PHYSICS

1) A conducting wire of cross-sectional area 1 cm^2 has 3×10^{23} charge carrier per m^3. If wire carries a current of 24 mA, the drift velocity of carriers is :-

(1) 5×10^{-2} ms^{-1}

(2) 0.5 ms^{-1}

(3) 5×10^{-3} ms^{-1}

(4) 4×10^{-2} ms^{-1}

2) The amount of charge Q passing at time t through a cross section of a wire is $Q = (5t^2 + 3t + 1)$. The value of current at time t = 5 sec is :

(1) 9 A

(2) 49 A

(3) 53 A

(4) None of these

3) Current I versus time t graph through a conductor is shown in the figure. Average current
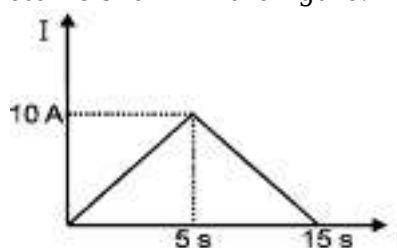
through the conductor in the interval 0 to 15 s is

(1) 1 A

(2) 10 A

(3) 7.5 A

(4) 5 A

4) **Assertion :-** Electric field is present in the vicinity of a current carrying wire.
Reason :- The principle of conservation of charge is not obeyed, when charges are in motion.

(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.

5) The resistance of a metallic conductor is 50Ω at a temperature of 100°C. If its temperature coefficient of resistance is 0.005°C^{-1}, then its resistance will become 150 Ω at a temperature of :-

(1) 300°C

(2) 400°C

(3) 700°C

(4) 1000°C

6) Two wires A and B of equal masses and of the same metal are taken. The diameter of the wire A is half the diameter of the wire B. If the resistance of the wire A be 24 ohm, the resistance of the wire B is :-

(1) 3Ω

(2) 1.5 Ω

(3) 4.5 Ω

(4) 6Ω

7) Two cylindrical conductors, one of copper and other of aluminium have the same length and the same resistance. Resistivity of aluminium = 1.5 × resistivity of copper. Density of aluminium = $\frac{1}{3}$ × density of copper. How many times is copper conductor heavier than aluminium ?

(1) 2 times

(2) 4 times

(3) $\frac{1}{2}$ times

(4) $\frac{1}{4}$ times

8) Match the column:-

Column-I		Column-II	
(a)	Ball dropped on a perfectly rigid floor, rebounds to same height	(1)	e = 0
(b)	Two day balls collide and stick together	(2)	e = 1
(c)	A superelastic (fictitious, where KE increases)	(3)	0 < e < 1
(d)	A glass ball dropped on a steel plate, rebound to a lesser height	(4)	e > 1

(1) a→2;b→1;c→4;d→3

(2) a→1;b→2;c→3;d→4

(3) a→2;b→1;c→3;d→4

(4) a→4;b→1;c→2;d→3

9) A boat of 90 kg is floating in still water. A boy of mass 30 kg walks from one end to another end of boat. The Length of the boat is 3 m. Calculate the distance through which centre of mass of boat will move.

(1) 1.5 m

(2) 0 m

(3) 0.75 m

(4) 1.75 m

10) A bowling ball (6 kg) rolls at 4 m/s and collides with another stationary bowling ball of the same mass. The coefficient of restitution is 0.5. What is the relative velocity after the collision?

(1) 2 m/s

(2) 3 m/s

(3) 1.5 m/s

(4) 4.5 m/s

11) A bomb of mass m is projected with velocity u, at an angle θ from ground. At highest point it explodes into three equal fragment, one retraces it's path, second comes at rest, then find the range of center of mass of system.

