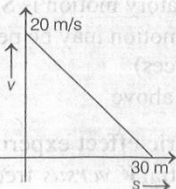


PHYSICS

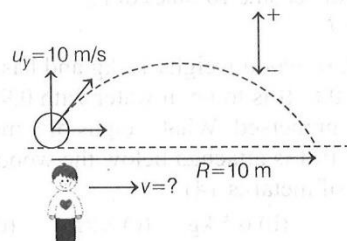
Section A : Objective Type Questions

- A cylinder of mass 1 kg is given heat of 20000 J at atmospheric pressure. If initially, temperature of the cylinder is 20°C , then work done by the cylinder will be (Given that specific heat of cylinder $= 400 \text{ J kg}^{-1}\text{ }^{\circ}\text{C}$, coefficient of volume expansion $= 9 \times 10^{-5} \text{ }^{\circ}\text{C}^{-1}$, atmospheric pressure $= 10^5 \text{ N/m}^2$ and density of cylinder 9000 kg/m^3)
(a) 0.02 J (b) 0.05 J (c) 0.08 J (d) 0.1 J
- In a double slit experiment, a glass plate of refractive index 1.5 of thickness t is introduced in the path of one of the interfering beams of wavelength λ . The position of central maxima has got shifted by $\frac{2\lambda D}{d}$, then what would be the thickness of plate?
(a) 4λ (b) 2λ (c) λ (d) 3λ
- The wavelength of first line of Balmer series of hydrogen atom is $\lambda \text{ \AA}$. The wavelength of this line of a double ionised lithium atom ($Z=3$) is
(a) $\frac{\lambda}{3}$ (b) $\frac{\lambda}{9}$ (c) $\frac{\lambda}{8}$ (d) $\frac{\lambda}{27}$
- 10 resistors, each of resistance R are connected in series to a battery of emf E and negligible internal resistance, then those are connected in parallel to the same battery. If I_p and I_s be the current drawn by the battery in parallel and series combination, then
(a) I_p will become 10 times of I_s
(b) I_p will become 100 times of I_s
(c) I_s will become 10 times of I_p
(d) $I_p = I_s$
- A block of wood weighs 12 kg and has a relative density 0.6. It is to be in water with 0.9 of its volume immersed. What weight of a metal is needed, if it is attached below the wood? (Relative density of metal is 14)
(a) 7 kg (b) 6.5 kg (c) 8 kg (d) 16 kg
- If the velocity v of a particle moving along a straight line decreases linearly with its displacement s , from 20 ms^{-1} to a value approaching zero at $s=30 \text{ m}$, then acceleration of the particle at $s=15 \text{ m}$, is



- (a) $\frac{2}{3} \text{ ms}^{-2}$ (b) $-\frac{2}{3} \text{ ms}^{-2}$ (c) $\frac{20}{3} \text{ ms}^{-2}$ (d) $-\frac{20}{3} \text{ ms}^{-2}$

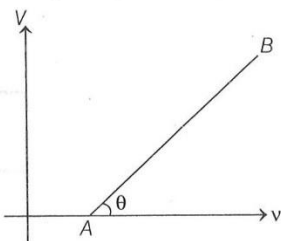
- If the least count of a vernier scale is $\frac{1}{2}$ times of main scale division, then the number of division on vernier scale that coincide with 4 divisions on main scale is
(a) 4 (b) 10 (c) 8 (d) 11
- A body of mass 5 kg is placed on earth's surface. If this body is taken from earth's surface to a height h , where $h=4R$, the change in gravitational potential energy will be
(a) $25 \times 10^8 \text{ J}$ (b) $15 \times 10^6 \text{ J}$
(c) $15 \times 10^8 \text{ J}$ (d) $25 \times 10^6 \text{ J}$
- The force acting on a body in SI unit is 65 N. In a certain unit in which the unit of length is 20 cm, unit of mass is 30 g and the unit of time is 15 s, the numerical value of force acting on the body is
(a) 126500 (b) 165200
(c) 125600 (d) 2437500
- For a medium with permittivity ϵ and permeability μ , the refractive index of medium would be (μ_0 and ϵ_0 refer to permeability and permittivity of vacuum)
(a) $\mu\epsilon / \mu_0\epsilon_0$ (b) $\mu_0\epsilon_0 / \mu\epsilon$
(c) $\sqrt{\frac{\mu\epsilon}{\mu_0\epsilon_0}}$ (d) $\sqrt{\frac{\mu_0\epsilon_0}{\mu\epsilon}}$
- A batsman hits a ball as shown in the figure and starts running to catch it. By what speed, he should run so that he could catch the ball?



