume, air to be diatomic. The work done and change in internal energy is
(a) 46 kJ, - 46 kJ (b) 36 kJ, - 36 kJ
(c) - 46 kJ, 46 kJ (d) 36 kJ, - 46 kJ
- At 0.3V and 0.7V, the diodes Ge and Si become conductor respectively. In given figure, if ends of diode Ge overturned, the change in potential V_0 will be



- 0.7 V (b) 0.6 V (c) 0.4 V (d) 0.8 V

- A particle of mass m is executing oscillations about the origin on the X -axis. Its potential energy is $U(x) = k|x^3|$, where k is a positive constant. If the amplitude of oscillation is A , then its time period T is
(a) proportional to $\frac{1}{\sqrt{A}}$ (b) independent of A
(c) proportional to $\sqrt{A}$ (d) proportional to $A^{3/2}$
- Assertion** If the accelerating potential in an X-ray tube is increased, the wavelengths of the characteristic X-rays do not change.
Reason Whenever an electron beam strikes the target in an X-ray tube, part of the KE is converted into mechanical energy.
(a) Assertion and Reason both are true and Reason is a correct explanation of Assertion.
(b) Assertion and Reason both are true and Reason is not a correct explanation of Assertion.
(c) Assertion is true but Reason is false.
(d) Assertion is false but Reason is true.

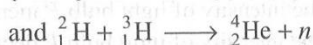
11. The electric field in a region is given by

$$E = (6\hat{i} + 8\hat{j}) \text{ N/kg}$$

If the potential at the origin is taken to be zero, then the ratio of the potential at the points (8m, 0) and (0, 6m) is

- (a) 0 (b) 1 (c) 2 (d) $\frac{1}{2}$

12. A star has a supply of 10^{50} deuterons. It produces energy via a fusion reaction



where, masses of nuclei are

$$m({}^2_1\text{H}) = 2.014 \text{ amu,}$$

$$m(p) = 1.007 \text{ amu, } m(n) = 1.008 \text{ amu and}$$

$$m({}^4_2\text{He}) = 4.001 \text{ amu}$$

If the average power radiated by the star is 10^{16} W .

The deuteron supply of the star is exhausted in a time of the order of (1 amu = 931 MeV)

- (a) 10^{22} s (b) 10^{18} s (c) 10^8 s (d) 10^{12} s

13. In two different experiments, an object of mass 10 kg moving with a speed of 25 ms^{-1} hits two different walls and come to rest within

(i) 4 s and

(ii) 8 s respectively, some statements are given below.

Choose the correct set of statements.

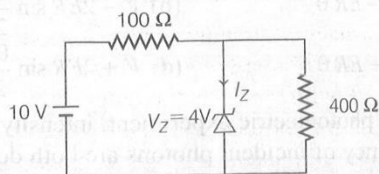
I. Change in momentum is same in both cases.

II. Impulse imparted is same in both cases.

III. F_{avg} in case (ii) is more than in case (i)

- (a) Only I is true
(b) Only II is true
(c) I and II both are true
(d) I, II and III all are true

14. The current flowing through the zener diode is

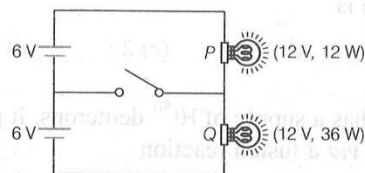


- (a) 50 mA (b) 100 mA
(c) 25 mA (d) 40 mA

15. A small body of mass m slides over a hemisphere of radius 3 m. At what height from the ground, the body will detach itself from hemisphere?