(1) $\dfrac{3u^2 \sin\theta \cos\theta}{g}$

(2) $\dfrac{2u \sin 2\theta}{g}$
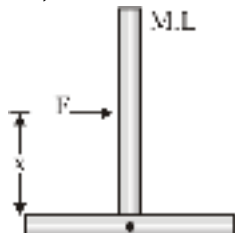
(3) $\dfrac{2u^2 \sin\theta \cos\theta}{g}$

(4) None

12) In the given figure four rods AB, BC, CD and DA have mass m, 2m,3m and 4m respectively.
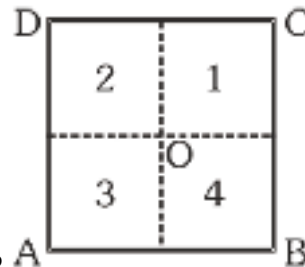
In which of the regions (numberd 1, 2, 3, 4) the centre of mass of system lies?

(1) 1

(2) 2

(3) 3

(4) 4

13) An inverted T-shaped object is place on a smooth horizontal floor as shown in figure.

M.I. A force F is applied on the system as shown in figure. The value of x so that the system performs pure translational motion is :-

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

(2) $\dfrac{3L}{4}$

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

(4) $\dfrac{3L}{2}$

14) A particle of mass m is moving along the x-axis with speed v when it collides with a particle of mass 2m initially at rest. After the collision, the first particle has come to rest, and the second particle has split into two equal-mass pieces that are shown in the figure. Which of the following statements correctly describes the speeds of the two pieces ? ($\theta > 0$)
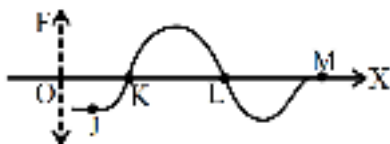

Before collision   After collision
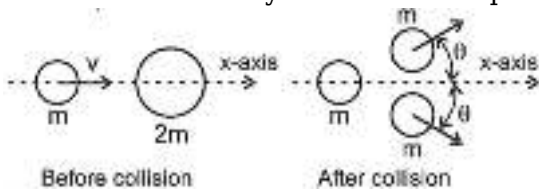
(1) Each piece moves with speed less than v/2.

(2) Each piece moves with speed v/2.

(3) One of the pieces moves with speed v/2, the other moves with speed greater than v/2

(4) Each piece moves with speed greater than v/2.

15) A particle of mass m strikes the ground inelastically, with coefficient of restitution e :-
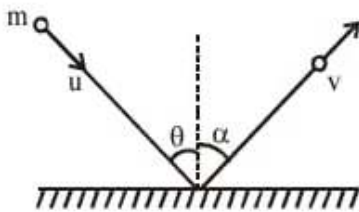
(1) $\dfrac{\tan \alpha}{\tan \theta} = e$

(2) $\dfrac{\tan \theta}{\tan \alpha} = e$

(3) $\tan^2\theta + \tan^2\alpha = 1$

(4) $\tan^2\theta + \tan^2\alpha = e^2$

16) A particle moving along x-axis is being acted upon by one dimensional conservative force F. In the F-x curve shown, four points J, K, L, M are marked on the curve. List-II gives different type of equilibrium for the particle at different positions. List-I gives certain positions on the force position graph. Match the positions in List-I with the corresponding nature of equilibrium in List-II at these positions.

List-I		List-II	
P	Point J is position of	1	Neutral equilibrium
Q	Point K is position of	2	Unstable equilibrium

| R	Point L is position of	3	Stable equilibrium
S	Point M is position of	4	No equilibrium

(1) P→4; Q→2; R→3; S→1

(2) P→2; Q→4; R→3; S→3

(3) P→4; Q→2; R→3; S→3

(4) P→2; Q→4; R→3; S→1

17) Potential energy U of a particle in a conservative field is given by the expression $U = \left(\dfrac{2}{x^2} - \dfrac{4}{x}\right) J$. The acceleration of the particle of mass 2 kg at position x = 1m is :-

(1) Zero

(2) 4 m/s^2

(3) 1 m/s^2

(4) 2 m/s^2

18) A chain of mass m and length ℓ is hanging freely from edge A (as shown in diagram I). Calculate
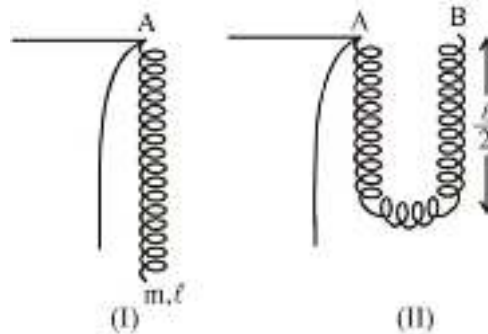
the work done to fold it as shown in diagram (II).