- (a) 4 m/s (b) 5 m/s
(c) 10 m/s (d) 15 m/s
- Which of the following statement is correct ?
(a) Periodic motion is necessarily an oscillatory motion
(b) Every oscillatory motion is SHM
(c) Oscillatory motion may be periodic (without resistive forces)
(d) None of the above

13. In a photoelectric effect experiment, the graph of stopping potential V versus frequency of light is shown in the figure.

As the intensity of light decreased,



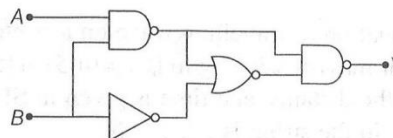
- (a) the angle θ remains constant
(b) the point A shifts towards left with same angle θ .
(c) the point A shifts towards right with angle greater than θ
(d) the straight line AB becomes a curve.
14. **Assertion** The amount of work done in the isothermal expansion is greater than work done in the adiabatic system for the same final volume.
- Reason** In the adiabatic expansion of a gas, temperature and pressure both decrease due to decrease in internal energy of the system.
- (a) Both Assertion and Reason are correct and Reason is the correct explanation of Assertion.
(b) Both Assertion and Reason are correct but Reason is not the correct explanation of Assertion.
(c) Assertion is correct but Reason is incorrect.
(d) Assertion is incorrect but Reason is correct.
15. **Statement I** For a massless string, the tension has the same magnitude at all points throughout the string.
Statement II The direction of tension on a body is away from the point of contact and on a pulley, is towards the point of contact.
Choose the correct option
(a) Statement I is true but Statement II is false.
(b) Statement I is false but Statement II is true.
(c) Both the Statements are true.
(d) Both the Statements are false.
16. Match the Column I (Molecule type) with Column II (C_p / C_v) for ideal gases and select the correct answer from the codes given below.

Column I	Column II
A. Helium (He)	1. 7/5
B. Chlorine (Cl_2) rigid	2. 9/7
C. Oxygen (O_2) non-rigid	3. 4/3
D. Water (H_2O) rigid	4. 5/3

Codes

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

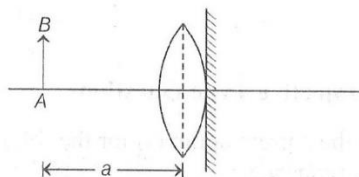
17. In the following digital circuit, what will be the output Y, when the input (A, B) are (0, 1), (0, 0), (1, 1), (1, 0) ?



- (a) 0, 0, 1, 0 (b) 1, 0, 1, 1
(c) 1, 1, 1, 1 (d) 0, 0, 0, 0
18. A uniform chain has a mass m and length l . It is held on a frictionless table with $\left(\frac{1}{6}\right)$ th of its length hanging over the edge. The work done in just pulling the hanging part back on the table is
(a) $\frac{mgl}{72}$ (b) $\frac{mgl}{36}$ (c) $\frac{mgl}{12}$ (d) $\frac{mgl}{6}$
19. An electron and a proton both have same kinetic energy and enter into a magnetic field. If r_e and r_p is the radius of curved trajectory of electron and proton, then
(a) $r_e > r_p$ (b) $r_e = r_p$
(c) $r_e < r_p$ (d) None of these
20. I. If four equal charges q are placed on the vertices of a square, then the electric field at the centre of square is zero.
II. Electric field inside a uniformly charged spherical shell is non-zero constant.
III. The electric potential outside a uniformly charged non-conducting solid sphere is inversely proportional to the distance.
Which of the following statement(s) is/are correct ?
(a) Both I and II (c) Both I and III
(b) Both II and III (d) Only III

