PHYSICS

1) A screw gauge has a least count of 0.01 mm. If the pitch of screw gauge is decreased by 25 % and the number of circular scale divisions are increased by 50%, the new least count will become :

(1) 1×10^{-3} mm

(2) 2.5×10^{-3} mm

(3) 2×10^{-3} mm

(4) 5×10^{-3} mm

2) **Statement-I :** Electric field at all the points on axis of dipole is in the direction of dipole.

Statement-II : For a dipole, at all points $E \propto \dfrac{1}{r^3}$.

(1) Both **Statement I** and **Statement II** are incorrect.

(2) **Statement I** is correct but **Statement II** is incorrect.

(3) **Statement I** is incorrect but **Statement II** is correct.

(4) Both **Statement I** and **Statement II** are correct.

3) Two thin conducting shells of radii R and $3R$ are shown in figure. The outer shell carries a charge $+Q$ and the inner shell is neutral. The inner shell is earthed with the help of switch S. Find the
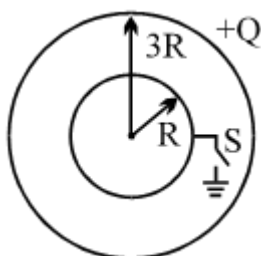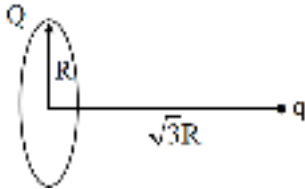

charge attained by the inner shell.

(1) Q

(2) Q/2

(3) –Q/3

(4) No charge will come on inner shell.

4) A section of ring of radius R, has uniform linear charge density as shown. Its intensity of electric
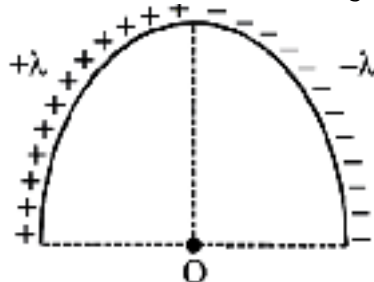
field at its centre equals to :-

(1) $\dfrac{2K\lambda}{R}$

(2) $\dfrac{4K\lambda}{R}$

(3) $\dfrac{K\lambda}{R}$

(4) Zero

5)

Force on the ring of charge Q due to charge q :

(1) $\dfrac{2\sqrt{2}KQq}{R^2}$

(2) $\dfrac{3KQq}{8R^2}$

(3) $\dfrac{\sqrt{3}KQq}{8R^2}$

(4) $\dfrac{2\sqrt{3}KQq}{R^2}$

6) Two resistances are given as $R_1 = (10 \pm 0.5)\Omega$ and $R_2 = (15 \pm 0.5)\Omega$. The percentage error in the measurements of equivalent resistances when they are connected in parallel is :

(1) 2.33

(2) 4.33

(3) 5.33

(4) 6.33

7) Velocity vs time graph is given for a particle then find out displacement of the particle from t = 0

→ t = 10 sec
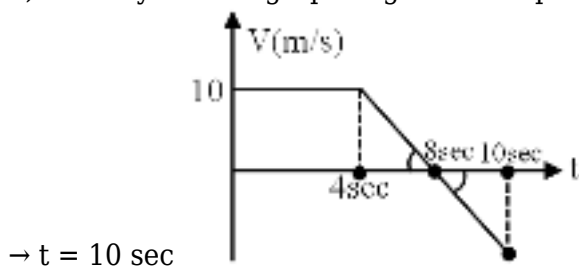
(1) 55 m

(2) 60 m

(3) 50 m

(4) Data insufficient

8) In a vernier calliper, the vernier scale has 20 divisions, which are equivalent to 18 divisions of main scale. If least count of instrument is 0.05 mm, one main scale division is equal to :

(1) 0.2 mm

(2) 0.5 mm

(3) 1 mm

(4) 2 mm

9) A uniform electric field E = (8m/e) V/m is created between two parallel plates of length 1m as shown in figure, (where m = mass of electron and e = charge of electron). An electron enters the field symmetrically between the plates with a speed of 2m/s. The angle of the deviation (θ) of the path of the electron as it comes out of the field will be ....
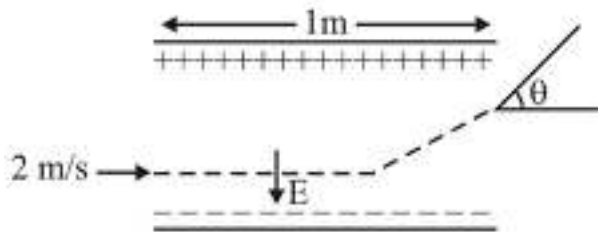
(1) $\tan^{-1}(4)$

(2) $\tan^{-1}(2)$

(3) $\tan^{-1}\left(\dfrac{1}{3}\right)$

(4) $\tan^{-1}(3)$

10) In a vernier callipers, each cm on main scale is divided into 20 equal parts. If 10 divisions of vernier scale coincides with 9 divisions of main scale. The value of vernier constant will be :

(1) 0.5 mm

(2) 0.05 mm

(3) 0.3 mm

(4) 0.06 mm

11) A charge q is placed at one corner of a cube. The flux through all the faces of cube is :-

(1) $\dfrac{q}{\varepsilon_0}$

(2) $\dfrac{q}{6\varepsilon_0}$

(3) $\dfrac{q}{24\varepsilon_0}$

(4) $\dfrac{q}{8\varepsilon_0}$

12) If electric field in a region is zero, then potential in that region :-

(1) is constant

(2) is zero

(3) changes linearly

(4) Increases with distance

13) A charge q at rest experiences a force F in electric field E. If acceleration is a, then the charge to mass ratio $\frac{q}{m}$ will be :-

(1) $\frac{a}{E}$

(2) $\frac{E}{a}$

(3) $\frac{F}{a}$

(4) $\frac{a}{F}$

14) When 97.52 is divided by 2.54, then correct result is :

(1) 38.3937

(2) 38.394

(3) 38.39

(4) 38.4

15) Density of a material in CGS system of units is 8 gm/cm³. In a system of units in which unit of length is 5cm and unit of mass is 20 gm. Then value of density of material will be :

(1) 25

(2) 50

(3) 75

(4) 100

16) The frequency (ν) of an oscillating drop may depend upon radius (r) of the drop, density (ρ) of liquid and surface tension (s) of the liquid as $\nu = r^a \rho^b s^c$. The values of a, b and c respectively are :

(1) $\left(-\frac{3}{2}, -\frac{1}{2}, \frac{1}{2}\right)$

(2) $\left(\frac{3}{2}, -\frac{1}{2}, \frac{1}{2}\right)$

(3) $\left(\frac{3}{2}, \frac{1}{2}, -\frac{1}{2}\right)$

(4) $\left(-\frac{3}{2}, \frac{1}{2}, \frac{1}{2}\right)$

17) Infinitely long uniformly charged wire with linear charge density λ is kept along z-axis. Find the
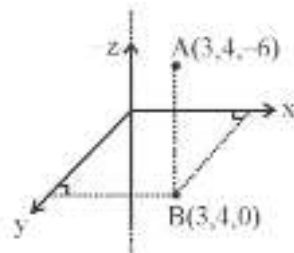
ratio of electric field at point A and B :

(1) 1 : 2

(2) 1 : 6

(3) 6 : 1

(4) 1 : 1

18) If $x = at^3$ and $y = bt^2$, find $\dfrac{dx}{dy}$.

(1) $\dfrac{3at}{4b}$

(2) $\dfrac{3b}{4at}$

(3) $\dfrac{3at}{2b}$

(4) $\dfrac{3a}{2bt}$

19) Three identical charged balls each of charge 2C are suspended from a common point P by silk threads of 2m each (as shown in figure). They form an equilateral triangle of side 1m.
The ratio of net electric force on a charged ball to the force between any two charged balls will be :
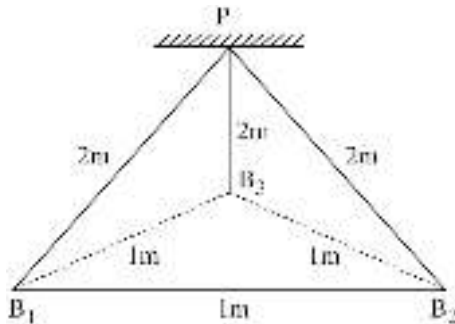
(1) 1 : 1

(2) 1 : 4

(3) $\sqrt{3} : 2$

(4) $\sqrt{3} : 1$

20) Two concentric conducting spheres of radii r_1 and r_2 are shown in figure. There potential at their
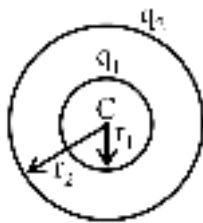
center is :-

(1) $\dfrac{Kq_2}{r_2} + \dfrac{Kq_1}{r_2}$

(2) $\dfrac{Kq_2}{r_2} + \dfrac{Kq_1}{r_1}$

(3) $\dfrac{Kq_1}{r_2} + \dfrac{Kq_2}{r_1}$

(4) $\dfrac{Kq_1}{r_1} + \dfrac{Kq_2}{r_1}$

21) Select correct statement :

(1) A dimensionless quantity never has a unit.

(2) A dimensionless quantity does not exist.

(3) A dimensionless quantity always have a unit.

(4) A dimensionless quantity may have a unit.

22) Energy density is given by $U = \dfrac{\alpha}{\beta} \sin\left(\dfrac{\alpha x}{kt}\right)$, where α, β are constants and x is displacement, k is Boltzmann constant, t is the temperature. The dimensions of β will be :

(1) $[M^1\, L^2\, T^{-2}]$

(2) $[M^0\, L^2\, T^{-2}]$

(3) $[M^0\, L^0\, T^0]$

(4) $[M^0\, L^2\, T^0]$

23) The resistance is $R = \dfrac{V}{I}$ where V = (200 ± 2) volt and I = (20 ± 0.3) ampere. What is the total error in R ?

(1) 2.5%

(2) 5%

(3) 7.5%

(4) 9.5%

24) A particle of mass 2 gm and charge 1μC is held at a distance of 1m from a fixed charge of 1mC. If the particle is released it will be repelled. The speed of the particle when it is at a distance of 10m from the fixed charge is :-

(1) 100 m/s

(2) 90 m/s

(3) 60 m/s

(4) 45 m/s
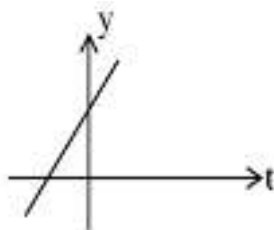
25) The equation of the line as shown can be :

(1) y = 3t + 4

(2) y = –3t + 4

(3) y = –3t – 4

(4) y = 3t – 4

26) Order of magnitude of 2.3×10^5 is :

(1) 3

(2) 5

(3) 7

(4) 9

27) A mosquito is flying with speed 5.5 m/s from point (1,2,–3) cm to point (3,–4,6) cm, its velocity vector is given by :
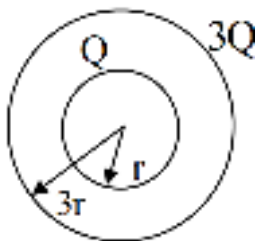
(1) $-\hat{i} + 3\hat{j} - 4.5\hat{k}$

(2) $\hat{i} - 3\hat{j} + 4.5\hat{k}$

(3) $\hat{i} - 4.5\hat{j} + 3\hat{k}$

(4) None of these

28)
Two concentric shells of radius r and 3r having charge Q and 3Q respectively, then potential at common centre is :

(1) $\dfrac{4KQ}{r}$

(2) $\dfrac{2KQ}{r}$

(3) $\dfrac{2KQ}{3r}$

(4) $\dfrac{3KQ}{2r}$

29) A short electric dipole has dipole moment of 2.4×10^{-10} Cm. The electric potential due to the dipole at a point at a distance of 0.4 m from the centre of dipole situated on a line making an angle 60° with the dipole axis.