(1) $mg\dfrac{l}{2}$

(2) $-mg\dfrac{l}{2}$

(3) $mg\dfrac{l}{4}$

(4) $-mg\dfrac{l}{4}$

19) A body of mass m dropped from a certain height strikes a light vertical fixed spring of stiffness k. The height of its fall before touching the spring if the maximum compression of the spring is equal to $\dfrac{3mg}{k}$ is :

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

(2) $\dfrac{2mg}{k}$

(3) $\dfrac{3mg}{4k}$

(4) $\dfrac{mg}{4k}$

20) Two blocks of mass 3 kg and 6 kg respectively are placed on a smooth horizontal surface. They are connected by a light spring of force constant k = 200 N/m. Initially the spring is unstretched. The indicated velocities are imparted to the blocks. The maximum extension of the spring will be :
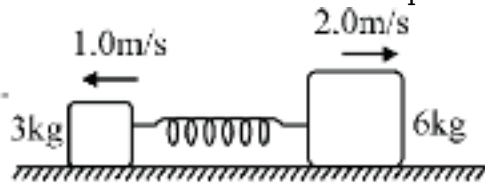
(1) 30 cm

(2) 25 cm

(3) 20 cm

(4) 15 cm

21) A small block A of mass m_0 is given a velocity v in horizonal direction as shown. The bigger block B is initially at rest. The curved surface of the block B becomes vertical at the top point. If M = $4m_0$, what should be the minimum value of v so that the block A climbs upto the top on B? All surfaces are
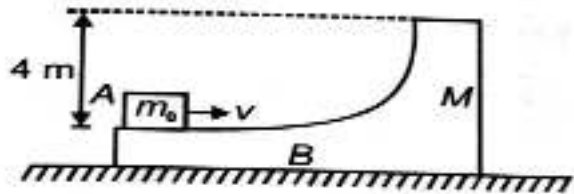
smooth (g = 10 m/s²)

(1) 20 m/s

(2) 10 m/s

(3) 9 m/s

(4) 2 m/s

22) An engine pumps 400 kg of water through height of 10 m in 40 sec. Find the power of the engine if its efficiency is 80% (g = 10 m/s²) :

(1) 0.08 kW

(2) 5.25 kW

(3) 1.25 kW

(4) None of these

23) Power supplied to a particle of mass 2 kg varies with time as $P = \dfrac{3t^2}{2}$ watt. Here t is in second. If velocity of particle at t = 0 is v = 0, the velocity of particle at time t = 2s will be :

(1) 1 m/s

(2) 4 m/s

(3) 2 m/s

(4) $2\sqrt{2}$ m/s

24) Which of the sets given below may represent the magnitude of three vectors adding to zero :-

(1) 3, 5, 1

(2) 3, 8, 4

(3) 5, 5, 5

(4) 1, 2, 4

25)

Two particles of mass 4 kg and 16 kg are separated by 6 m distance. Find gravitational potential at a point where gravitational field intensity due to the particles is zero-

(1) 6 G J/kg

(2) –6G J/kg

(3) –3G J/kg

(4) 4G J/kg

26) $\vec{A}$ and $\vec{B}$ are two vectors with magnitude 5 and 10 respectively with their resultant is perpendicular on $\vec{A}$ than find out the angle between $\vec{A}$ and $\vec{B}$:-