Section B : Numerical Value Type Questions

21. An electric dipole is placed in uniform electric field of intensity $2 \times 10^5 \text{ N/C}$ at an angle of 30° . It experiences a torque of 4 N-m. If the length of electric dipole is 2 cm, magnitude of charge on the dipole is found to be $x \times 10^{-3} \text{ C}$. The value of x is
22. A thin convex lens of focal length f is put on a plane mirror as shown in figure. When an object is kept at a distance a from the lens mirror combination, its image is formed at $\frac{a}{3}$ in front of the combination. The value of a is nf , then what is the value of n ?

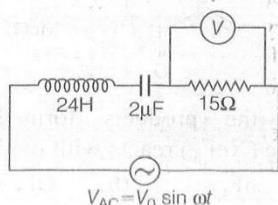


23. The charge flowing through a resistance R varies with time t as $Q = at - bt^2$, where a and b are positive

constants. The total heat produced in R is $H = \frac{a^n R}{6b}$,

the value of n is

24. An L - C - R circuit as shown in the figure is connected to a voltage source V_{AC} whose frequency can be varied. The frequency, at which the voltage across the resistor is maximum, isHz.



25. A person of mass 50 kg is standing at the centre of a circular disc platform of mass 160 kg rotating about its axis at 10 rpm. The person now starts moving towards extreme point of the disc platform, then the rotational speed of circular disc platform is $\frac{x}{100}$ rad/s.

The value of x is

2. What are the products formed when xenon hexafluoride (XeF_6) reacts with oxide of silicon?

(a) $\text{XeO}_3 + \text{SiF}_4$ (b) $\text{XeOF}_4 + \text{SiF}_4$
(c) $\text{XeF}_4 + \text{SiO}_2$ (d) $\text{XeSiO}_4 + \text{SiF}_4$

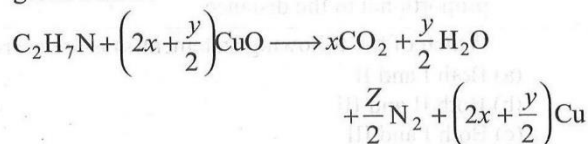
3. Choose the incorrect statement.

(a) Glucose exists in two different crystalline forms, α -D-glucose and β -D-glucose.
(b) α -D-glucose and β -D-glucose are anomers.
(c) Cellulose in a straight chain polysaccharides made up of only β -D-glucose units.
(d) Starch is a mixture of amylose and amylopectin, both contain unbranched chain of α -D-glucose units.

4. The bond order and magnetic property of acetylide ion are same as that of

(a) O_2^+ (b) O_2^- (c) N_2^+ (d) NO^+

5. The transformation occurring in Duma's method is given below:



The value of y is

(a) 5 (b) 6 (c) 7 (d) 8

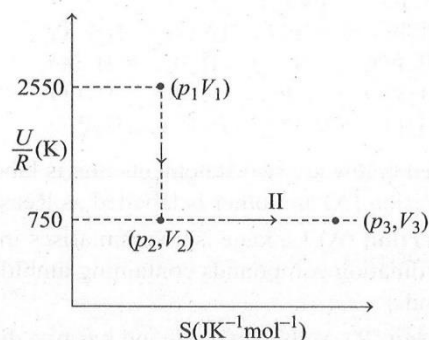
6. Which of the following will produce two different carbonyl compounds on ozonolysis of X , out of which one is acetone and another produces diastereomer on reduction with LiAlH_4 ?

(a) 2,3, 4-trimethylhex-2-ene
(b) 2,3-dimethylhex-2-ene
(c) 3,4 -dimethylhex-2-ene
(d) 2,2-dimethylhex-2-ene

7. If conc.HCl followed by H_2S is added to aqueous solution containing ions such as Al^{3+} , Ni^{2+} , Fe^{3+} , Ca^{2+} and Cu^{2+} . Then, how many cations will be precipitated during this reaction.