(1) 3.25 V

(2) 4.55 V

(3) 6.75 V

(4) 12.50 V

30) A vernier calliper is used to measure depth of a cylindrical vessel. When the depth strip just touches the base of the vessel, it was observed that main scale reading is 4.2 cm and 5th division of vernier scale coincides with a main scale division. If vernier constant is 0.1 mm and area of its base is given by 5.0 cm^2, the volume of empty vessel is given by:

(1) 21.250 cm^3

(2) 21.25 cm^3

(3) 21.2 cm^3

(4) 21 cm^3

31) Find $\int x\, dy$ from A to B :-
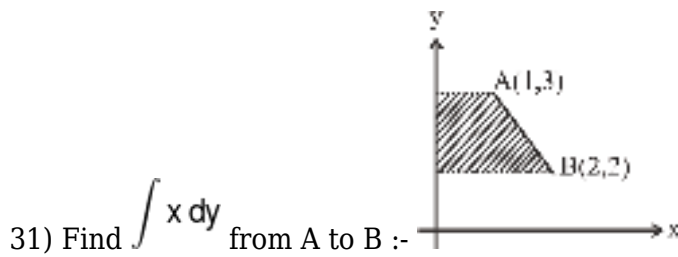
(1) $\dfrac{-3}{2}$ unit

(2) $\dfrac{3}{2}$ unit

(3) $\dfrac{-5}{2}$ unit

(4) $\dfrac{5}{2}$ unit

32) If potential (in volt) in a region is expressed as $V(x, y, z) = 6xy - y + 2yz$, (where x, y, z are in meter)
the electric field (in N/C) at point (1, 1, 0) is –

(1) $-\left(6\hat{i} + 9\hat{j} + \hat{k}\right)$

(2) $-\left(3\hat{i} + 5\hat{j} + 3\hat{k}\right)$

(3) $-\left(6\hat{i} + 5\hat{j} + 2\hat{k}\right)$

(4) $-\left(2\hat{i} + 3\hat{j} + \hat{k}\right)$

33) In a vernier calliper, 20 vernier scale divisions are equal to 18 main scale divisions. When both jaws touch each other, it was found that zero of the vernier scale was left to the zero of main scale and 16th vernier division coincides with a main scale division. If zero error in instrument is 0.2 mm, then in 1 cm of main scale the number of main scale divisions are

(1) 5

(2) 8

(3) 10

(4) 20

34) The number of electric field lines starting or ending on a charge +q is proportional to :

(1) q^2

(2) q

(3) $\dfrac{1}{q^2}$

(4) $\dfrac{1}{q}$

35) A solid insulating sphere of radius R has non-uniform charge density given as $\rho = Ar^2$. (A is constant, r is distance from centre). Calculate total charge of sphere :-
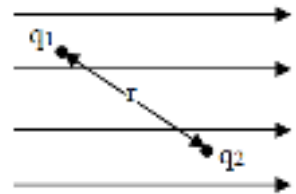
(1) $\dfrac{AR^4}{4\epsilon_0 r^2}$

(2) $\dfrac{AR^5}{4\epsilon_0 r^2}$

(3) $\dfrac{4\pi AR^5}{5}$

(4) $\dfrac{AR^4}{5\epsilon_0 r^2}$

36) Two point charges q_1 & q_2 are placed in an external uniform electric field as shown in figure. The potential at the location of q_1 & q_2 are V_1 & V_2 respectively, the effect of q_1, q_2 are not included in V_1 & V_2 i.e., V_1 & V_2 are potential at location of q_1 & q_2 due to external unspecified charges only, then

electrical potential energy for this configuration of two charged particles is

(1) $\dfrac{q_1 V_1 + q_2 V_2}{2}$

(2) $q_1 V_1 + q_2 V_2$

(3) $q_1 V_1 + q_2 V_2 + \dfrac{q_1 q_2}{4\pi\epsilon_0 r}$

(4) $\dfrac{q_1 q_2}{4\pi\epsilon_0 r}$

37) In a screw gauge, on two full rotations of screw, it advances by 1mm on linear scale, and there are 50 divisions on its circular scale. Before measurement, when screw was closed and in touch with anvil, it was observed that 45th circular scale division coincides with reference line of main scale and the zero of linear scale is barely visible. While measuring thickness of a thin aluminium sheet, linear scale reads one division and 22nd circular scale division coincides with reference line. The thickness of sheet is :-

(1) 0.65 mm

(2) 0.72 mm

(3) 0.77 mm

(4) 0.81 mm

38) **Statement-I :** Electric field inside a conductor may be zero.

Statement-II : Electric field inside a conductor is always zero.

(1) Statement-I is correct and statement-II is incorrect

(2) Statement-I is incorrect and statement-II is correct

(3) Both statement-I and statement-II are correct

(4) Both statement-I and statement-II are incorrect

39) The dimensions of angular momentum are :

(1) $[M^1 L^1 T^{-1}]$

(2) $[M^1 L^2 T^{-2}]$

(3) $[M^1 L^1 T^{-2}]$

(4) $[M^1 L^2 T^{-1}]$

40) **Assertion (A) :** Electric potential inside a uniformly charged spherical shell is constant.
Reason (R) : Electric field inside a uniformly charged shell is zero.

(1) **(A)** and **(R)** are true and **(R)** is the correct explanation of **(A)**.

(2) **(A)** and **(R)** are true and **(R)** is not the correct explanation of **(A)**.

(3) **Assertion** is correct but **Reason** is incorrect.

(4) **Assertion** is incorrect but **Reason** is correct.

41) A sphere of radius R has uniform charge density ρ. Field inside at distance r from centre is :-

(1) $\dfrac{\rho r}{3\varepsilon_0}$

(2) $\dfrac{\rho r^2}{3\varepsilon_0}$

(3) $\dfrac{\rho r}{4\pi\varepsilon_0}$

(4) zero

42) A vector of magnitude a is rotated through an angle θ. What is the magnitude of change in the vector?

(1) 2a sin(θ/2)

(2) 2a cos(θ/2)

(3) 2a sinθ

(4) 2a cosθ
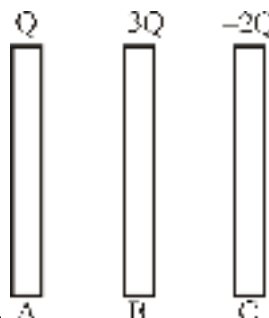
43) Three charged metallic plates A, B & C are shown. Final charges on left surfaces of plates B & C are :-

(1) +Q, +4Q

(2) –4Q, –2Q

(3) 0, –2Q

(4) –3Q, 0

44) If the vector $2\hat{i} + 3\hat{j} + 8\hat{k}$ is perpendicular to the vector $4\hat{i} - 4\hat{j} + \alpha\hat{k}$, then the value of α is :

(1) – 1

(2) $-\dfrac{1}{2}$

(3) $\dfrac{1}{2}$

(4) 1

45) An electric dipole consisting of two opposite charges of 2×10^{-6} C separated by a distance of 3 cm placed in an electric field of 2×10^{5} N/C then the maximum torque acting on dipole is

(1) 12×10^{-1} N-m

(2) 24×10^{-3} N-m

(3) 12×10^{-3} N-m

(4) 24×10^{-1} N-m

CHEMISTRY

1) The reaction, $2C + O_2 \rightarrow 2CO$ is carried out by taking 24 g carbon and 96 g O_2. Which one is limiting reagent ?

(1) C

(2) O_2

(3) Both C and O_2

(4) None of these

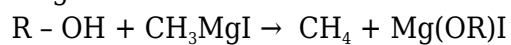2) Iron (III) oxide can be reduced with CO to form metallic iron as described by unbalanced chemical reaction $Fe_2O_3 + CO \rightarrow Fe + CO_2$
The number of moles of CO required to form one mole of Fe from its oxide is :-

(1) 1

(2) 1.5

(3) 2

(4) 3

3) 1.12 mL of a gas is produced at STP by the action of 4.12 mg of alcohol ROH with methyl magnesium iodide. The molecular mass of alcohol is –

$R - OH + CH_3MgI \rightarrow CH_4 + Mg(OR)I$

(1) 16

(2) 41.2

(3) 82.4

(4) 156.0

4)

In a compound percentage of C, H and N are given as follows C = 40%, H = 13.33%, N = 46.67%. The empirical formula of compound will be :-

(1) CH_2N

(2) C_2H_4N

(3) CH_4N

(4) CH_3N

5)

Which of the following contains the greatest number of atoms ?

(1) 1.0 g of butane (C_4H_{10})

(2) 1.0 g of nitrogen (N_2)

(3) 1.0 g of silver (Ag)

(4) 1.0 g of water (H_2O)

6) Insulin contains 3.4% sulphur by mass the minimum molecular weight of insulin is :

(1) 941

(2) 989

(3) 880

(4) 710

7) A + 2B → 3C
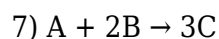
If reaction is started with 4 moles of A and 10 moles of B then produced moles of C are :

(1) 4

(2) 8

(3) 12

(4) 16

8) The following data are obtained when dinitrogen and dioxygen react together to form different compounds.

Mass of dinitrogen	Mass of dioxygen
14 g	16 g
14 g	32 g
28 g	16 g
28 g	80 g

Which law of chemical combination is obeyed by the above experimental data ?

(1) Law of conservation of mass

(2) Law of definite proportions

(3) Law of multiple proportions

(4) Avogadro's Law

9) The statements for laws of chemical combinations are given below. Mark the statement which is not correct.

(1) Mass can neither be created nor destroyed : law of conservation of mass

(2) A compound always contains exactly the same proportion of elements by weight: Law of definite proportions.

(3) When gases combine they do so in a simple ratio by weight : Gay Lussac's Law.

(4) Equal volumes of gases at same temperature and pressure contain same number of molecules : Avogadro's Law.

10) Match the following **List I** and **List II** :-

	List-I		List II (At STP)
A.	$10g\ CaCO_3 \xrightarrow[\text{decomposition}]{\Delta}$	1.	$0.224\,L\ CO_2$
B.	$1.06g\ Na_2CO_3 \xrightarrow{\text{Excess HCl}}$	2.	$4.48\,L\ CO_2$
C.	$2.4g\ C \xrightarrow[\text{Combustion}]{\text{Excess } O_2}$	3.	$0.448\,L\ CO_2$
D.	$0.56g\ CO \xrightarrow[\text{Combustion}]{\text{Excess } O_2}$	4.	$2.24\ L\ CO_2$
		5.	$22.4\ L\ CO_2$

	A	B	C	D
(1)	4	1	2	3
(2)	5	1	2	3
(3)	4	1	3	2
(4)	1	4	2	3

(1) 1

(2) 2

(3) 3

(4) 4

11) Match the following column :-

	Column-I		Column-II
(a)	N_2	(p)	40% carbon by mass
(b)	CO	(q)	Empirical formula = CH_2O
(c)	$C_6H_{12}O_6$	(r)	Vapour density = 14
(d)	CH_3COOH	(s)	14 N_A electrons in one mole

Correct match is :

(1) a - s ; b - p ; c - q ; d - r

(2) a - r ; b - s ; c - p, r ; d - q, s

(3) a - r, s ; b - r, s ; c - p, q ; d - p, q

(4) a - r, s ; b - p, r ; c - q, s ; d - p, q

12) Match List-I with List-II

	List-I		List-II
(a)	No of electrons in 18 ml H_2O	(i)	$\dfrac{3N_A}{2}$
(b)	Volume of 1 g hydrogen gas at STP	(ii)	22.4 L
(c)	No of atoms in 11.2 L SO_2 at STP	(iii)	10 N_A
(d)	Volume of 6.023×10^{23} molecules of O_2 at STP	(iv)	11.2 L

(1) (a)-(i), (b)-(iv), (c)-(iii), (d)-(ii)

(2) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)

(3) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)

(4) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)

13) **Assertion :** 1 amu represents a mass equal to 1.66×10^{-27} kg.
Reason : 1 amu represents the actual mass of one atom of carbon –12.

(1) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(2) Both Assertion and Reason are true but Reason is not the correct explanation of Assertion.

(3) Assertion is true but Reason is false.

(4) Both Assertion and Reason are false.

14) Given below are two statements:
Statement I : When gases combine or are produced in a chemical reaction they do so in a simple

ratio by volume, provided all gases are at the same temperature and pressure.

Statement II : Equal volumes of all gases at the same temperature and pressure should contain equal no. of atoms.

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

(1) Both Statement I and Statement II are correct.

(2) Statement I is correct but Statement II is incorrect.

(3) Statement I is incorrect but Statement II is correct.

(4) Both Statement I and Statement II are incorrect.

15) The ratio of vapour density of two gases is 1 : 6. The ratio of their molecular weight would be :

(1) 6 : 1

(2) 1 : 6

(3) 12 : 1

(4) 1 : 12

16) Haemoglobin contains 0.33 % Iron by mass. Molar mass of Hemoglobin is 67,200. Calculate the number of iron atoms in a molecule of Haemoglobin. [Atomic mass : Fe = 56]

(1) 1

(2) 2

(3) 4

(4) 6

17) Which of the following statements is false concerning the formula of a compound ?

(1) The empirical formula is the simplest whole number ratio of atoms in a compound.

(2) The molecular formula is the true ratio of number of atoms in a compound.

(3) The molecular formula and empirical formula can be identical.

(4) The number of atoms in a molecular formula is always greater than the number of atoms in an empirical formula.