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

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

(3) $\dfrac{\pi}{6}$

(4) $\dfrac{4\pi}{3}$

27) If the resultant of vectors $\left(3\hat{i} - 4\hat{j}\right)$ and $\left(p\hat{i} + q\hat{j}\right)$ is a unit vector along y-axis then the values of p & q are respectively :–

(1) –3, 5

(2) 3, –5

(3) 3, –3

(4) 5, –5

28) The angles which vector $\hat{i} + \hat{j} + \sqrt{2}\hat{k}$ makes with x,y and z axis respectively are :-

(1) 60°, 60°, 60°

(2) 45°, 45°, 45°

(3) 60°, 60°, 45°

(4) 45°, 45°, 60°

29) If $\hat{a}$ and $\hat{b}$ are non-collinear unit vectors and $\left|\hat{a} + \hat{b}\right| = \sqrt{3}$, then the value of $(2\hat{a} - 5\hat{b}).(3\hat{a} + \hat{b})$ is :-

(1) $\dfrac{41}{2}$

(2) $\dfrac{11}{2}$

(3) $-\dfrac{11}{2}$

(4) $-\dfrac{41}{2}$

30) Component of vector $\left(\hat{i}+\hat{j}\right)$ along vector $\left(3\hat{i}+4\hat{j}\right)$:-

(1) $\dfrac{7}{5}\left(3\hat{i}+4\hat{j}\right)$

(2) $\dfrac{7}{25}\left(3\hat{i}+4\hat{j}\right)$

(3) $\dfrac{7}{2}\left(\hat{i}+\hat{j}\right)$

(4) $\dfrac{5}{2}\left(\hat{i}+\hat{j}\right)$

31) The area of the parallelogram whose sides are represented by the vector $\hat{j}+3\hat{k}$ and $\hat{i}+2\hat{j}-\hat{k}$ is -

(1) $\sqrt{61}$

(2) $\sqrt{59}$

(3) $\sqrt{49}$

(4) $\sqrt{52}$

32) A body weighs 144 N at the surface of earth. When it is taken to a height of h = 3R, where R is radius of earth, its weight would be :

(1) 48 N

(2) 36 N

(3) 16 N

(4) 9 N

33) The figure represents two concentric shells of radii R_1 and R_2 and masses M_1 and M_2 respectively. The gravitational field intensity at the point A at distance a (R_1 < a < R_2) is:
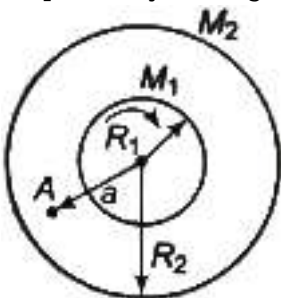
(1) $\dfrac{G(M_1+M_2)}{a^2}$

(2) $\dfrac{GM_1}{a^2} + \dfrac{GM_1}{R_2^2}$

(3) $\dfrac{GM_1}{a^2}$

(4) Zero

34) Four particles each of mass M are located at the vertices of a square with side L. The gravitational potential due to this at the centre of square is-

(1) Zero

(2) $-\sqrt{16}\dfrac{GM}{L}$

(3) $-\sqrt{32}\dfrac{GM}{L}$

(4) $-\sqrt{64}\dfrac{GM}{L}$

35) A body of mass m raised to a height $h = \dfrac{R}{7}$ from the Earth's surface where R is Earth's radius. If g is acceleration due to gravity at the Earth's surface, the increase in potential energy:-

(1) mgh

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

(3) $\dfrac{7}{8}$mgh

(4) $\dfrac{6}{7}$mgh

36) The mass of a planet is six times of that of the earth. The radius of the planet is twice of that of earth. If the escape velocity from the earth is v then the escape velocity from the planet is :-

(1) $\sqrt{3}v$

(2) $\sqrt{2}v$

(3) $\sqrt{5}v$

(4) $\sqrt{12}v$

37) Imagine a light planet revolving around a very massive star in a circular orbit of radius r with a period of revolution T. If the gravitational force of attraction between the planet and the star is inversly proportional to $r^{5/2}$ then the square of the time period will be proportional to :