- (a) $\frac{2}{3} \text{ m}$ (b) 2 m (c) $\frac{3}{5} \text{ m}$ (d) $\frac{5}{3} \text{ m}$

16. Two light bulbs shown in the circuit are having ratings P (12 V, 12 W) and Q (12 V, 36 W) as shown in the figure. When the switch is closed, then



- (a) the intensity of light bulb P increases
(b) the intensity of light bulb P decreases
(c) the intensity of light bulb Q remains unchanged
(d) the intensity of light bulb Q decreases

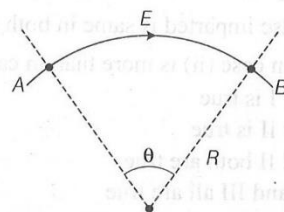
17. A plane electromagnetic wave has frequency $5.0 \times 10^{10} \text{ Hz}$ and its energy density is $2.04 \times 10^{-8} \text{ J/m}^3$ in vacuum. The amplitude of magnetic field of the wave is

(Take, $\frac{1}{4\pi\epsilon_0} = 9 \times 10^9 \text{ N-m}^2/\text{C}^2$,

speed of light = $3 \times 10^8 \text{ m/s}$)

- (a) 225.4 nT (b) 226.4 nT
(c) 375.8 nT (d) 250.6 nT

18. Figure shows an electric line of force which curves along a circular arc. The magnitude of electric field intensity is same at all points on this curve and is equal to E . If the potential at A is V , then the potential at B is



- (a) $V - ER\theta$ (b) $V - 2ER \sin \frac{\theta}{2}$
(c) $V + ER\theta$ (d) $V + 2ER \sin \frac{\theta}{2}$

19. If in a photoelectric experiment, intensity and frequency of incident photons are both doubled, the saturation current

- (a) remains unchanged (b) increases slightly
(c) decreases slightly (d) doubles

20. A light ray is incident perpendicular to one face of a 90° prism and is totally internally reflected at the glass-air interface. If the angle of reflection is 45° , we conclude that the refractive index n ,

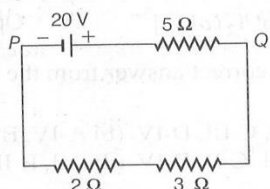
- (a) $n > \sqrt{2}$ (b) $n < \sqrt{2}$
(c) $n > \frac{1}{\sqrt{2}}$ (d) $n < \frac{1}{\sqrt{2}}$

Section B : Numerical Value Type Questions

21. If a body is projected from surface of Earth with a velocity $\frac{1}{Z}$ of escape velocity, such that maximum

height achieved is $\frac{R}{8}$ (where, R is radius of Earth), then the value of Z is

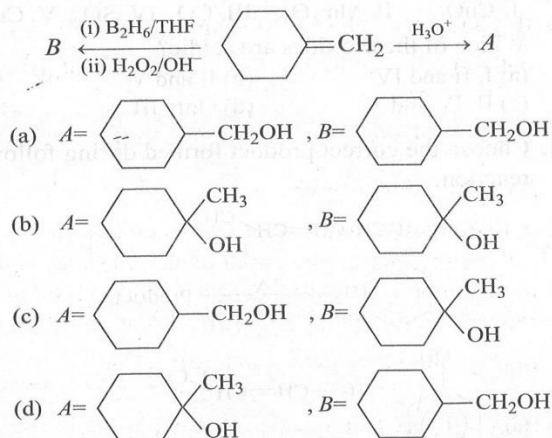
22. A body tied to a massless string and length L is rotated in a horizontal circle with constant angular momentum having time period T . If string length reduces by $L/2$, while the particle is in motion, the time period becomes $\frac{T}{P}$, where P is
23. Two blocks with masses $m_1 = 1$ kg and $m_2 = 2$ kg are connected by a spring of spring constant $k = 24 \text{ Nm}^{-1}$ and placed on a frictionless horizontal surface. The block m_1 is imparted an initial velocity $v_0 = 12 \text{ cm s}^{-1}$ to the right, the amplitude of oscillation is cm.
24. Two cricket balls P and Q thrown with speeds in the ratio $1:\sqrt{3}$ acquired the same heights. If P is thrown at an angle of 45° with the horizontal, then the angle of projection is found to be $\sin^{-1} \frac{1}{\sqrt{m}}$, then the value of m is
25. For the given electrical network, the potential difference $V_Q - V_P$ is V.