18) The ratio of number of oxygen atoms (O) in 16.0g ozone (O_3), 28.0 g carbon monoxide (CO) and 16.0g oxygen (O_2) is :
(Atomic mass : C = 12, O = 16 and Avogadro's Constant N_A = 6.0 × 10^{23} mol^{-1})

(1) 3:1:1

(2) 1:1: 2

(3) 3:1:2

(4) 1:1:1

19) 5.6 litre of a gas at N.T.P. weighs equal to 8 gm. The vapour density of gas is -

(1) 32

(2) 16

(3) 8

(4) 40

20) Elements A and B form two compounds B_2A_3 and B_2A. 0.05 moles of B_2A_3 weighs 9.0 g and 0.10 mole of B_2A weighs 10 g, atomic weight of A and B are respectively -

(1) 20 and 30

(2) 30 and 40

(3) 40 and 30

(4) 30 and 20

21) A mixture containing 64.0 g H_2 and 64.0 g O_2 is reacted so that water is formed as follows :
$2H_2 + O_2 \rightarrow 2H_2O$
Which of the following statements is/are correct ?

(1) H_2 is the limiting reagent

(2) O_2 is the limiting reagent

(3) The reaction mixture contains 72.0g of H_2O and 56.0g of unreacted H_2

(4) Both (2) and (3)

22) Match the list I and II and pick the correct matching from the code given below :-

List I		List II	
A	Isotope	a	$^{228}_{88}Ra$ & $^{228}_{89}Ac$
B	Isobar	b	$^{39}_{18}Ar$ & $^{40}_{19}K$
C	Isotone	c	$^{2}_{1}H$ & $^{3}_{1}H$
D	Isosters	d	$^{235}_{92}U$ & $^{231}_{90}Th$
E	Isodiapheres	e	CO_2 & N_2O

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

(1) 1

(2) 2

(3) 3

(4) 4

23) Given :
Element M (At. wt. 51.7) contains

Isotope ($M^{2?}$)   and   Isotope ($M^{5?}$)

What is the abundance of M^{50} :-

(1) 15%
(2) 45%
(3) 75%
(4) 85%

24) The number of photons emitted by a 10 watt bulb in 10 second, if wavelength of light is 1000 Å, is :

(1) 1.01×10^{20}
(2) 3.03×10^{18}
(3) 5.05×10^{19}
(4) 7.07×10^{14}

25) Let mass of electron is half, mass of proton is two times and mass of neutron is three fourth of original masses, then new atomic weight of O^{16} atom:-

(1) increases by 37.5 %
(2) remain constant
(3) increases by 12.5 %
(4) decreases by 25 %

26) The number of neutron in 5g of D_2O (D = $_1^2H$) are :

(1) $0.25\ N_A$
(2) $2.5\ N_A$
(3) $1.1\ N_A$
(4) None of these

27)

Select isoelectronic set :-
(a) K^+, S^{-2}, Sc^{+3}
(b) Na^+, H_3O^+, NH_4^+
(c) CO_2, H_3O^+, NH_4^+

(d) O_2^{+2}, N_2, C_2^{-2}
(1) a, c, d
(2) b, c, d
(3) a, b, d
(4) a, b, c

28) Arrange in increasing order of the e/m ratio electron, proton, neutron & α-particle

(1) $e^- < p < n < \alpha$

(2) $\alpha < n < e^- < p$

(3) $n < \alpha < p < e$

(4) None of these

29) The energies E_1 and E_2 of two radiations are
25 eV and 50 eV respectively. The relation between their wavelength of λ_1 and λ_2 will be:-

(1) $\lambda_1 = \dfrac{\lambda_2}{2}$

(2) $\lambda_1 = \lambda_2$

(3) $\lambda_1 = 2\lambda_2$

(4) $\lambda_1 = 4\lambda_2$

30) **Statement-I :-** The angular momentum of an electron in n^{th} orbit is same for all H-like species.
Statement-II :- The velocity of electron in n^{th} orbit is equal for all H-like species.

(1) Both Statement-I and Statement-II are true.

(2) Both Statement-I and Statement-II are false.

(3) Statement-I is true but Statement-II is false.

(4) Statement-I is false but Statement-II is true.

31) **Assertion (A) :** The orbital angular momentum of 2s–electron is equal to that of 3s–electron.

Reason (R) : The orbital angular momentum is given by the relation $\sqrt{\ell(\ell+1)}\dfrac{h}{2\pi}$ and the value of
 is same for 2s–electron and
3s–electron.

(1) Both **A** and **R** are correct and **R** is correct explanation of **A**

(2) Both **A** and **R** are correct but **R** is not correct explanation of **A**

(3) **A** is correct and **R** is wrong

(4) **A** is wrong and **R** is correct

32) Match the following column:-

	Column-I		**Column-II**
(a)	$mvr = nh/2\pi$	(p)	paschen series
(b)	Infrared region	(q)	total energy of e^-
(c)	$\lambda = h/p$	(r)	de-Broglie equation
(d)	$-\dfrac{KZe^2}{2r}$	(s)	Schrodinger equation
(e)	$\hat{H}\psi = E\psi$	(t)	Bohr's Postulate

(1) (a) – t, (b) – q, (c) – r, (d) – p, (e) – s

(2) (a) – t, (b) – p, (c) – r, (d) – q, (e) – s

(3) (a) – r, (b) – q, (c) – t, (d) – s, (e) – p

(4) (a) – s, (b) – p, (c) – q, (d) – r, (e) – t

33) Match the following Column-I with Column-II.

Column-I		Column-II	
(A)	$2(2\ell+1)$	(P)	Number of orbitals in subshell
(B)	n^2	(Q)	Value of shell in an atom
(C)	n	(R)	Number of electrons in subshell
(D)	$(2\ell+1)$	(S)	Number of orbital in shell
		(T)	Number of subshell in shell

(1) (A)–(S); (B)–(R); (C)–(Q,T); (D)–(P)

(2) (A)–(S); (B)–(P); (C)–(R,T); (D)–(Q)

(3) (A)–(R); (B)–(S); (C)–(Q,T); (D)–(P)

(4) (A)–(R); (B)–(P); (C)–(Q); (D)–(S)

34) The wavelength of third line of the Balmer series for a H atom is

(1) $\dfrac{21}{100R}$

(2) $\dfrac{100}{21R}$

(3) $\dfrac{21R}{100}$

(4) $\dfrac{100R}{21}$

35) If the kinetic energy of an electron is increased 4 times, the wavelength of the de-Broglie wave associated with it would become :-

(1) four times

(2) two times

(3) half times

(4) one fourth times

36) In a sample of H-atom, electrons make transition from 5th excited state upto ground state, producing all possible types of photons, then number of lines in infrared region are

(1) 4

(2) 5

(3) 6

(4) 3

37) If the shortest wave length of Lyman series of H atom is x, then the wave length of the first line of Balmer series of H atom will be -

(1) 9x/5

(2) 36x/5

(3) 5x/9

(4) 5x/36

38) The de-Broglie wavelength of a tennis ball of mass 60 g moving with a velocity of 10 m/s is approximately (planck's constant, $h = 6.63 \times 10^{-34}$ J-s)

(1) 10^{-33} m

(2) 10^{-31} m

(3) 10^{-16} m

(4) 10^{-25} m

39) If uncertainity in position and momentum are equal, then uncertainity in velocity is :

(1) $\dfrac{1}{m}\sqrt{\dfrac{h}{\pi}}$

(2) $\sqrt{\dfrac{h}{\pi}}$

(3) $\dfrac{1}{2m}\sqrt{\dfrac{h}{\pi}}$

(4) $\sqrt{\dfrac{h}{2\pi}}$

40) Orbital having 3 angular nodes and 3 total nodes is :-

(1) 5 p

(2) 3 d

(3) 4 f

(4) 6 d

41) The measurement of the electron's position is associated with an uncertainty in momentum, which is equal to 1×10^{-18} g cm s^{-1}. The uncertainty in velocity of electron is :
(mass of electron = 9×10^{-28}g)

(1) 1.1×10^{11} cm s^{-1}

(2) 1.1×10^{9} cm s^{-1}

(3) 1.1×10^{6} cm s^{-1}

(4) 1.1×10^{5} cm s^{-1}

42) Consider the following statements:

(a) Electron density in the XY plane in $3d_{x^2-y^2}$ orbital is zero

(b) Electron density in the XY plane in $3d_{z^2}$ orbital is zero.

(c) 2s orbital has one nodal surface

(d) For $2p_z$ orbital, XY is the nodal plane.

Which of these are incorrect statements:

(1) a & c

(2) b & c

(3) Only b

(4) a, b

43) Which of the following set of quantum number is impossible for an electron ?

(1) n = 1, ℓ = 0, m = 0, s = +1/2

(2) n = 9, ℓ = 7, m = –6, s = –1/2

(3) n = 2, ℓ = 1, m = 0, s = +1/2

(4) n = 3, ℓ = 2, m = –3, s = +1/2

44) The correct set of quantum numbers for the unpaired electron of a chlorine atom is :

(1) $2, 0, 0, + \dfrac{1}{2}$

(2) $2, 1, -1, + \dfrac{1}{2}$

(3) $3, 1, -1, \pm \dfrac{1}{2}$

(4) $3, 0, 0, \pm \dfrac{1}{2}$

45) Maximum number of electrons in a subshell with ℓ = 3 and n = 4 is :

(1) 10

(2) 12

(3) 14

(4) 16

BIOLOGY

1) Members of Phycomycetes are found in :

(i) Aquatic habitats

(ii) On decaying wood

(iii) Moist and damp places

(iv) As obligate parasites on plants

Choose from the following options :

(1) Only (iv)

(2) (i) and (iv)

(3) (ii) and (iii)

(4) All of these

2) *Cleviceps* and *Neurospora* are the members of which of the following class ?

(1) Phycomycetes

(2) Ascomycetes

(3) Basidiomycetes

(4) Deuteromycetes

3) Which fungi cause rust and smut diseases respectively ?

(1) *Ustilago* and *Agaricus*

(2) *Puccinia* and *Ustilago*

(3) *Puccinia* and *Agaricus*

(4) *Ustilago* and *Puccinia*

4) **Assertion:** The spores of slime moulds lack true walls.
Reason: Spores are dispersed by air currents.

(1) Both assertion and reason are true and the reason is a correct explanation of the assertion.

(2) Both assertion and reason are true and reason is not a correct explanation of the assertion.

(3) Assertion is true but the reason is false.

(4) Assertion is false but the reason is true.

5) According to R.H. Whittaker five kingdom Classification which kingdom includes producers, consumers and decomposers ?

(1) Plantae

(2) Fungi

(3) Protista

(4) Animalia

6) **Assertion-(A) :-** According to Whittaker classification *Chlorella* and *Amoeba* both are included in kingdom Protista.
Reason-(R) :- *Chlorella* and *Amoeba* both are unicellular eukaryotes and have cellulosic cell wall

(1) A is true while R is false

(2) A and R both are true & R is not correct explanation of A

(3) A is false while R is true

(4) A and R both are true and R is correct explanation of A

7) **Statement 1 :** Fungi are cosmopolitan and occur in air, water, soil and on animals and plants.
Statement 2 : Fungi prefer to grow in warm and humid places.

(1) Both Statement 1 & Statement 2 are True.

(2) Statement 1 is false but Statement 2 is True.

(3) Statement 1 is True but the Statement 2 is False.

(4) Both Statement 1 & Statement 2 are False.

8) Match column-I with column-II and select the correct option :-

	Column-I		Column-II
A	Chief producers in oceans	i.	Euglenoids
B.	Red tides	ii.	Diatoms
C.	Myxotrophic nutrition	iii.	Slime moulds
D.	Plasmodium	iv.	Dinoflagellates

(1) A-ii, B-iv, C-i, D-iii

(2) A-ii, B-iv, C-iii, D-i

(3) A-i, B-iii, C-iv, D-ii

(4) A-iii, B-iv, C-ii, D-i

9) Match the column I & II and select correct option -

	Column-I		Column-II
A	Phycomycetes	i	*Alternaria*
B	Ascomycetes	ii	*Agaricus*
C	Basidiomycetes	iii	*Penicilium*
D	Deuteromycetes	iv	*Rhizopus*

(1) A -i, B - ii, C - iii, D - iv

(2) A -iv, B - iii, C - ii, D - i

(3) A -ii, B - iii, C - iv, D - i

(4) A -iii, B - iv, C - i, D - iv

10) Select the correct statements out of following :-
(A) Fungal association with roots of higher plants is called lichen.
(B) In Phycomycetes mycelium is aseptate and coenocytic.
(C) Ascomycetes are commonly known as sac-fungi.
(D) The basidiospores are endogenously produced in basidium.
(E) *Colletotrichum* and *Trichoderma* are example of Deuteromyetes.
Options :-

(1) (A), (B) and (C)

(2) (C), (D) and (E)

(3) (A), (D) and (E)

(4) (B), (C) and (E)

11) Read the following statements :-
(A) Lichens do not grow in polluted areas.
(B) Viroids have low molecular weight DNA
(C) Virus are inert outside their specific host cell.
(D) Mumps, small pox and influenza diseases are caused by Bacteria.
Which statements are correct ?