(a) 1 (b) 2 (c) 3 (d) 4

8. One mole of an ideal gas at 800 K, undergoes two reversible process, I followed by II, as shown below. If the work done by the gas in the two processes are same, the value of $\ln V_3/V_2$ will be,

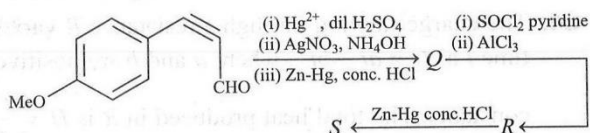


(a) 10 (b) 7
(c) 19.5 (d) 2.30

CHEMISTRY

Section A : Objective Type Questions

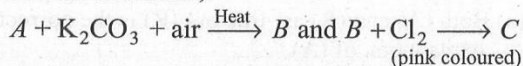
1. Choose the correct option(s) for the following reaction sequence



Identify the products formed Q and S .

- (a) $Q =$, $S =$
(b) $Q =$, $S =$
(c) $Q =$, $S =$
(d) $Q =$, $S =$

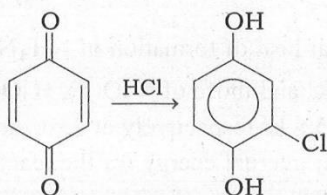
9. For the reactions,



Which of the following is correct?

- A is black Bi_2O_3 , B is green coloured $KBiO_2$, C is pink K_2MnO_4 .
- A is green $FeCO_3$, B is yellow K_2CrO_4 , C is pink $K_2Cr_2O_7$.
- A is black MnO_2 , B is yellow K_2CrO_4 , C is pink Cr_2O_3 .
- A is black MnO_2 , B is green K_2MnO_4 , C is pink $KMnO_4$.

10. Consider the following reaction,



Which of the following statement is correct for the given example?

- It is an example of 1, 2-addition of HCl followed by tautomerism.
- It is an example of 1, 2-addition followed by reduction.
- It is an example of 1, 4-addition followed by tautomerism.
- It is an example of 1, 4-addition followed by oxidation.

11. Match List I with List II.

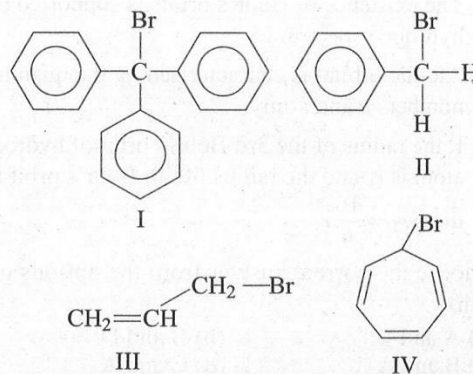
List I (Reaction)	List II (Reagents)
A. Cannizzaro reaction	I. $Br_2/NaOH$
B. Clemmensen reduction	II. $NaNO_2 + HX/CuX$
C. Sandmeyer reaction	III. $CHCl_3, NaOH/H_3O^+$
D. Hofmann degradation	IV. $Zn-Hg/HCl$

Choose the correct answer from the options given below.

- A-III, B-IV, C-I, D-II
- A-III, B-IV, C-II, D-I
- A-II, B-III, C-IV, D-I
- A-II, B-III, C-I, D-IV

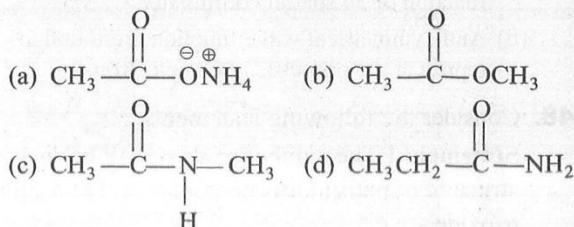
12. All of the given substrates undergoes S_N1 reaction.

Choose the correct order for decreasing regarding S_N1 reaction.



- $IV > I > II > III$
- $I > IV > II > III$
- $I > II > III > IV$
- $I > III > IV > II$

13. A cyclic compound X having molecular formula C_3H_6O is treated with Tollen's reagent does not produce any colouration. When treated with NH_2OH it produces a compound Y . What will be the product Z when it is treated with H_2SO_4 ?