CHEMISTRY

Section A : Objective Type Questions

1. Find out the major products from the following reactions.



2. Which of the following carbohydrate will form same osazone?
- (a) Glucose and fructose
(b) Glucose and gluconic acid
(c) Mannose and sucrose
(d) Fructose and maltose

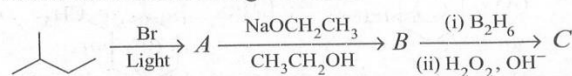
3. Which one of the following compounds has the electron pair geometry as the trigonal bipyramidal with three equatorial positions occupied by lone pair of electrons?

- (a) XeF_2 (c) $[\text{Pt}(\text{NH}_3)_2\text{Cl}_2]$
(b) AlCl_3 (d) $\text{CH}_3-\text{Mg}-\text{Br}$

4. Which of the following is incorrect statement?

- (a) Ions of d -block elements are coloured due to $d-d$ transition.
(b) Ions of f -block elements are coloured due to $f-f$ transition
(c) $[\text{Sc}(\text{H}_2\text{O})_6]^{3+}$, $[\text{Ti}(\text{H}_2\text{O})_6]^{4+}$ are coloured complexes
(d) Cu^+ is colourless ion

5. Consider the following reaction,



Major product formed by the above sequence of reactions is

- (a) (b)
(c) (d)

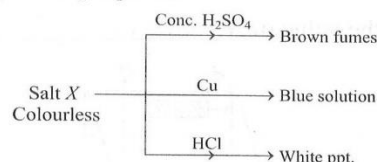
6. A student has studied the decomposition of a gas XY_3 at 25°C . She obtained the following data.

P(mm Hg)	25	50	100	200
Relative $t_{1/2}$ (s)	8	4	2	1

The order of the reaction is

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

7. For the following reactions, identify the salt (X) that satisfy these properties.



- (a) AgNO_3 (b) $\text{Cu}(\text{NO}_3)_2$
(c) $\text{Pb}(\text{NO}_3)_2$ (d) NaNO_3

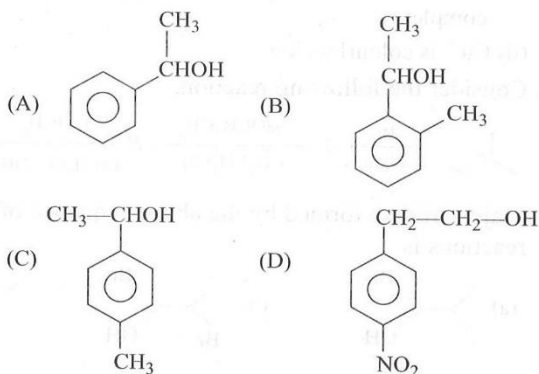
8. Benzoyl chloride on reaction with H_2 in presence of Pd/BaSO_4 produces a compound A. Which of the following will be the product, if A is treated with KCN in aqueous alcohol?

- (a) 1-hydroxy-1,2-diphenylethan-1-one
(b) 2-hydroxy-1,2-diphenylethan-1-one
(c) 2-hydroxy-2,2-diphenylethan-2-one
(d) 2-hydroxy-1,1-diphenylethan-2-one

9. When chlorine water is added to an aqueous solution of sodium iodide in the presence of chloroform, a violet colouration is obtained. On adding more of chlorine water and vigorous shaking, the violet colour disappears. This shows that X is converted to Y. Then, X and Y are

- (a) I_2 , HI (b) I_2 , HIO_4
(c) I_2 , HIO_3 (d) I_2 , HIO

10. Increasing order of dehydration of



Choose the correct answer from the options given below.

- (a) $A > B > C > D$ (b) $B > C > A > D$
(c) $D > A > C > B$ (d) $D > A > B > C$

11. Match List-I with List-II.

List-I (Complex)	List-II (Isomerism)
A. $\text{Cr}(\text{NH}_3)_6[\text{Co}(\text{CN})_6]$	I. Linkage isomerism
B. $[\text{Ni}(\text{NH}_3)_3(\text{NO}_2)_3]^{3-}$	II. Solvate isomerism
C. $[\text{Fe}(\text{H}_2\text{O})_6]\text{Cl}_3$	III. Co-ordination isomerism
D. $\text{cis}[\text{CoCl}_2(\text{ox})_2]^{3-}$	IV. Optical isomerism

Choose the correct answer from the options given below.