(1) A and B

(2) A and C

(3) A, B and C

(4) A, B and D

12) Which of the following is not correct :-

(1) Fungi show a great diversity in morphology and habitat.

(2) Viruses can be parasite or saprophyte

(3) *Mycoplasma* can survive in absence of oxygen

(4) Cyanobacteria have chlorophyll "a" similar to green plants

13) The bacteria that are found in extreme salty area are called as –

(1) Halophiles

(2) Thermoacidophiles

(3) Methanogens

(4) Cyanobacteria

14) Viroids differ from viruses in having.

(1) DNA molecules without protein coat

(2) RNA molecules with protein coat

(3) RNA molecules without protein coat

(4) DNA molecules with protein coat

15) In the given Taxonomic categories the missing categories A, B and C sequentialy in reference to
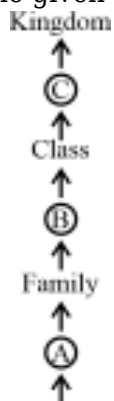
a plant : Species

(1) Order, Phylum, Genus

(2) Genus, Order, Sub-Class

(3) Genus, Order, Division

(4) Order, Genus, Division

16) Arrange the following taxa to form the correct sequence of classification of housefly :-
(a) Insecta   (b) Arthropoda
(c) Muscidae   (d) Diptera

(1) b, a, c, d

(2) c, d, a, b

(3) c, d, b, a

(4) b, d, c, a

17) The number of species that are known and described :-

(1) 1.7 - 1.8 billion

(2) 17 - 18 million

(3) 17 - 18 lakh

(4) 1.7 - 1.8 lakh

18) What is common for wheat and mango?

(1) Class

(2) Order

(3) Family

(4) Division

19) Which of the following is a correct scientific name according to ICBN ?

(1) *Mangifera indica linn.*

(2) Mangifera indica Linn.

(3) *Mangifera Indica* Linn.

(4) *Mangifera indica* Linn.

20) The relation of Solanaceae and Convolvulaceae with Polymoniales is similar to the relation occuring in :-

(1) Felidae and Canidae with Carnivora

(2) Primata and Carnivora with Mammalia

(3) Amphibia and Reptilia with Chordata

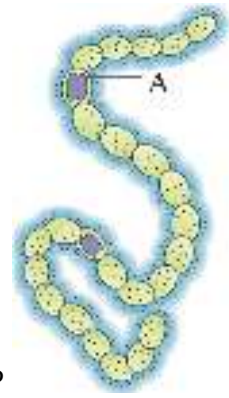(4) *Solanum* and *Petunia* with Solanaceae

21) Out of the following taxa which one represents the highest rank in taxonomic hierarchy?

(1) Poales

(2) Anacardiaceae

(3) Monocotyledonae

(4) Polymoniales

22) Identify 'A' in the figure given below and to which process it is related ?

(1) Holdfast - Nitrogen fixation

(2) Heterocyst - Nitrogen fixation

(3) Heterocyst - Production of methane

(4) Pyrenoids - Storage body

23) Read the following statements. Find out how many statements are incorrect ?
(A) *Chlorella* is used as food supplement even by space travellers.
(B) In bryophyte, zygote undergo reduction division.
(C) Pteridophytes are used for medicinal purpose and as soil-binders.
(D) Root in *Cycas* have fungal association in the form of mycorrhiza.

(1) One

(2) Four

(3) Two

(4) Three

24)

List some of the plants is given below :-
Pinus, Dryopteris, Cedrus, Pteris, Ulothrix, Adiantum, Porphyra.

How many are vascular plants ?
(1) Four

(2) Two

(3) Three

(4) Five

25) Some characters/structures are given below. How many of them are found in both bryophyta and pteridophyta ?
(A) Archegonium
(B) Protonema
(C) Ovule
(D) Vascular tissue
(E) Antheridium

(1) Two

(2) Three

(3) Four

(4) Five

26) Read the following statements. Find out which one is correct for gymnosperm.

(1) In *Cycas* the pinnate leaves persist for a few days.

(2) Corolloid roots of *Pinus* are associated with N_2-fixing cyanobacteria.

(3) Development of pollen grains take place with in the megasporangia.

(4) Female gametophyte bears two or more archegonia.

27) What is the correct ploidy sequence in the following ?
A. Protonema cell of moss
B. Capsule cell of liverworts
C. Root cells of pteridophytes
D. Archegonia of Gymnosperm

(1) n, n, 2n, n

(2) n, 2n, 2n, n

(3) n, n, 2n, 3n

(4) n, 2n, 2n, 4n

28) Read the following statement :-
(A) Sexual reproduction may be Isogamous, anisogamous or oogamous
(B) Union of gametes may take place in water or with in the oogonium
(C) The gametes are pyriform (pear shaped) and bear two laterally attached flagella
(D) Photosynthetic pigments are chl a and chl c.
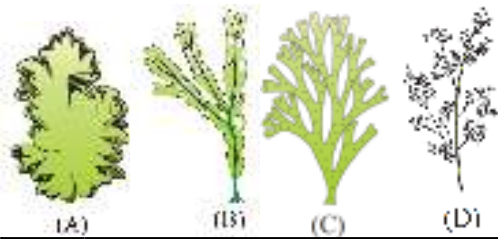Above statements are related to which class of algae ?

(1) Chlorophyceae

(2) Phaeophyceae

(3) Cyanophyceae

(4) Rhodophyceae

29) Chlorophyll **a** and **b** are present in members of :-

(1) Rohdophyceae

(2) Chlorophyceae

(3) Angiosperms

(4) (2) and (3) both

30)

Examine the figures A, B, C and D. In which one of the four options, all the items A, B, C and D are correctly identified ?
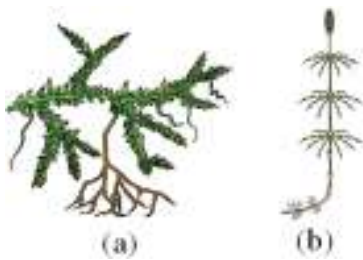
	A	B	C	D
(1)	*Fucus*	*Dictyota*	*Porphyra*	*Polysiphonia*
(2)	*Polysiphonia*	*Porphyra*	*Dictyota*	*Fucus*
(3)	*Porphyra*	*Fucus*	*Dictyota*	*Polysiphonia*
(4)	*Porphyra*	*Polysiphonia*	*Fucus*	*Dictyota*

(1) 1

(2) 2

(3) 3

(4) 4

31)
Identity the plants given in the figure. (a) & (b) :-

(1) *Selaginella* and *Pteris*

(2) *Equisetum* and *Salvinia*

(3) *Selaginella* and *Equisetum*

(4) *Salvinia* and *Fern*

32) Which of the following statement is correct ?

(1) In *Sphagnum*, asexual reproduction takes place by green, multicellular buds called gemmae

(2) The sporophyte of bryophytes is differentiated into foot, seta and capsule and it is a free-living generation

(3) Protonema is a green, creeping, branched and filamentous stage in mosses, which develops directly from a spore.

(4) Liverworts have an elaborate mechanism of seed dispersal.

33) Read the following statements regarding Gymnosperms :-
(A) The main plant body is sporophyte.
(B) Roots in some genera have algal association in the form of mycorrhiza.
(C) The multicellular female gametophyte bears two or more archegonia.
(D) The male and female cones may be borne on the same tree or on different trees.

(1) Statements A, C and D are correct and statement B is incorrect.

(2) Statement A , B and D are correct and statement C is incorrect.

(3) Statement A and D are correct and statement B & C are incorrect.

(4) Statement A and B are correct and statement C & D are incorrect.

34) Match the column :-

Column-I			Column-II
A	*Cycas*	i	Heterosporous fern
B	*Pinus*	ii	Homosporous fern
C	*Salvinia*	iii	Pinnate leaves
D	*Adiantum*	iv	Needle like leaves

(1) A → iv; B → iii; C → ii; D → i

(2) A → iv; B → iii; C → i; D → ii

(3) A → iii; B → iv; C → i; D → ii

(4) A → iii; B → iv; C → ii; D → i

35) Which of the following statements are true for female gametophyte in gymnosperm ?
(A) It nourishes the developing embryo present in seed
(B) It is not independant
(C) It bears Archegonia
(D) It is formed after fertilisation

(1) A, B, C are correct

(2) Only B, C are correct

(3) Only A, C are correct

(4) A, B, C, D are correct

36) Match the followings Column-I with Column-II :-

	Column-I		Column-II
(a)	*Polysiphonia*	(i)	Moss
(b)	*Pinus*	(ii)	Pteridophyte
(c)	*Psilotum*	(iii)	Algae
(d)	*Polytrichum*	(iv)	Gymnosperm

(1) a - i; b - iii; c - iv; d - ii

(2) a - ii; b - iii; c - iv; d - i

(3) a - iii; b - iv; c - ii; d - i

(4) a - iv; b - ii; c - i; d - iii

37) **Statement-I :-** Pyrenoids contain proteins surrounding the starch.
Statement-II :- *Porphyra, Laminaria* and *Spirogyra* algae are used as food.

(1) Both Statement-I & Statement-II are incorrect.

(2) Statement-I is correct but Statement-II is incorrect.

(3) Statement-I is incorrect but Statement-II is correct.

(4) Both Statement-I & Statement-II are correct.

38)

Which of the following is called as amphibians of plan kingdom ?

(1) Ferns

(2) Bryophytes

(3) Algae

(4) Euglenoids

39)

Why seeds of gymnosperms are naked ?

(1) Gymnosperms lack ovary

(2) Gymnosperms lack ovules

(3) Female gametophyte is absent in gymnosperms

(4) Endosperm is haploid

40) **Assertion :** Algae are of paramount importance as primary producers of energy rich compounds which form the basis of the food cycle of all aquatic animals.
Reason : At least half of the total O_2 fixation on earth is carried out by algae through photosynthesis.

(1) Both Assertion & Reason are True & the Reason is a correct explanation of the Assertion.

(2) Both Assertion & Reason are True but Reason is not a correct explanation of the Assertion.

(3) Assertion is True but the Reason is False.

(4) Both Assertion & Reason are False.

41) First vascular land plants are :-

(1) Pteridophytes

(2) Bryophytes

(3) Thallophytes

(4) Gymnosperms

42) Find out the wrong pair :

(1) Green algae - *Sargassum*

(2) Brown algae - *Dictyota*

(3) Red algae - *Porphyra*

(4) Brown algae - *Ectocarpus*

43) Which among the following is the tallest tree ?

(1) *Cycas*

(2) *Pinus*

(3) *Cedrus*

(4) *Sequoia*

44) Which one of the following have an elaborate mechanism of spore dispersal ?

(1) *Funaria*

(2) *Sphagnum*

(3) *Marchantia*

(4) Both (1) & (2)

45) Read the following statements and select the correct option.
(A) In conifers needle like leaves reduce the surface area.
(B) Most of gymnosperm are homosporous.
(C) Reduced gametophyte of gymnosperm is called a pollen grain.
(D) Megaspore mother cell devides mitotically to form four megaspore.

(1) 2 - correct, 2 - incorrect

(2) 3 - correct, 1 - incorrect

(3) 1 - correct, 3 - incorrect

(4) 0 - correct, 4 - incorrect

46) Which one is gregarious pest ?

(1) *Limulus*

(2) *Locusta*

(3) Laccifer

(4) *Aedes*

47) Identify the given diagram and their excretory organ :

(1) *Balanoglossus* - Nephridia

(2) *Cucumaria* - Proboscis gland

(3) *Balanoglossus* - Proboscis gland

(4) *Saccoglossus* - Flame cells

48) Which one of the following features is not present in the phylum - Arthropoda ?

(1) Metameric segmentation

(2) Parapodia

(3) Jointed appendages

(4) Chitinous exoskeleton

49) In phylum porifera opening through which water enter in the spongocoel is called ?

(1) Ostia

(2) Ommatidia

(3) Osculum

(4) Choanocytes

50) The term 'radial symmetry' refers :-

(1) When the body can be divided into two unequal halves on passing central axis through it

(2) To any plane passing through centre, which does not divide the body into equal halves

(3) When the body can be divided into identical left and right halves only in one plane

(4) Any plane passing through the central axis of the body dividing the organism into two equal halves

51) Match the following columns and select the correct option:

	Column-I		**Column-II**
(i)	*Carcharodon*	(a)	Saw fish
(ii)	*Exocoetus*	(b)	Flying fish
(iii)	*Betta*	(c)	Great white shark
(iv)	*Pristis*	(d)	Fighting fish

(1) i-d, ii-c, iii-b, iv-a

(2) i-a, ii-b, iii-c, iv-d

(3) i-c, ii-b, iii-d, iv-a

(4) i-d, ii-c, iii-a, iv-b

52) Mark the incorrect statement in reference to phylum Arthropoda.