14. Which of the following is incorrect about tetraamminedithiocyanato-S cobalt (III)tris(oxalato)-cobaltate(III)?

- It is a chelating complex and show linkage isomerism.
- It shows optical isomerism.
- It shows geometrical isomerism.
- The formula of the complex is, $[Co(SCN)_2(NH_3)_4][Co(ox)_3]$.

15. At 298K, the standard reduction potentials are 1.51V for $MnO_4^-|Mn^{2+}$, 1.36 V for $Cl_2|Cl^-$, 1.07 V for $Br_2|Br^-$, and 0.54 V for $I_2|I^-$. At pH = 3, permanganate is expected to oxidise $\left(\frac{RT}{F} = 0.059V\right)$

- Br^- and I^-
- Cl^- and Br^-
- Cl^- , Br^- and I^-
- I^- Only

16. Which of the following statements are correct regarding Bohr's model?
- A. If the radius of the 3rd Bohr's orbit of hydrogen atom is r_3 and the radius of 4th Bohr's orbit is r_4 , then $r_4 = \frac{9}{16} r_3$
- B. The existence of Bohr's orbits is supported by hydrogen spectrum.
- C. Atomic orbital is characterised by the quantum numbers n and l only.
- D. If the radius of the 3rd Bohr's orbit of hydrogen atom is r_3 and the radius of 4th Bohr's orbit is r_4 then, $r_4 = \frac{16}{9} r_3$.

Choose the correct answer from the options given below.

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

17. Identify the incorrect statement.
- (a) An electronic wave function must be symmetrical with respect to the interchange of any two electrons.
- (b) ψ^2 must remain unchanged when the spin and space coordinates of spin and space coordinates of paired electrons are interchanged.
- (c) For n electron system the wave function ψ will be a function of $3n$ spatial coordinate.
- (d) Anti-symmetrical wave function are found to represent the properties of an electron.

18. Consider the following statements.

Statement I The number of P—O—P bridges in the structure of phosphorus pentoxide and phosphorus trioxide are 6.

Statement II Basicity of orthophosphoric acid and phosphorous acid are 2 and 3 respectively.

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

- (a) Statement I is true but Statement II is false.
(b) Statement I is false but Statement II is true.
(c) Both Statement I and Statement II are true.
(d) Both Statement I and Statement II are false.

19. Choose the correct order of the oxidation state of phosphorus atom.

- (a) $\text{H}_3\text{PO}_4 > \text{H}_3\text{PO}_2 > \text{H}_3\text{PO}_3 > \text{H}_4\text{P}_2\text{O}_6$
(b) $\text{H}_3\text{PO}_4 > \text{H}_4\text{P}_2\text{O}_6 > \text{H}_3\text{PO}_3 > \text{H}_3\text{PO}_2$
(c) $\text{H}_4\text{P}_2\text{O}_6 > \text{H}_3\text{PO}_3 > \text{H}_3\text{PO}_4 > \text{H}_3\text{PO}_2$
(d) $\text{H}_3\text{PO}_2 > \text{H}_3\text{PO}_4 > \text{H}_3\text{PO}_3 > \text{H}_4\text{P}_2\text{O}_6$

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

Assertion (A) Linkage isomerism arises in coordination compounds containing ambidentate ligand.

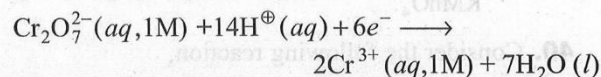
Reason (R) Ambidentate ligand has two different donor atoms/sites.

In 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.