- (a) A-II, B-I, C-III, D-IV (b) A-IV, B-II, C-III, D-I
(c) A-III, B-I, C-II, D-IV (d) A-I, B-II, C-III, D-IV

12. Consider the statements given below.

Statement I Enzyme activators can be considered as positive allosteric modulators for receptors.

Statement II When a vitamin is present along the enzyme, the catalytic activity is increased considerably.

In the light of the above statements. Choose the correct answer from the options given below.

- (a) Both Statements I and Statement II are correct.
(b) Both Statement I and Statement II are incorrect.
(c) Statement I is correct but Statement II is incorrect.
(d) Statement I is incorrect but Statement II is correct.

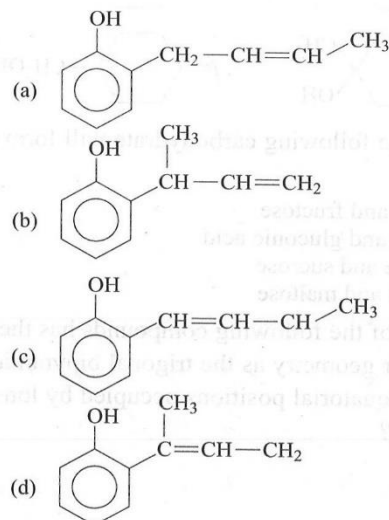
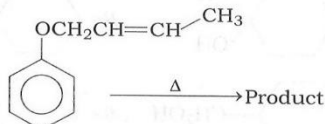
13. Given are the oxides of some elements.

- I. CuO II. Mn_2O_7 III. CO IV. SO_2 V. CrO_3

Which of these oxides are acidic?

- (a) I, II and IV (b) II and V
(c) II, IV and V (d) Only III

14. Choose the correct product formed during following reaction,



15. The maximum number of P—H bonds are contained in which of the following molecules?

- (a) H_3PO_2 (b) H_3PO_3 (c) H_3PO_4 (d) $\text{H}_4\text{P}_2\text{O}_7$

16. Given below are two statements one is labelled as Assertion (A) and other is labelled as Reason (R).

Assertion (A) In water, orthoboric acid behaves as a weak monobasic acid.

Reason (R) In water, orthoboric acid acts as a proton donor.

In the light of the above statements. Choose the correct answer from the options given below.

- (a) Both (A) and (R) are true but (R) is the correct explanation of (A).
(b) Both (A) and (R) are true but (R) is not the correct explanation of (A).
(c) (A) is true but (R) is false.
(d) (A) is false but (R) is true.

17. Match List-I with List-II.

List-I	List-II
A.	I.
B.	II.
C.	III.
D.	IV.

Choose the correct answer from the options given below.

- (a) A-IV, B-I, C-II, D-III (b) A-II, B-I, C-IV, D-III
(c) A-III, B-II, C-I, D-IV (d) A-II, B-IV, C-III, D-I

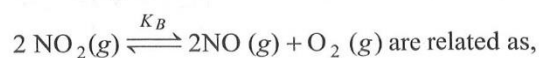
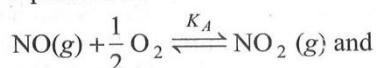
18. Order of atomic radii,

- A. Nd > Ce > Eu > Ho
- B. Ho < Eu < Nd < Ce
- C. Ce < Sm < Yb < Lu
- D. Lu < Yb < Sm < Ce
- E. Nd > Ce < Eu > Ho

Choose the correct answer from the given options below.

- (a) B and D
- (b) A, D and E
- (c) C and D
- (d) B, C and D

19. Equilibrium constants K_A and K_B for the following equilibrium



- (a) $K_A = \frac{1}{K_B}$
- (b) $K_B = \frac{1}{K_A}$
- (c) $K_B = \frac{1}{K_A^2}$
- (d) $K_A = \frac{1}{K_B^2}$

20. Which of the following statement is not correct?

- (a) Absorption peak for $[\text{Cr}(\text{NH}_3)_6]^{3+}$ is 21680 cm^{-1} .
- (b) Effective atomic no. of Pt in $[\text{PtCl}_6]^{2-}$ is 84.
- (c) Crystal field stabilisation energy of d^2 in weak ligand field is $(-0.8\Delta_0)$.
- (d) Example of weak ligand for d^5 configuration is $[\text{MnF}_6]^{4-}$.