(1) This is the largest phylum of Animalia which includes insects.

(2) They are bilaterally symmetrical, triploblastic, segmented and coelomate animals.

(3) Their unsegmented body consists of distinct head, visceral hump and muscular foot.

(4) Circulatory system is of open type.

53) Specialised cells called flame cells help in osmoregulation and excretion are found in -

(1) *Fasciola*

(2) *Nereis*

(3) *Ctenoplana*

(4) *Aplysia*

54) Identify the animals given in figure A,B,C and D and select the right option about them:-

A-

B-

C-

D-
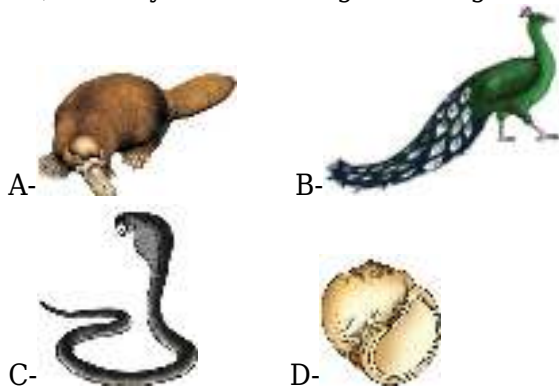
(1) A-*Ornithorhynchus*, B-*Pavo*, C-*Naja*, D-*Pila*

(2) A-*Macropus*, B-*Struthio*, C-*Corvus*, D-*Pteropus*

(3) A-*Ornithorhynchus*, B-*Columba*, C-*Chelone*, D-*Rana*

(4) A-*Hippocampus*, B-*Catla*, C-*Rana*, D-*Sycon*

55) **Statement-I :** Open type is the circulation in which the blood is pumped out of the heart and the cells and tissues are directly bathed in it
Statement-II : Closed type is the circulation in which the blood is circulated through a series of vessels of varying diameters

(1) Both Statement-I and Statement-II are incorrect

(2) Statement-I is correct but Statement-II is incorrect

(3) Statement-I is incorrect but Statement-II is correct

(4) Both Statement-I and Statement-II are correct

56) Read the following four statements (A–D) :
(A) Porifera are primitive multicellular animals and have tissue level of organisation.
(B) Sponges have a water transport or canal system. This pathway of water transport is helpful in food gathering, respiratory exchange and removal of waste.
(C) Choanocytes or collar cells line the spongocoel and the canals.
(D) Sponges reproduce asexually by fragmentation and sexually by formation of gametes.
How many of the above statements are incorrect ?

(1) Three

(2) Two

(3) One

(4) Four

57) Match the following columns -

Column-I		Column-II	
(A)	*Pennatula*	(i)	Brain coral
(B)	*Meandrina*	(ii)	Sea fan

(C)	*Gorgonia*	(iii)	Sea pen
(D)	*Adamsia*	(iv)	Sea anemone

(1) A–iii, B–i, C–ii, D–iv

(2) A–i, B–iii, C–ii, D–iv

(3) A–ii, B–iv, C–i, D–iii

(4) A–ii, B–iii, C–iv, D–i

58) **Statement-I :** All living members of the class cyclostomata are endoparasites on some fishes.
Statement-II : Cyclostomes have a sucking and circular mouth without Jaws.

(1) Both **Statement I** and **Statement II** are incorrect.

(2) **Statement I** is correct but **Statement II** is incorrect.

(3) **Statement I** is incorrect but **Statement II** is correct.

(4) Both **Statement I** and **Statement II** are correct.

59) Match the column :-

(i)	Aves	(a)	Skin dry and scaly
(ii)	Amphibia	(b)	Diaphragm present
(iii)	Mammals	(c)	Pneumatic bones
(iv)	Reptiles	(d)	Skin moist and scaleless

(1) i-d, ii-c, iii-a, iv-b

(2) i-c, iv-b, ii-a, iii-d

(3) i-c, ii-d, iii-b, iv-a

(4) i-a, ii-b, iii-c, iv-d

60) Identify the cell given in diagram :

(1) Choanocyte

(2) Cnidoblast

(3) Lasso cells

(4) Pinacoderm
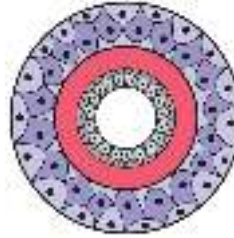
61) Given diagram below is the feature of which animal :

 (1) Tapeworm
 (2) Earthworm
 (3) Hydra
 (4) *Taenia*

62) Which group contains Bony fishes

 (1) *Silver fish, Betta, Devils fish*
 (2) *Cray fish, Catla, star fish*
 (3) *Jelly fish, Clarius, Pterophyllum*
 (4) *Clarius, Catla, Exocoetus*

63) **Assertion :** Members of phylum Aschelminthes are called as Roundworms.
Reason : The body of the aschelminthes is circular in cross-section.

 (1) Both assertion and reason are true and reason is the correct explanation of assertion
 (2) Both assertion and reason are true and reason is not the correct explanation of assertion
 (3) Assertion is true but reason is false
 (4) Both assertion and reason are false

64) **Assertion (A) :** Animals possessing coelom are called coelomates
Reason (R) : The body cavity, which is lined by endoderm is called coelom.

 (1) Both (A) and (R) are true and (R) is correct explanation of (A).
 (2) Both (A) and (R) are true and (R) is not correct explanation of (A).
 (3) (A) is true but (R) is false.
 (4) (R) is true but (A) is false.

65) Which one of the following groups of animals is bilaterally symmetrical and triploblastic ?

 (1) Coelenterates (Cnidarians)
 (2) Aschelminthes (round worms)
 (3) Ctenophores
 (4) Sponges

66) The presence of water vascular system is the characteristic feature of phylum :-

 (1) Arthropoda
 (2) Annelida

(3) Nematoda

(4) Echinodermata

67) Corals belong to the phylum -

(1) Porifera
(2) Coelenterata
(3) Mollusca
(4) Echinodermata

68) External ear opening absent, tympanum represents ear, 3-chambered heart. It is true for :-

(1) *Chameleon, Rana*
(2) *Calotes, Pteropus*
(3) *Corvus, Chelone*
(4) *Canis, Hyla*

69) Mesoglea is present in :

(1) Porifera, Coelenterata
(2) Coelenterata, Ctenophora
(3) Coelenterata, Platyhelminthes
(4) Platyhelminthes, Nematoda

70) Blood sucking leech is :-

(1) *Nereis*
(2) *Hirudinaria*
(3) *Pheretima*
(4) *Ancylostoma*

71) Hairs on skin and pinnae both are found in :-

(1) Flying Fox
(2) *Columba*
(3) *Neophron*
(4) *Pavo*

72) Poison sting is present in :-

(1) *Torpedo*
(2) *Trygon*
(3) Dog fish
(4) Sea-horse

73) Operculum and air bladder both are absent in :-

(1) *Pristis*
(2) Angel fish
(3) Fighting fish
(4) Magur

74) Which animal belongs to agnatha division of vertebrata :

(1) Hag fish
(2) Dog fish
(3) Starfish
(4) Devil fish

75) Protochordata includes :-

(1) Tunicata, cephalopoda
(2) Cephalopoda, cephalochordata
(3) Tunicata, cephalochordata
(4) Only tunicata

76) Stomochord is found in :

(1) *Balanoglossus*
(2) Star fish
(3) Sea-urchin
(4) *Doliolum*

77) Sea-urchin is related to :-

(1) Hemichordata
(2) Mollusca
(3) Echinodermata
(4) Cephalochordata

78) Which of the following is a genus of squid ?

(1) Apple snail
(2) Pearl-oyster
(3) Sea-hare
(4) *Loligo*

79) Mantle cavity is space between :-

(1) Mantle and shell
(2) Muscular foot and head
(3) Head and mantle
(4) Hump and mantle

80) Which of the following is not a round worm :-

(1) *Ascaris*
(2) Hook worm
(3) Filarial worm
(4) Acorn worm

81) Gastrovascular cavity is found in :-

(1) Tape worm
(2) Liver fluke
(3) Bath Sponge
(4) Sea-anemone

82) Polyp and medusa stages are found in :-

(1) Porifera
(2) Ctenophora
(3) Tunicata
(4) Cnidaria

83) Radula is related with -

(1) Respiration
(2) Circulation
(3) Excretion
(4) Feeding

84) Which of the following is not a arthropoda -

(1) Locust
(2) Butterfly
(3) Prawn
(4) *Aplysia*

85) Sponges are mostly :-

(1) Radially symmetrical
(2) Bilaterally symmetrical
(3) Symmetrical
(4) Asymmetrical

86) In which fish teeth are formed by modification of placoid scales :-

(1) *Scoliodon*
(2) *Exocoetus*

(3) *Labeo*

(4) *Clarias*

87) Which of the following animal lacks scales.

(1) *Bufo*

(2) Magur

(3) Krait

(4) *Betta*

88) Which of the following set of animals contain the oil gland at the base of the tail.

(1) Crow, Pigeon

(2) Fox, Flying fox

(3) Tiger, Lion

(4) Cobra, Viper

89) In which of the following, True segmentation of body is first observed ?

(1) Platyhelminthes

(2) Aschelminthes

(3) Annelida

(4) Arthropoda

90) In which animal notochord is present only in larval tail :-

(1) Lancelet

(2) *Doliolum*

(3) *Petromyzon*

(4) *Myxine*

ANSWER KEYS

PHYSICS

Q.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A.	4	1	3	1	3	2	1	2	2	2	4	1	1	4	2	1	4	3	4	2
Q.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
A.	4	4	1	2	1	2	2	2	3	4	1	3	4	2	3	3	3	1	4	1
Q.	41	42	43	44	45															
A.	1	1	4	3	3															

CHEMISTRY

Q.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65
A.	1	2	3	3	1	1	3	3	3	1	3	3	3	2	2	3	4	4	2	3
Q.	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85
A.	4	4	1	3	1	2	3	3	3	3	1	2	3	2	3	3	2	1	3	3
Q.	86	87	88	89	90															
A.	2	4	4	3	3															

BIOLOGY

Q.	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110
A.	4	2	2	4	3	1	1	1	2	4	2	2	1	3	3	2	3	4	4	1
Q.	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
A.	3	2	3	4	1	4	2	2	4	3	3	3	1	3	1	3	1	2	1	3
Q.	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
A.	1	1	4	4	1	2	3	2	1	4	3	3	1	1	4	3	1	3	3	2
Q.	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170
A.	3	4	1	3	2	4	2	1	2	2	1	2	1	1	3	1	3	4	4	4
Q.	171	172	173	174	175	176	177	178	179	180										
A.	4	4	4	4	4	1	1	1	3	2										

SOLUTIONS

PHYSICS

1) Least count = $\dfrac{\text{Pitch}}{\text{No of CSD}}$

$\Rightarrow LC_1 = 0.01\,\text{mm}$

New least count = LC_2

$= \dfrac{\text{Pitch}(1-0.25)}{(\text{No of CSD})(1+0.50)} \Rightarrow \dfrac{0.75}{1.5} \times 0.01$ mm

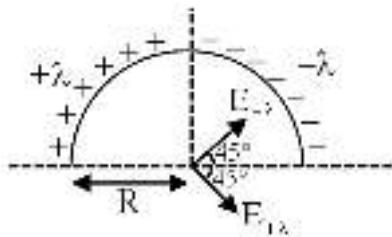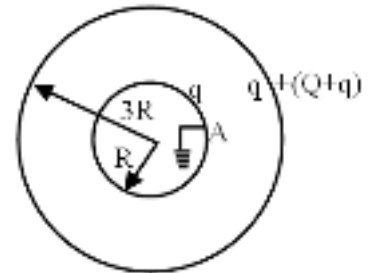$= 0.005 = 5 \times 10^{-3}$ mm

2)

(I) For outside points statement I is correct but for inside points electric field is in opposite direction.

(II) $E \propto \dfrac{1}{r^3}$ is valid for far away points not for near by points.