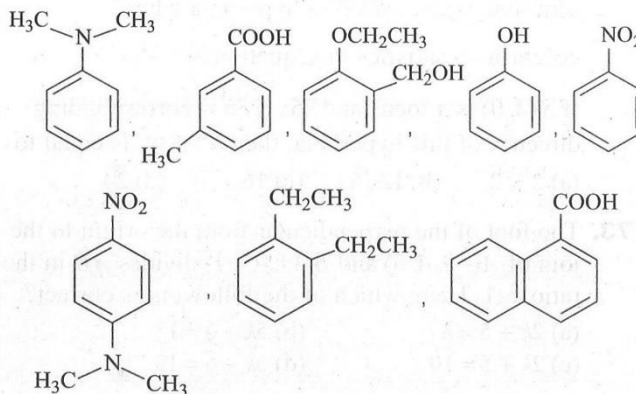
Section B : Numerical Value Type Questions

21. The standard electrode potential for the following reaction is + 1.33 V. The potential at pH = 2 will be (+..... V). (Nearest integer)



22. The relative lowering of vapour pressure of aqueous solution containing a non-volatile solute is 0.0125. The molality of the solution is $\times 10^{-2}$ m.
23. 6×10^{-3} mole of $\text{K}_2\text{Cr}_2\text{O}_7$ reacts completely with 9×10^{-3} mole of X^{n+} to give XO_3^- and Cr^{3+} . The value of n will be

24. Amongst the following, the total number of compounds soluble in aqueous NaOH is



25. The formula of a gaseous hydrocarbon, which requires 6 times of its own volume of O_2 for complete oxidation and produces 4 times its own volume of CO_2 is C_xH_y . The difference between y and x will be (+)

MATHEMATICS

Section A : Objective Type Questions

1. Let $P(z_1)$, $Q(z_2)$ and $R(z_3)$ be the vertices of a triangle whose circumcentre is at origin, if altitude from P to QR intersect the circumcircle at $S(z_4)$, then

(a) $z_4 = -\frac{z_1 z_3}{z_2}$ (b) $z_4 = -\frac{z_2 z_3}{z_1}$
(c) $z_4 = -\frac{z_1 z_2}{z_3}$ (d) $z_4 = \frac{z_2 z_3}{z_1}$

2. Consider the following statements

Statement I $\frac{{}^nC_1}{2} - \frac{{}^nC_3}{4} + \frac{{}^nC_5}{6} - \dots + \frac{{}^nC_n}{42} = \frac{1}{42}$, if $n = 41$

Statement II The maximum value of the expression $\frac{1}{2} \sum_{n=3}^{20} {}^nC_3 (\sin^{2n} x + \operatorname{cosec}^{2n} x)$ is ${}^{21}C_4$,

- (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
3. If $K(n)^{n-1} = n^{n-1} + 2(n+1)^1 n^{n-2} + 3(n+1)^2 n^{n-3} + \dots + (n+1)^{n-1} n$, then the value of K if $n=10$, is
- (a) 10
(b) 100
(c) -100
(d) -10

4. The sum of values of α for which

$$\lim_{x \rightarrow \infty} \frac{8x^3 \cot^{-1} |\alpha x| + \alpha^2 x^6 \sin \frac{1}{x^3} - 3\alpha x^3}{\pi} = \frac{1}{2}, \text{ is}$$

- (a) 0 (b) 1
(c) 3 (d) 4
5. In the odd man out game, each of $n \geq 2$ persons tosses a coin to determine who will buy refreshments for the entire group the odd man is the one with a different outcome from the rest, the probability that there is a loser in any game, is

(a) $\frac{n}{2^{n-1}}$ (b) $\frac{n}{2^{n-2}}$ (c) $\frac{1}{2^{n-1}}$ (d) $\frac{3n}{2^{n-1}}$

6. Consider the function

$$f(x) = \begin{cases} [x], & -2 \leq x \leq -1 \\ |x|+1, & -1 < x \leq 2 \end{cases}$$

$$g(x) = \begin{cases} [x], & -\pi \leq x < 0 \\ \sin x, & 0 < x \leq \pi \end{cases}$$

(where, $[\cdot]$ denotes the greatest integer function), then the range of $g[f(x)]$ is

(a) $[\sin 3, \sin 1]$ (b) $[\sin 3, 1] \cup \{-2, 0\}$
(c) $[\sin 3, 1] \cup \{-2, -1\}$ (d) $[\sin 1, 1]$