Section B : Numerical Value Type Questions

21. The number of correct statements from the following is

- (A) A second order reaction is always a multistep reaction.
- (B) A zero order reaction is a multistep reaction.
- (C) A first order reaction is always a single step reaction.
- (D) A zero order reaction is a single step reaction.

22. On mixing, heptane and octane form an ideal solution at 373 K, the vapour pressures of the two liquid components (heptane and octane) are 105 kPa and 45 kPa respectively. Vapour pressure of the solution obtained by mixing 25 g of heptane and 35 g of octane will bekPa. (Molar mass of heptane = 100 g mol^{-1} and of octane = 114 g mol^{-1})

23. In reaction $A + 2B \rightleftharpoons 2C + D$, initial concentration of B was 1.5 times of [A], but at equilibrium the concentrations of A and B became equal. The equilibrium constant for the reaction is

24. A 1.025 g sample containing a weak acid, HA (molecular weight = 82) is dissolved in 60 mL of water and titrated with 0.25 M NaOH. When half of the acid was neutralised the pH was found to be 5.0 and at the equivalent point, the pH is 9.0. The weight percentage of HA in sample will be

25. A hydrogen atom in its ground state is exposed to radiation by the light of wavelength 970 Å. The ground state energy of hydrogen atom is -13.6 eV. The number of lines present in the emission spectrum is

[Given, $hc/e = 1237 \times 10^{-6} \text{ eV-m}$]

MATHEMATICS

Section A : Objective Type Questions

1. The angle between the lines whose direction cosines has the relation $l + m + n = 0$ and $2l^2 + 2m^2 - n^2 = 0$ is

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

2. Let $p(x)$ be a polynomial with real coefficient such that $(x^3 - \alpha^3)$ is a factor of $p(x) - p(\alpha)$ for each positive real number α , then $p(x)$ is the form of

- (a) $f(x^3)$
- (b) $xf(x^3)$
- (c) $x^2 f(x^3)$
- (d) a constant

3. Three numbers are in AP with common difference d are removed from first n natural numbers and

average of remaining numbers is found to be $\frac{43}{4}$,

then ordered pair (n, d) can be

- (a) (23, 5)
- (b) (19, 8)
- (c) (19, 5)
- (d) (23, 8)

4. If $A = \begin{bmatrix} \sqrt{3} & 1 \\ 2 & 2 \\ -1 & \sqrt{3} \\ 2 & 2 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ and $C = ABA^T$ and

$x = A^T C^{2023} A$, then x is equal to

- (a) $\begin{bmatrix} 1 & 2023 \\ 0 & 1 \end{bmatrix}$
- (b) $\begin{bmatrix} 4 + 2023\sqrt{3} & 6150 \\ 2025 & 4 - 2023\sqrt{3} \end{bmatrix}$
- (c) $\frac{1}{4} \begin{bmatrix} 2 + \sqrt{3} & 1 \\ -1 & 2 - \sqrt{3} \end{bmatrix}$
- (d) $\frac{1}{4} \begin{bmatrix} 2023 & 2 - \sqrt{3} \\ 2 + \sqrt{3} & 2023 \end{bmatrix}$

5. For $f(x) = \int_x^{x^2} \frac{du}{(\log u)^2}$, $x \neq 0, 1$, then consider the

following statements for $f(x)$.

Statement I $f(x)$ is monotonically increasing in the interval $(2, \infty)$.

Statement II $f(x)$ is monotonically decreasing in the interval $(0, 1)$.