3)

Let charge on inner shell = q

$V_A = \dfrac{Kq}{R} - \dfrac{Kq}{3R} + \dfrac{K(Q+q)}{3R} = 0$

$\dfrac{Kq}{R} - \dfrac{Kq}{3R} + \dfrac{KQ}{3R} + \dfrac{Kq}{3R} = 0$

$\Rightarrow \dfrac{Kq}{R} + \dfrac{KQ}{3R} = 0 \Rightarrow q = \dfrac{-Q}{3}$

4)

$|E_{+\lambda}| = |E_{-\lambda}| = \dfrac{\sqrt{2}K\lambda}{R}$

$E_{Net} = \sqrt{|E_{+\lambda}|^2 + |E_{-\lambda}|^2 + 2|E_{+\lambda}||E_{-\lambda}|\cos 90^\circ}$

$= \sqrt{\left(\dfrac{\sqrt{2}K\lambda}{R}\right)^2 + \left(\dfrac{\sqrt{2}K\lambda}{R}\right)^2}$

$= \dfrac{2K\lambda}{R}$

$$F = qE = q\frac{KQ\sqrt{3}R}{\left(R^2 + 3R^2\right)^{3/2}} = \frac{\sqrt{3}KQq}{8R^2}$$

5)

6) Parallel $\Rightarrow \dfrac{1}{R_{eq}} = \dfrac{1}{R_1} + \dfrac{1}{R_2}$

$$\frac{1}{R_{eq}} = \frac{1}{10} + \frac{1}{15} = \frac{1}{6}$$

$$\frac{1}{R_{eq}} = \frac{1}{6}$$

For error :

$$\frac{dR_{eq.}}{R_{eq.}^2} = \frac{dR_1}{R_1^2} + \frac{dR_2}{R_2^2}$$

$$\Rightarrow \frac{dR_{eq.}}{(6)^2} = \frac{0.5}{(10)^2} + \frac{0.5}{(15)^2}$$

$$dR_{eq.} = 36 \times 0.5 \times \frac{13}{900} = \frac{26}{100}$$

Now : % error

$$\frac{dR_{eq.}}{R_{eq.}} \times 100\%$$

$$\frac{26/100}{6} \times 100\% \Rightarrow \frac{26}{6} = 4.33$$

7) v-t Area = Displacement

$$= 10 \times 4 + \frac{1}{2} \times 4 \times 10 + \frac{1}{2}(2)(-5)$$

$$= 55 \text{ m}$$

8) $\text{LC} = \left(\dfrac{20-18}{20}\right) \times 1\text{MSD}$

$$\Rightarrow 0.05\text{mm} = \frac{1}{10} \times 1\text{MSD}$$

$$\Rightarrow 1 \text{ MSD} = 0.5 \text{ mm}$$
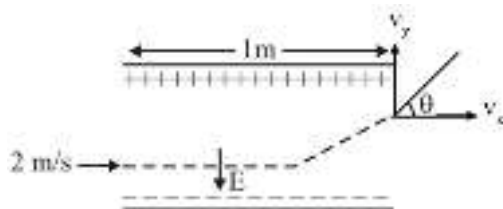
9)

$$a_y = \frac{F_y}{m} = \frac{e\,(E)}{m} = \frac{e\left(\frac{8m}{e}\right)}{m} = 8\text{m/s}^2$$

$$s_x = u_x t$$

$$1 = 2 \times t$$

$$t = \frac{1}{2} \text{ sec}$$

$$v_y = u_y + a_y t$$

$$v_y = 0 + \frac{8 \times \frac{1}{2}}{}$$

$v_y = 4$ m/s

$$\tan\theta = \frac{v_y}{v_x} = \frac{4}{2} = 2 \Rightarrow \theta = \tan^{-1}(2)$$

10) 1 cm on M.S. = 20 parts on M.S. $\Rightarrow$ 1 MSD = $\frac{1}{20}$cm

and 10 VSD = 9MSD

$\Rightarrow$ 1 VSD = $\frac{9}{10}$ (MSD)

L.C. = 1 MSD – 1 VSD

= 1 MSD – $\frac{9}{10}$(1MSD)= $\frac{1}{10}$(1MSD) = $\frac{1}{10} \times \frac{1}{20}$cm

= 0.05 mm

11)

When charge q is placed at the corner of a cube then to enclose the charge symmetrically, we have to require eight identical cube, incliding the given cube. So, flux through 8 cube

$$\phi = \frac{q}{\varepsilon_0}$$

flux from ore cube $\quad \phi' = \frac{q}{8\varepsilon_0}$

12) $E = \frac{-dV}{dr} \Rightarrow \frac{dV}{dr} = 0 \quad$ V = const.

13) $a = \frac{F}{m} \Rightarrow a = \frac{qE}{m} \Rightarrow \frac{q}{m} = \frac{a}{E}$

14) $\frac{97.52}{2.54} = 38.3937 \simeq 38.4$

should be with 3 S.F.

15) $n_2 = n_1 \left[\frac{M_1}{M_2}\right]^1 \left[\frac{L_1}{L_2}\right]^{-3}$

$n_2 = (8)\left[\frac{1gm}{20gm}\right]^1 \left[\frac{1cm}{5cm}\right]^{-3}$

$= 8 \times \frac{1}{20} \times (5)^3 = 50$

16) $v = r^a \rho^b s^c \quad [M^0 L^0 T^{-1}] = [L^1]^a [M^1 L^{-3}]^b [M^1 L^0 T^{-2}]^c$

$[M^0 L^0 T^{-1}] = [M^{b+c} L^{a-3b} T^{-2c}]$

Compare $\Rightarrow$

b + c = 0 $\quad\quad\quad\quad$ ...(1)

a – 3b = 0   ...(2)

–2c = –1   ...(3)

by solving, we get

$a = -\dfrac{3}{2}, b = -\dfrac{1}{2}, c = \dfrac{1}{2}$

17)

For point A, B perpendicular distance from z-axis

$r_A = r_B = \sqrt{3^2 + 4^2} = 5$ and $E = \dfrac{\lambda}{2\pi\varepsilon_0 r}$

$\Rightarrow \dfrac{E_A}{E_B} = 1$

18) $\dfrac{dx}{dt} = 3at^2 ; \dfrac{dy}{dt} = 2bt$

$\dfrac{dx}{dy} = \dfrac{3at^2}{2bt} = \dfrac{3at}{2b}$
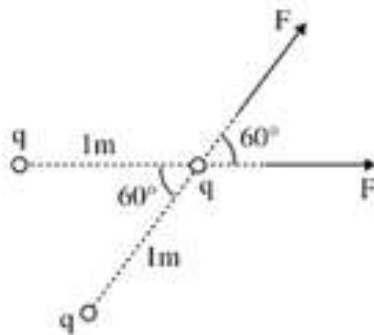
19)

$F = \dfrac{k(2)(2)}{(1)^2}$

(F = Electrostatic force between two charges).

F = 4k

$F_{net} = 2F \cos 30^\circ = 2 \cdot F \cdot \dfrac{\sqrt{3}}{2} = F\sqrt{3}$

(F_{net} = Net electrostatic force on one charged ball)

$\dfrac{F_{net}}{F} = \dfrac{\sqrt{3}\,F}{F} = \left(\sqrt{3}\right)$

Remark: Net force on any one of the ball is zero. But no option given in options.

20) $V_{centre} = Vq_1 + Vq_2$

$= \dfrac{Kq_1}{r_1} + \dfrac{Kq_2}{r_2}$

21) Coefficient of friction → dimensionless & unit less

Angular displacement → dimensionless but having unit

22) $[k] = \left[\dfrac{\text{Energy}}{\text{Temperature}}\right]$

∵ Angle is dimensionless

So $\left[\dfrac{\alpha x}{kt}\right]$ = dimensionless = 1

$\Rightarrow \alpha = \dfrac{[kt]}{[x]} = \dfrac{[k][t]}{[x]} = \dfrac{\text{Energy}}{\text{distance}}$

and $U = \dfrac{\alpha}{\beta} \times 1 \Rightarrow \beta = \dfrac{\alpha}{U}$

$\Rightarrow [\beta] = \dfrac{[\alpha]}{[U]} = \dfrac{[\text{Energy/distance}]}{[\text{Energy/volume}]} = \dfrac{L^3}{L^1} = [L^2]$

23) $R = \dfrac{V}{I} \quad \dfrac{\Delta R}{R} = \dfrac{\Delta V}{V} + \dfrac{\Delta I}{I} = \dfrac{2}{200} + \dfrac{0.3}{20}$

$\% \Rightarrow \dfrac{\Delta R}{R} \times 100\% = \left(\dfrac{2}{200} + \dfrac{0.3}{20}\right) \times 100\% = 2.5\%$

24) $\dfrac{1}{2}mv^2 = \Delta u = kq_1 q_2 \left[\dfrac{1}{r_1} - \dfrac{1}{r_2}\right]$

25)

Equation of straight line y = mx + C. In given graph slope m is positive and intercept on y-axis C is also positive , which is given in only (1) option.

26) 2.3×10^5

$a \times 10^b$

If $a \le 5$

$\Rightarrow$ Order of magnitude = b

Order of magnitude = b = 5

27) $\vec{V} = 5.5 \left[\dfrac{(3-1)\hat{i} + (-4-2)\hat{j} + (6-(-3))\hat{k}}{\sqrt{4 + 36 + 81}}\right]$

$\vec{V} = \hat{i} - 3\hat{j} + 4.5\hat{k}$

28) $V = \dfrac{K3Q}{3r} + \dfrac{KQ}{r} = \dfrac{2KQ}{r}$

29)

Electric potential at any general point due to electric dipole is given by

$V = \dfrac{p\cos\theta}{4\pi\varepsilon_0 r^2}$

Here, p = 2.4×10^{-10} C m, r = 0.4 m

$$V = \frac{2.4 \times 10^{-10} \times \cos 60° \times 9 \times 10^9}{(0.4)^2} = \frac{67.5}{10} = 6.75 \text{ V}$$

30) LC = 0.01 cm
Depth, d = 4.2 cm + (5 × 0.01) cm = 4.25 cm
Volume of empty vessel = Base area × depth
 = 5.0 cm^2 × 4.25 cm = 21.25 cm^3 ⛶ 21 cm^3
(with proper SF)

31)

Area under curve with y-axis is given by

Area = $-\frac{1}{2}$ (1 + 2) (1) = $-\frac{3}{2}$ units
Area is negative because it is integrated from A to B which is along – y axis.

32) $\vec{E} = -\frac{dv}{dr}$, where v = 6xy – y + 2yz $\vec{E} = -\left(\frac{dv}{dx}\hat{i} + \frac{d}{dy}\hat{j} + \frac{dv}{dz}\hat{k}\right)$

$= -\left(6y\hat{i} + (6x-1)\hat{j} + 2y\hat{k}\right)$

$\Rightarrow \vec{E}(1,1,0) = -\left(6\hat{i} + 5\hat{j} + 2\hat{k}\right)$

33) ZE is negative;
$LC = \left(\frac{20-18}{20}\right)$ 1 MSD = $\frac{1}{10}$ × 1MSD
|ZE| = 0.2 mm
$\Rightarrow$ 0.2 mm = (20 –16) × LC = 4 × $\frac{1}{10}$ × 1MSD
$\Rightarrow$ 1 MSD = $\frac{10 \times 0.2mm}{4}$ = 0.5mm
No. of MSD in 1 cm = $\frac{1cm}{0.5mm} = \frac{10mm}{0.5mm}$
= 20 divisions.

34)

No. of field lines ∝ q

35)

dq = (Ar$^\circ$)4πr^{2}dr
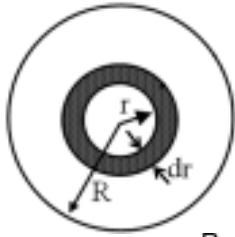
$$Q = \int dq = \int_0^R 4\pi A r^4 dr$$

$$Q = \frac{4\pi A R^5}{5}$$

36) The PE of the system can be found by computing the work done by external agent in assembling the system without changing the kinetic energy of the system.
Let we first brought q_1 from infinity to desired location, then in doing so we have to do work against external electric field which is equal to
$W_1 = q_1 V_1$
[potential at infinity is considered as zero]
Now we will bring q_2 from infinity to desired location, to do so we have to do work against external electric field and against electric force of q_1, so work done is

$$W_2 = q_2 V_2 + \frac{q_1 q_2}{4\pi \in_0 r}$$

so, total work done

$$= U = q_1 V_1 + q_2 V_2 + \frac{q_1 q_2}{4\pi \in_0 r}$$

37) Pitch $= \dfrac{1mm}{2} = 0.5mm$;

LC $= \dfrac{0.5}{50} = 0.01mm$

(a) When screw is closed :
ZE $= -5 \times 0.01 = -0.05$ mm
(b) During measurement :
MSR $= 1$ div $\times 0.5$ mm $= 0.5$ mm
CSR $= 22^{nd}$ div $\times 0.01$ mm $= 0.22$ m
Corrected reading for thickness sheet :
$= 0.5$ mm $+ 0.22$ mm $- (-0.05$ mm$) = 0.77$ mm

38)

In electrostatic condition electric field inside conductor is zero but for a current carrying conductor electric field is not zero, it is along direction of current.

39) Angular momentum L = mvr
$[L] = [M^1] [L^1 T^{-1}] [L^1] = [M^1 L^2 T^{-1}]$

40) $E = \dfrac{-dv}{dr} = 0 \Rightarrow V = $ const.