7. Let the shortest distance between the two lines $\frac{x-1}{4} = \frac{y+3}{5} = \frac{z+4}{3}$ and $\frac{x-4}{3} = \frac{y-3}{4} = \frac{z-5}{2}$ is α , where $\alpha > 0$. Then, $\sqrt{6}\alpha$ is equal to

(a) 2 (b) 14 (c) 9 (d) 12

8. An ellipse passes through the foci of the hyperbola $\frac{x^2}{9} - \frac{y^2}{16} = 1$ and its major and minor axes lie along the transverse and conjugate axes of the hyperbola respectively. If the sum of eccentricities of the two conic is $\frac{5\sqrt{17}+3}{3\sqrt{17}}$, then which of the following point does not lie on the ellipse?

(a) (5, 0) (b) $(0, \frac{20}{\sqrt{17}})$
(c) $(\frac{5}{\sqrt{2}}, \frac{20}{\sqrt{34}})$ (d) $(\frac{9}{5\sqrt{2}}, \frac{5}{\sqrt{34}})$

9. If r is inradius of ΔPQR and R is its circumradius, then $\frac{R}{r}$ is equal to, if ΔPQR is equilateral, where

$r = \frac{\Delta}{s}$ and $R = \frac{abc}{4\Delta}$

(a) 1 (b) 2 (c) 3 (d) 4

10. For two data sets, each of size 5, the variances are given to be 4 and 5 and the corresponding mean are given to be 2 and 4, respectively. The variance of the combined data set is

(a) $\frac{5}{2}$ (b) $\frac{11}{2}$ (c) 6 (d) $\frac{13}{2}$

11. If a and b are the roots of the quadratic equation $x^2 + x \sin \alpha - 2 \sin \alpha = 0$, $\alpha \in (0, \frac{\pi}{2})$, then

$\frac{a^{12} + b^{12}}{(a^{-12} + b^{-12})(a-b)^{24}}$ is equal to

(a) $\frac{2^{12}}{(\sin \alpha + 4)^{12}}$ (b) $\frac{2^{12}}{(\sin \alpha + 8)^6}$
(c) $\frac{2^6}{(\sin \alpha + 8)^{12}}$ (d) $\frac{2^{12}}{(\sin \alpha + 8)^{12}}$

12. Let a and b respectively be the semi-transverse and semi-conjugate axes of a hyperbola whose eccentricity satisfies the equation $3e^2 - 6e + \frac{5}{3} = 0$.

If $S(4, 0)$ is a focus and $25x = 36$ is corresponding directrix of this hyperbola, then $a^2 + b^2$ is equal to

(a) $25\sqrt{2}$ (b) $12\sqrt{5}$ (c) 16 (d) 24

13. The foot of the perpendicular from the origin to the join of $A(-9, 4, 5)$ and $B(11, 0, -1)$ divides AB in the ratio $k:1$. Then, which of the following is correct?

(a) $2k + 5 = 8$ (b) $5k + 6 = 11$
(c) $2k + 5 = 10$ (d) $3k + 6 = 12$

14. Let $y_1(x)$ and $y_2(x)$ be the solutions of the differential equation $\frac{dy}{dx} = y + 17$ satisfying the conditions $y_1(0) = 0$ and $y_2(0) = 1$, then

(a) y_1 and y_2 will never intersect.
(b) y_1 and y_2 will intersect at $x = 17$.
(c) y_1 and y_2 will intersect at $x = e$.
(d) y_1 and y_2 will intersect at $x = 1$.

15. If $\int \frac{dt}{t^3(1+t^6)^{2/3}} = t f(t)(1+t^6)^{2/3} + K$, where K is integration constant, then the function $f(t)$ is equal to

(a) $\frac{-1}{2t^3}$ (b) $\frac{3}{t^2}$ (c) $-\frac{1}{6t^3}$ (d) $-\frac{1}{2t^2}$