- (a) Statement I is true and Statement II is false
- (b) Statement I is false and Statement II is true
- (c) Statement I and Statement II both are true
- (d) Statement I and Statement II both are false

6. Let $f(x) = \frac{2x(\sin x + \tan x)}{2\left[\frac{x+21\pi}{\pi}\right] - 41}$, $x \neq n\pi$
(where, $[\cdot]$ represents greatest integer function), then f is
(a) an odd function
(b) an even function
(c) Both odd and even
(d) Neither odd nor even
7. If $4y = -3x$ and $\sqrt{3}y = x$ are the equations of a pair of conjugate diameters of an ellipse, then the eccentricity of the ellipse is
(a) $\sqrt{\frac{4+\sqrt{3}}{4}}$
(b) $\sqrt{\frac{4-\sqrt{3}}{2}}$
(c) $\sqrt{\frac{2-\sqrt{3}}{2}}$
(d) None of these
8. Let $\mathbf{a} = 2\hat{i} + 8\hat{j} + 4\hat{k}$, $\mathbf{b} = 6\hat{i} - 4\hat{j} + 14\hat{k}$ and $\mathbf{c} = 4\hat{i} - 2\hat{j} + 8\hat{k}$. If a vector $\mathbf{d}$ satisfies $\mathbf{d} \times \mathbf{b} = \mathbf{c} \times \mathbf{b}$ and $\mathbf{d} \cdot \mathbf{a} = 32$, then $9\mathbf{d}$ is equal to
(a) $48\hat{i} - 26\hat{j} + 100\hat{k}$
(b) $89\hat{i} - 48\hat{j} + 92\hat{k}$
(c) $62\hat{i} - 72\hat{j} + 48\hat{k}$
(d) $62\hat{i} + 88\hat{j} - 72\hat{k}$
9. If A and B represents the complex numbers z_1 and z_2 such that $|z_1 + z_2| = |z_1 - z_2|$, then the circumcentre of $\triangle OAB$, where O is origin, is
(a) $\frac{z_1 + z_2}{2}$
(b) $\frac{z_1 - z_2}{2}$
(c) $\frac{z_1 + z_2}{3}$
(d) $\frac{z_1 - z_2}{3}$
10. The parabola $y^2 - px + 12 = 0$ has directrix as the straight line $x = 2$. Then, if p_1 and p_2 represent the two possible values of p (where $p_1, p_2 \in \mathbb{R}$, $p_1 < p_2$), then $\left(\frac{p_1}{p_2}\right)$ is
(a) 3
(b) $\frac{1}{3}$
(c) -3
(d) $-\frac{1}{3}$
11. If $\cos(\beta - \alpha)$, $\cos \beta$ and $\cos(\beta + \alpha)$ are in harmonic progression, then the value of $2 \cos^2 \frac{\beta}{2} \cdot \sec \frac{\alpha}{2} - \sec \frac{\alpha}{2}$ is equal to
(a) $\pm \frac{1}{\sqrt{2}}$
(b) $\pm 2\sqrt{2}$
(c) $\pm \sqrt{2}$
(d) $\pm \sqrt{3}$
12. The mean and variance of seven observations are 8 and 16, respectively. If 5 of the observations are 2, 4, 10, 12 and 14, then the product of the remaining two observations is
(a) 45
(b) 49
(c) 48
(d) 40
13. The interval of a , for which (a, a^2, a) and $(3, 2, 1)$ lies on same side of $x + y - 4z + 2 = 0$, is
(a) $(-\infty, 1) \cup (2, \infty)$
(b) $(-\infty, 1] \cup [2, \infty)$
(c) $(-\infty, 2) \cup (3, \infty)$
(d) $(-\infty, 2] \cup [3, \infty)$
14. The area of the greatest isosceles triangle that can be inscribed in a given ellipse having its vertex coincident with one end of the major axis, is
(a) $\frac{\sqrt{3}}{4} ab$
(b) $\frac{\sqrt{3}}{2} ab$
(c) $\frac{3\sqrt{3}}{4} ab$
(d) $\sqrt{3} ab$
15. The contents of 3 bags with respect to green and red marbles is as given in the table below
- | Bag | A | B | C |
|-------|---|---|---|
| Green | 3 | 2 | 1 |
| Red | 1 | 2 | 3 |
- A person randomly select one of the bags and draws a marble from it and retains it. If the marble is green, the persons draws the second marbles randomly from one of the two remaining bags.
If the first marble drawn is red the person draws one more marble from the same bag. The probability that the second drawn marble is green, is
(a) $\frac{73}{144}$
(b) $\frac{79}{140}$
(c) $\frac{63}{134}$
(d) $\frac{56}{137}$
16. Suppose $f(x) = ax + b$ and $g(x) = bx + a$, where a and b are positive integers. If $f[g(20)] - g[f(20)] = 28$, then $a + b$ is
(a) 6
(b) 8
(c) 9
(d) 13
17. Let $f(x) = [\tan x (\cot x)]$, $x \in \left[\frac{\pi}{12}, \frac{\pi}{2}\right]$, where $[\cdot]$ denotes the greatest integer less than or equal to x . Then, the number of points, where $f(x)$ is discontinuous, is equal to
(a) 1
(b) 0
(c) 3
(d) ∞
18. The coefficient of x^{11} in the expansion of $(1 - 2x + 3x^2)(1 + x)^{11}$, is
(a) 196
(b) 64
(c) 121
(d) 144
19. If $\frac{a}{b}$ is the area of the region bounded by the curves $y = ex \ln x$ and $y = \frac{\ln x}{ex}$, where $\ln e = 1$, then $a + b$ is equal to
(a) $e^2 + 4e - 5$
(b) $e^2 + 4e + 5$
(c) $e^2 - 2e - 5$
(d) $e^2 - 4e + 5$