41) $E(r < R) = \dfrac{kQr}{R^3}$

$= \dfrac{1}{4\pi\varepsilon_0} \dfrac{\left(\frac{4}{3}\pi R^3\right)\rho r}{R^3} = \dfrac{\rho r}{3\varepsilon_0}$

42)

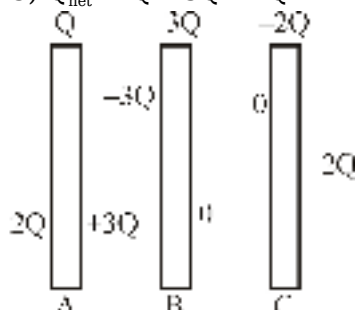Magnitude of change in vector

$= \sqrt{a^2(\cos\theta - 1)^2 + a^2\sin^2\theta}$

$= \sqrt{2a^2 - 2a^2\cos\theta}$

$= 2a\sin\left(\dfrac{\theta}{2}\right)$

43) $Q_{net} = Q - 3Q - 2Q = -4Q$

44) $\vec{A} \cdot \vec{B} = 0$

$2(4) + 3(-4) + 8(\alpha) = 0$

$8 - 12 + 8\alpha = 0$

$8\alpha = 4$

$\alpha = \dfrac{1}{2}$

45) $q = 2\times 10^{-6}C, \quad \ell = 3\times 10^{-2}m, \quad E = 2\times 10^5 N/c$

$\vec{J} = \vec{P} \times \vec{E}$

$\vec{J}_{max} = PE = (q\ell)E$

$= 2 \times 10^{-6} \times 3 \times 10^{-2} \times 2 \times 10^5$

$\vec{J}_{max} = 12 \times 10^{-3} N.m$

CHEMISTRY

46)

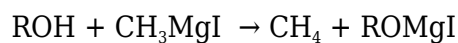$2C \quad + \quad O_2 \quad \rightarrow \quad 2CO$

$\dfrac{24}{12} \qquad \dfrac{96}{32}$

2 mole   3 mole

$C \rightarrow O_2$

$2 \rightarrow 1$

$1 \rightarrow \dfrac{1}{2}$

$2 \rightarrow \dfrac{1}{2} \times 2 = 1$ mole of O_2 required

47)

$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$
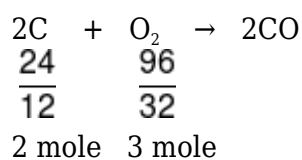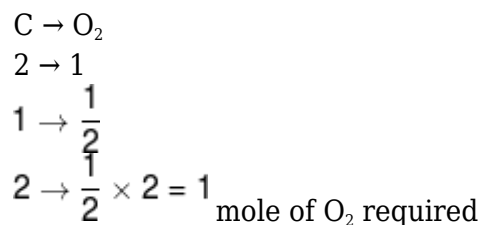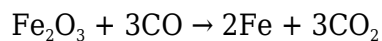
For 2 mol Fe, 3 mol CO is required

For 1 mol Fe, $\dfrac{3}{2} = 1.5$ mol CO is required.

48)

$ROH + CH_3MgI \rightarrow CH_4 + ROMgI$

$\quad\quad\downarrow \quad\quad\quad\quad\quad\quad\quad\downarrow$

1 mol $\quad\quad\quad\quad\quad$ 1 mol (22.4 L)

According to stoichiometry

moles of ROH = $\dfrac{W(gm)}{M_W} = \dfrac{V(L)}{22.4}$ [moles of gas (CH_4)]

49)

	%	mole	simplest ratio
C	40	$\dfrac{40}{12} = 3.33$	$\dfrac{3.33}{3.33} = 1$
H	13.33	$\dfrac{13.33}{1} = 13.33$	$\dfrac{13.33}{3.33} = 4$
N	46.67	$\dfrac{46.67}{14} = 3.33$	$\dfrac{3.33}{3.33} = 1$

EF = CH_4N

50)

no. of atoms = no. of moles $\times$ N_A $\times$ atomicity

51)

mass % of an element = $\dfrac{\text{no. of atom} \times \text{atomic mass}}{\text{mol. mass}} \times 100$
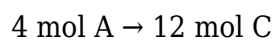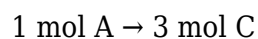
For min. mol. mass $\Rightarrow$ no. of atom = 1

$3.4 = \dfrac{1 \times 32}{x} \times 100$

x = 941.176

52)

$$A \ + \ 2B \rightarrow 3C$$

4mol 10mol

$$\frac{4}{1} \qquad \frac{10}{2}$$

ratio

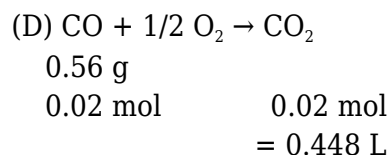= 4   = 5

LR

1 mol A → 3 mol C
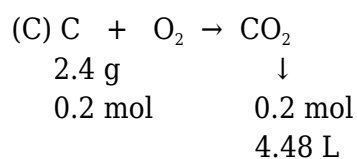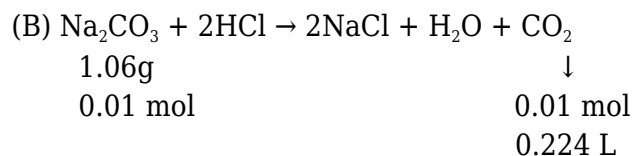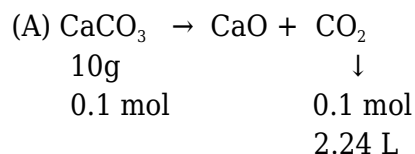
4 mol A → 12 mol C
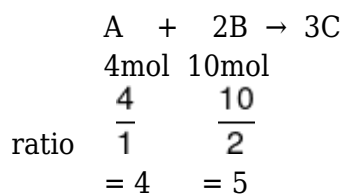
53)

NCERT-XI,

Some basic concept of chemistry laws of chemical combinations.
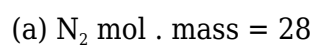

54)

Gay Lussac's Law: When gases combine or are produced in a chemical reaction they do so in a simple ratio by volume provided all gases are at same temperature and pressure.

55)

(A) $CaCO_3 \rightarrow CaO + CO_2$

10g   ↓

0.1 mol   0.1 mol

                2.24 L

(B) $Na_2CO_3 + 2HCl \rightarrow 2NaCl + H_2O + CO_2$

1.06g   ↓

0.01 mol   0.01 mol

                            0.224 L

(C) $C \ + \ O_2 \rightarrow CO_2$

2.4 g   ↓

0.2 mol   0.2 mol

            4.48 L

(D) $CO + 1/2 \ O_2 \rightarrow CO_2$

0.56 g

0.02 mol   0.02 mol

            = 0.448 L

[A-4, B-1, C-2, D-3]

56)

(a) N_2 mol . mass = 28

$$VD = \frac{mol.mass}{2} = 14$$

1 molecule of N_2 contain $14e^-$

N_A molecules of N_2 contain $14 \ N_A \ e^-$

(b) V.D. of CO = $\dfrac{28}{2} = 14$

1 molecule of CO contain $14e^-$

N_A molecules contain $14N_A$ e^-

(c) $C_6H_{12}O_6$

mass % of carbon = $\dfrac{12 \times 6}{180} \times 100 = 40$

EF = CH_2O

(d) CH_3COOH

mass % of carbon = $\dfrac{12 \times 2}{60} \times 100 = 40$

EF = CH_2O

57)

(a) 18mL H_2O = 18g H_2O

= 1 mol = N_A molecules of H_2O

1 molecule of H_2O contain $10e^-$

N_A molecules $\Rightarrow 10N_A e^-$

(b) $n_{H_2} = \dfrac{1}{2} = 0.5$ mol

$V_{H_2} = 0.5 \times 22.4$L

= 11.2 L

(c) $n_{SO_2} = \dfrac{11.2}{22.4} = 0.5$ mol

$\Rightarrow 0.5\ N_A$ molecules

no. of atoms = $0.5\ N_A \times 3$

= $1.5\ N_A$

(d) $\dfrac{N}{N_A} = \dfrac{V(L)}{22.4}$

$\dfrac{6.023 \times 10^{23}}{6.023 \times 10^{23}} = \dfrac{V}{22.4}$

V = 22.4 L

58)

1 amu represents 1/12 of actual mass of one atom of carbon-12 so reason is false.

59)

Solution/Explanation/Calculation :
Question:
Analyze two statements about gas behavior in chemical reactions.
Concepts:
Gay-Lussac's Law of Gaseous Volumes:
At constant temperature and pressure, the volumes of reacting gases and gaseous products are in simple whole-number ratios.
Analysis of Statements:
Statement I: "When gases combine or are produced in a chemical reaction they do so in a

simple ratio by volume, provided all gases are at the same temperature and pressure.
Correct. This is a direct statement of Gay-Lussac's Law.
Statement II: "Equal volumes of all gases at the same temperature and pressure should contain equal no. of atoms."
Incorrect. This should refer to equal numbers of molecules, not atoms. Avogadro's Law relates to the number of molecules, not atoms. The number of atoms in a molecule can vary (e.g., O_2, O_3, etc.).
Conclusion:
Therefore, the correct answer is 2. Statement I is correct and Statement II is incorrect.

60) $VD = \dfrac{\text{mol. mass}}{2}$

$VD \propto \text{mol. mass}$

61) $\%\text{ mass of element} = \dfrac{\text{no. of atoms } \times \text{ atomic mass}}{\text{mol. mass}} \times 100$

$0.33 = \dfrac{\text{no. of atoms} \times 56}{67200} \times 100$

no. of atoms = 4

62)

When molecular formula and empirical formula is same for a compound like H_2O, CH_4 etc. then option (4) is false.
The no. of atoms in M.F. is equal to or greater than no. of atoms in E.F.

63)

$n_{O_3} = \dfrac{16}{48} = \dfrac{1}{3}\text{mol}$

no. of O atoms in O_3 = $\dfrac{1}{3} \times N_A \times 3 = N_A$

no. of O atoms in CO = $\dfrac{28}{28} \times N_A \times 1 = N_A$

no. of O atoms in $16gO_2$ = $\dfrac{16}{32} \times N_A \times 2 = N_A$

Ratio = $N_A : N_A : N_A$

     = 1 : 1 : 1

64) $\dfrac{W_{(g)}}{M_W} = \dfrac{V(L)}{22.4}$

$\dfrac{8}{M_W} = \dfrac{5.6}{22.4}$

$M_w = 32$

$V.D = \dfrac{M_W}{2} = \dfrac{32}{2} = 16$

65)

Let atomic wt of A = a
Atomic wt of B = b

For $B_2A_3 \Rightarrow n = \dfrac{w}{M_w}$
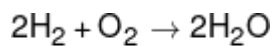
$0.05 = \dfrac{9}{M_w} \Rightarrow M_w = 180$

For $B_2A \Rightarrow 0.1 = \dfrac{10}{M_w} \Rightarrow M_w = 100$

$2b + 3a = 180$ ... (1)
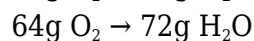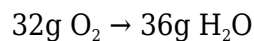$2b + a = 100$ ...(2)
On solving equation (1) & (2)
a = 40, b = 30

$$2H_2 + O_2 \rightarrow 2H_2O$$
66) $\quad$ 64g $\quad$ 64g

4g H_2 reacts with 32g O_2 according to stoichiometry so 64g O_2 will react with 8g H_2 and 56g H_2 will remain as unreacted.

O_2 is LR

32g $O_2 \rightarrow$ 36g H_2O

64g $O_2 \rightarrow$ 72g H_2O

67)

Isotope $\Rightarrow$ same atomic no. & different mass no.

Eg. $_1H^2$ & $_1H^3$

Isobar $\Rightarrow$ same mass no. & different atomic no.
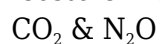
$_{88}^{228}Ra$ & $_{89}^{228}Ac$
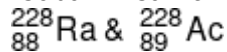
Isotone $\Rightarrow$ same neutrons

no. of neutrons = A – Z

Both $_{18}^{39}Ar$ & $_{19}^{40}K$ have 21 neutrons

Isosters $\Rightarrow$ same no. of atoms & same electrons

CO_2 & N_2O

Isodiaphers $\Rightarrow$ (n – p) same

$_{92}^{235}U$ & $_{90}^{231}Th$
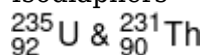
68)

Average atomic wt. = $\dfrac{M_1x_1 + M_2x_2}{x_1 + x_2}$

$51.7 = \dfrac{50(x) + 52(100 - x)}{100}$

x = 15

69)

$P = \dfrac{E}{t} \Rightarrow E = P \times t$

$$E = \frac{nhc}{\lambda}$$

$$10 \times 10 = \frac{n \times 6.62 \times 10^{-34} \times 3 \times 10^8}{1000 \times 10^{-10}}$$

$$n \simeq 5 \times 10^{19}$$

70) **1. Question Explanation**
We are asked to determine the percentage change in the atomic weight of an O-16 atom if the mass of the electron is halved, the mass of the proton is doubled, and the mass of the neutron is reduced to three-fourths of its original value.
2. Given Data

A. Original masses:

- Electron: 1 unit
- Proton: 1 unit
- Neutron: 1 unit

A. New masses:

- Electron: $\frac{1}{2}$ unit
- Proton: 2 units
- Neutron: $\frac{3}{4}$ unit

3. Concept

A. **Atomic Weight:** Primarily determined by the combined mass of protons and neutrons in an atom. The mass of electrons is negligible compared to protons and neutrons.
B. **O-16 Atom:** Contains 8 protons and 8 neutrons.