16. Let $P = \begin{bmatrix} 1 & 1.5 \\ 1 & 2 \end{bmatrix}$, $Q = \begin{bmatrix} 4 & -3 \\ -2 & 2 \end{bmatrix}$ and

$$R_k = \begin{bmatrix} k3^k & 2^k \\ 0 & (k-1)3^k \end{bmatrix}$$

If $\sum_{k=1}^{50} \text{tr}[(PQ)^k R_k] = 3 + a \cdot 3^b$, where $\text{tr}(A)$ denotes

trace of matrix A , then $(b-a):(b+a)$ is equal to
(a) 1 : 50 (b) 50 : 1
(c) 51 : 49 (d) 49 : 51

17. Let $f: \mathbb{R} \rightarrow \mathbb{R}$ be defined by

$$f(x) = \begin{cases} \alpha_m + \sin \pi x, & \text{for } x \in [2m, 2m+1] \\ \beta_m + \cos \pi x, & \text{for } x \in (2m-1, 2m) \end{cases}$$

for all integer m , where α_m and β_m are real numbers. If f is continuous $\forall m$, then $\alpha_m - \beta_m$ is equal to

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

18. Let the image of the point $P(1, 0, 0)$ in the line

$$L: \frac{x-1}{2} = \frac{y+1}{-3} = \frac{z+10}{8} \text{ be } Q. \text{ Let } R(\alpha, \beta, \gamma) \text{ be a}$$

point that divides internally the line segment PQ in the ratio 1:3. Then, the value of $77(\alpha + \beta + \gamma)$ is equal to

(a) 77 (b) -66
(c) 88 (d) -77

19. Let $H(x) = f(x) + g(x)$, where $f(x) = \int_1^x \frac{\log u}{1+u} du$

and $g(x) = f\left(\frac{1}{x}\right)$, then $H(e)$ is equal to

(a) $\frac{1}{4}$ (b) $\frac{1}{2}$
(c) 0 (d) $\frac{1}{8}$

20. The area bounded by the curves $y = x$, $x = e$, $y = \frac{1}{x}$ and the positive X -axis, is

(a) $\frac{1}{2}$ sq unit
(b) $\frac{1}{4}$ sq unit
(c) $\frac{5}{2}$ sq units
(d) $\frac{3}{2}$ sq units

Section B : Numerical Value Type Questions

21. If p, q, r and s are the third, fourth, fifth and sixth terms in the expansion of $(1+x)^{100}$ and

$$\frac{q^2 - pr}{r^2 - qs} = \frac{\lambda p}{\mu r}, \text{ then } \lambda - \mu \text{ is equal to } \dots\dots\dots$$

22. $\sum_{K=1}^{360} \frac{1}{(\sqrt{K+1}) \cdot K + (K+1)\sqrt{K}}$ is the ratio of two relative prime positive integers a and b . Then, the value of $|a-b|$ is $\dots\dots\dots$

23. If $4x + 8\cos x + \tan x - 2\sec x -$

$4 \log \{\cos x(1 + \sin x)\} \geq 6, \forall x \in [0, \lambda)$, then the largest value of λ is $\frac{\pi K}{24}$, so the value of K is equal to

24. If the equation of the locus of the middle point of a chord of the circle $x^2 + y^2 = 2(x+y)$ such that the pair of lines joining the origin to the point of intersection of the chord and the circle are equally inclined to the X -axis is $px + qy = 1$, then $p+q$ is equal to $\dots\dots\dots$

25. Take a point in such a way that the sum of its distances from the point $(a, 0, 0)$ and $(-a, 0, 0)$ is always constant, then the locus of the point is $\frac{x^2}{K^2} + \frac{y^2 + z^2}{K^2 - a^2} = \lambda$. So, the value of λ is equal to $\dots$

**PHYSICS**

1	B	2	A	3	B	4	B	5	B	6	D	7	C	8	A	9	D	10	C
11	B	12	D	13	A	14	A	15	A	16	A	17	C	18	A	19	C	20	C
21	2	22	2	23	3	24	23	25	64										

CHEMISTRY

1	B	2	B	3	D	4	D	5	C	6	A	7	A	8	A	9	D	10	C
11	B	12	A	13	C	14	D	15	A	16	B	17	A	18	A	19	B	20	A
21	1	22	70	23	1	24	4	25	4										

MATHS

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