20. $f(x)$ is a continuous function for all real values of x and satisfies $\int_n^{n+1} f(x) dx = \frac{n^2}{2}, \forall n \in I$, then

$\int_{-3}^5 f(|x|) dx$ is equal to

- (a) $\frac{19}{2}$ (b) $\frac{35}{2}$
(c) $\frac{17}{2}$ (d) None of these

Section B : Numerical Value Type Questions

21. For $(2x-1)^{20} - (ax+b)^{20} = (x^2+px+q)^{10}$, where

a, b, p and q are real numbers. The value of $\left|\frac{p}{q}\right|$ is

equal to

22. If a function f satisfies the following conditions for all real values of x and y

- (i) $f(x+y) = f(x)f(y)$
(ii) $f(x) = 1 + xg(x)$, where $\lim_{x \rightarrow 0} g(x) = 1$.

Then, the value of $\log f(10)$ is

23. Let $\langle T_n \rangle$ be an arithmetic progression with common difference $d (d \neq 0)$ and $\langle S_n \rangle$ be a geometric progression with common ratio r , where r is a rational number and $0 < r < 1$. If $T_1 = d, S_1 = d^2$ and $\frac{T_1^2 + T_2^2 + T_3^2}{S_1 + S_2 + S_3}$ is a positive integer, then $6r$ is equal to

24. Let $f(x) = \begin{vmatrix} 2\cos^2 x & \sin 2x & -\sin x \\ \sin 2x & 2\sin^2 x & \cos x \\ \sin x & -\cos x & 0 \end{vmatrix}$

Then, $\frac{1}{\pi} \int_0^{\pi/2} [f(x) + f'(x)] dx$ is equal to

25. If $T = \sum_{r=1}^{90} \tan^{-1} \left(\frac{2r}{2+r^2+r^4} \right)$, then $8190(\cot T - 1)$ is equal to

PHYSICS

1	D	2	C	3	A	4	D	5	D	6	B	7	C	8	C	9	A	10	C
11	B	12	A	13	C	14	A	15	B	16	B	17	B	18	A	19	D	20	A
21	3	22	4	23	2	24	6	25	10										

CHEMISTRY

1	D	2	A	3	A	4	C	5	C	6	C	7	A	8	B	9	C	10	B
11	C	12	A	13	C	14	B	15	A	16	C	17	B	18	A	19	C	20	B
21	1	22	72	23	4	24	80	25	6										

MATHS

1	C	2	A	3	C	4	A	5	C	6	A	7	B	8	A	9	A	10	C
11	C	12	C	13	A	14	C	15	A	16	B	17	C	18	D	19	A	20	B
21	4	22	10	23	3	24	1	25	2										