4. Mathematical Calculation

A. **Original Atomic Weight:** (8 protons $\times$ 1 unit/proton) + (8 neutrons $\times$ 1 unit/neutron) = 16 units

B. **New Atomic Weight:** (8 protons $\times$ 2 units/proton) + (8 neutrons $\times \frac{3}{4}$ unit/neutron) = 16 units + 6 units = 22 units

C. **Percentage Change in Atomic Weight:** $\frac{\text{(New Atomic Weight} - \text{Original Atomic Weight)}}{\text{(Original Atomic Weight)}} \times$ 100

= ((22 units - 16 units) / 16 units) $\times$ 100
= (6 units/ 16 units) $\times$ 100 = 37.5%

5. Final Answer
The new atomic weight of the O-16 atom increases by **37.5%**

71)

$$n = \frac{5}{20} = 0.25$$
No. of molecules = 0.25 N_A
No. of neutrons = 0.25 $N_A \times$ 10

$$= 2.5 \, N_A$$

72)

Isoelectronic $\Rightarrow$ same no. of e$^-$

73) $\dfrac{e}{m}$ ratio for neutron = 0

$\dfrac{e}{m}$ ratio for $\alpha = \dfrac{2e}{4m_p} = \dfrac{e}{2m_p}$

$\dfrac{e}{m}$ ratio for proton $= \dfrac{e}{m_p}$

order $\Rightarrow$ n $<$ α $<$ p $<$ e

74)

$E = \dfrac{hc}{\lambda} \Rightarrow E \propto \dfrac{1}{\lambda}$

$\dfrac{E_1}{E_2} = \dfrac{\lambda_2}{\lambda_1}$

75) Angular momentum $= \dfrac{nh}{2\pi}$ (does not depend on Z)

velocity of e$^-$ $= 2.188 \times 10^6 \times \dfrac{Z}{n}$ m/sec (depends on z)

in nth bohr orbit.

76)

Orbital angular momentum $= \sqrt{\ell(\ell + 1)} \left(\dfrac{h}{2\pi} \right)$

It does not depend on n(principal quantum no.)

77)

Bohr's postulate $\Rightarrow$ mvr $= \dfrac{nh}{2\pi}$

Paschen series lies in IR region

de-Broglie equation $\lambda = \dfrac{h}{p}$

Total energy of e$^-$ = $-\dfrac{KZe^2}{2r}$

Schrodinger equation $\Rightarrow \hat{H}\Psi = E\Psi$

78)

(A) $2(2\ell + 1) \rightarrow$ Number of electrons in subshell (R)
(B) $n^2 \rightarrow$ Number of orbital in shell (S)
(C) $n \rightarrow$ Value of shell in an atom (Q), Number of subshell in shell (T)
(D) $(2\ell + 1) \rightarrow$ Number of orbitals in subshell (P)

79) **1. Question:** What is the wavelength of the third line of the Balmer series for a hydrogen (H) atom?
2. Concepts:

A. **Balmer Series:** A series of spectral lines in the hydrogen spectrum that corresponds to electron transitions from higher energy levels (n > 2) to the n = 2 energy level.

3. Formula: The Rydberg formula for wavelength (λ) is: $1/\lambda = R \times (1/n_1^2 - 1/n_2^2)$
4. Solution:

A. **Third Line of Balmer Series:** The third line corresponds to the transition from n = 5 to n = 2.
B. **Substitute Values in Rydberg Formula:**
    A. $n_i = 2$ (final energy level)
    B. $n_2 = 5$ (initial energy level)
    C. $1/\lambda = R \times (1/2^2 - 1/5^2)$
C. **Simplify and Solve for λ:**
    A. $1/\lambda = R \times (1/4 - 1/25)$
    B. $1/\lambda = R \times (21/100)$
    C. $\lambda = 100 / 21R$

Therefore, the wavelength of the third line of the Balmer series for a hydrogen atom is 100 / 21R.

80) **Explanation :** How many times will the wavelength become when the kinetic energy of the electron becomes four times.
Given Data : $(K.F)_e$ is increased 4 times.
Concept : $\lambda = \dfrac{h}{\sqrt{2mKE}}$, $\lambda \propto \dfrac{1}{\sqrt{KE}}$
Calculation : $KE_2 = 4KE_1$

$\lambda \propto \dfrac{1}{\sqrt{KE}}$

$\dfrac{\lambda_1}{\lambda_2} = \sqrt{\dfrac{KE_2}{KE_1}} \Rightarrow \dfrac{\lambda_1}{\lambda_2} = \sqrt{\dfrac{4KE_1}{KE_1}} = 2$

$\lambda_2 = \dfrac{\lambda_1}{2}$

Final Answer : Half times

81)

e^- shows transition from n = 6 to n = 1
No. of lines in Paschen series = $n_2 - 3 = 6 - 3 = 3$
No. of lines in Brackett series = $n_2 - 4 = 6 - 4 = 2$
No. of lines in Pfund series = $n_2 - 5 = 6 - 5 = 1$

Total lines in IR region = 3 + 2 + 1 = 6

82)

For λ_{min} of lyman series ($\infty \rightarrow 1$)

$\dfrac{1}{\lambda} = R \times Z^2 \left(\dfrac{1}{1^2} - \dfrac{1}{\infty^2} \right)$

$\dfrac{1}{x} = R \implies x = \dfrac{1}{R}$

For first line of Balmer series ($3 \rightarrow 2$)

$\dfrac{1}{\lambda} = R \times Z^2 \left(\dfrac{1}{4} - \dfrac{1}{9} \right)$

$\dfrac{1}{\lambda} = \dfrac{1}{x} \times \left(\dfrac{5}{36} \right)$

$\lambda = \dfrac{36x}{5}$

83) $\lambda = \dfrac{h}{mv} = \dfrac{6.63 \times 10^{-34}}{60 \times 10^{-3} \times 10}$

$= 1.1 \times 10^{-33} \, m$

84) $\Delta x \cdot m\Delta v = \dfrac{h}{4\pi}$

$m\Delta v \cdot m\Delta v = \dfrac{h}{4\pi}$

$(\Delta v)^2 = \dfrac{h}{4\pi \, m^2}$

$\Delta v = \sqrt{\dfrac{h}{4\pi \, m^2}} = \dfrac{1}{2m}\sqrt{\dfrac{h}{\pi}}$

85) **Asking About -** Name of orbit
Concept - No. of Radial and Angular Nodes.
Solution / Explanation -
Given Data
Angular nodes ⎕ = 3
Total node ⇒ n – 1 = 3
n = 4
Therefore name of orbital 4f
Correct Ans = option 3

86) **Question Asking -** The uncertainty in electron velocity.
Concept - Heisenberg uncertainty principle.

Formula - $\Delta x \Delta v = \dfrac{h}{4\pi m}$

Given Data -
$\Delta p = 1 \times 10^{-18} \, cm \, s^{-1}$
Solution -

$$\Delta v = \frac{\Delta p}{m} = \frac{1 \times 10^{-18}}{9.1 \times 10^{-28}}$$
$= 1.1 \times 10^9 \simeq 10^9 \, cm \, s^{-1}$
Therefore correct answer is 2

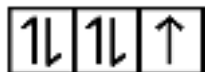87) $d_{x^2-y^2}$ orbital ⇒ two nodal plane
d_{z^2} orbital ⇒ no nodal plane

88)

$\ell = 0$ to $n - 1$
$m = -\ell$ to $+\ell$ including zero
for $\ell = 2 \Rightarrow m = -2, -1, 0, +1, +2$

89) $_{17}Cl = 1s^2 \, 2s^2 \, 2p^6 \, 3s^2 \, 3p^5$

$n = 3, \ell = 1, m = -1, 0, +1, \ s = \pm\frac{1}{2}$

90)

$n = 4, \ell = 3 \Rightarrow 4f \ subshell \Rightarrow 14e^-$

BIOLOGY

91)

NCERT XI Page # 17

92)

NCERT Pg. # 24

93) NCERT XI, Pg. # 24
OR
NCERT , Pg. # 18

94)

NCERT_Pg. No. # 15

95)

NCERT_Pg. No. # 11

96) NCERT XI Page # 12

97) NCERT Page No. 22
OR
NCERT Page No. 16

98)

NCERT-XII, Pg. # 14-15

99) NCERT Pg. 17, 18

100) NCERT XI Pg. # 17,18

101) NCERT Page No. # 26, 27 [Class-XI]
OR
NCERT Page No. # 20, 21

102)

NCERT XI Page No. # 22,26,20,19
OR
NCERT Page No. # 13,14,16,19

103) Halophiles are bacteria that thrive in environments with high salt concentrations, such as salt lakes or salt mines. They have adapted to survive in extreme saline conditions.
NCERT_Pg. No. # 13

104)

NCERT-XI, Pg. # 21

105)

NCERT - XI, Pg. # 8

106) NCERT Pg. # 8

107) NCERT-XI, Pg. # 3

108)

NCERT XI Pg no. 7
OR
NCERT Pg. No. 8

109) NCERT-XI, Pg.# 4, 5

110) NCERT Pg. # 9,10
OR
NCERT Pg. # 7

111)

NCERT XI Page No. # 10, 11 Table 1.1
OR
NCERT Page No. # 8

112) NCERT Pg # 13

113) NCERT Pg # 26, 29

114) NCERT XI, Pg. # 36, 38, para-1, 2, 1, 2

115) NCERT (XI) Pg. # 35, 38
A(Archegonium), C(Rhizoids) and F(Antheridium)

116) NCERT Pg. # 32, 33

117)

NCERT Pg # 28, 29, 32, 33

118)

NCERT Pg # 27

119) NCERT (XI) Pg # 33

120)

NCERT Pg # 25

121)

NCERT Page No. # 37

122) NCERT-XI Pg. # 36

123)

NCERT Pg # 32, 33

124) NCERT (XI) Pg. # 30, 32, 33

125)

NCERT Pg # 32, 33

126) NCERT (XI) Pg. # 45

127) NCERT Pg. # 26

128)

NCERT Pg # 28, 29

129)

NCERT Pg # 32, 33

130) NCERT pg no. 26

131)

NCERT XI Pg.# 36

132) NCERT Pg. # 26,27,28

133) NCERT Pg. # 32

134) NCERT Pg. # 30

135) NCERT Pg # 32, 33

136)

NCERT Pg # 44

137) NCERT XI Page No. # 45

138)
NCERT XI Page No. # 53

139) NCERT Page No. # 49

140) NCERT XI Page No. # 47

141) NEW NCERT-XI, Pg. # 48, Para 4.2.11.2, 4.2.11.3

142) New NCERT XI Pg # 44 Para 4.2.7

143) NEW NCERT-XI, Pg. # 42, Para 4.2.4

144) NEW NCERT-XI, Pg. # 44,49, 50 Fig 4.13, 4.22, 4.23, 42.24

145) NEW NCERT-XI, Pg. # 38, Para 4.1.1 Line no. 14

146) NEW NCERT-XI, Pg. # 40, Para 4.2.1

147)
NCERT Pg # 41

148)
Old NCERT-XI Pg.#56

149)
NCERT Pg # 48, 49

150) NCERT Pg # 50

151) NCERT Pg # 47

152) NCERT Pg # 57

153) NEW NCERT-XI, Pg. # 43, Para 4.2.5

154) NEW NCERT-XI, Pg. # 39, Para 4.1.4

155)

NCERT Pg # 39

156)

NCERT Pg # 45

157)

NCERT XI Pg # 50

158)

NCERT (XI) Pg. # 57-58

159) NCERT Pg # 38

160)

NCERT Pg # 43

161) NCERT Pg # 50, 51

162) NCERT Pg # 48

163) NCERT Pg # 47

164) NCERT Pg # 47

165) NCERT Pg # 46

166) NCERT Pg # 45

167) NCERT Pg # 45

168)

NCERT Pg. # 45

169) NCERT Pg # 44

170) NCERT Pg # 43

171) NCERT Pg # 41

172) NCERT Pg # 41

173) NCERT Pg # 44

174) NCERT Pg # 45

175) NCERT Pg # 38

176) NCERT Pg # 48

177) NCERT Pg # 48

178) NCERT Pg # 49

179) NCERT Pg # 39

180) NCERT Pg # 47