(1) r^3

(2) r^2

(3) $r^{2.5}$

(4) $r^{3.5}$

38)

Two planets of mass 4 M and 9 M have equal radius R. Their centres are 5R distance apart find minimum speed of projection of a particle of mass m from the surface of lighter planet directly towards the heavier planet in order to reach the surface of heavier planet

(1) $\sqrt{\dfrac{5GM}{2R}}$

(2) $\sqrt{\dfrac{GM}{R}}$

(3) $\sqrt{\dfrac{GM}{4R}}$

(4) $\sqrt{\dfrac{3GM}{4R}}$

39)

In a nuclear fission process, a high mass nuclide (A = 236) with binding energy 7.6 MeV/nucleon dissociated into middle mass nuclides (A = 118) having binding energy 8.6 MeV/nucleon. The energy released in the process would be in MeV :-

(1) 250 MeV

(2) 236 MeV

(3) 150 MeV

(4) 50 MeV

40)

Which of the following statements are correct?
(a) Energy released per nucleon in fusion is more than fission.
(b) Fusion takes place at high temperature so that fusing nuclei overcome coulomb barrier.
(c) Fusion on sun take place by proton-proton cycle.
(d) After fuel exhausted on sun, sun will become red Giant.

(1) only a

(2) a,b,c

(3) a, b

(4) all of the above are correct

41) In an experiment four quantities a, b, c and d are measured with percentage error 2%, 1%, 3% and 4% respectively. The quantity x is calculated as follows $X = \dfrac{a^2 b^3}{c\sqrt{d}}$. The % error in x is :-

(1) 10%

(2) 12%

(3) 7%

(4) 4%

42) The values of measurement of a physical quantity in five trials were found to be 1.51, 1.53, 1.53, 1.52 and 1.54. Then consider the following statements :

(a) Average absolute error is 0.01
(b) Relative error is 0.01
(c) Percentage error is 0.01%
(d) Percentage error is 1%
Correct statements are :–

(1) a, b, c

(2) a, b, d

(3) only a, c

(4) only a, d

43) A bus travels distance x_1 when accelerates from rest at constant rate a_1 for some time and after that travels a distance x_2 when decelerates at a constant rate a_2 to come to rest. A student established a relation $x_1 + x_2 = \dfrac{a_1 a_2 t^2}{2(a_1 + a_2)}$ choose the correct statement.

(1) The relation is dimensionally correct

(2) The relation is dimensionally incorrect

(3) The relation may be dimensionally correct

(4) None of the above

44) The speed of light (C), gravitational constant (G) and planck's constant (h) are taken as fundamental units in a system the dimensions of time in this new system should be

(1) $G^{1/2} h^{1/2} C^{-5/2}$

(2) $G^{-1/2} h^{1/2} C^{1/2}$

(3) $G^{1/2} h^{1/2} C^{-3/2}$

(4) $G^{1/2} h^{1/2} C^{1/2}$

45) The position of particle at time t is given by the relation $x(t) = \left(\dfrac{v_0}{\alpha}\right)(1-e^{-\alpha t})$. Where v^0 is a constant and $\alpha > 0$. The dimensions of v_0 and α are respectively:-

(1) $[M^0 L^1 T^{-1}]$ and $[T^{-1}]$

(2) $[M^0 L^1 T^0]$ and $[T^{-1}]$

(3) $[M^0 L^1 T^{-1}]$ and $[LT^{-2}]$

(4) $[M^0 L^1 T^{-1}]$ and $[T]$

CHEMISTRY

1) For two first order reactions having same concentation of A and B at t = 0, use the data given below to calculate the temperature at which both reaction occurs with same rate :-
Reaction-I $A \rightarrow Z$; $K_1 = 10^{16} e^{(-3000/T)}$
Reaction-II $B \rightarrow Y$; $K_2 = 10^{15} e^{(-2000/T)}$
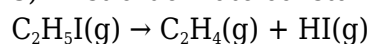
(1) 434.22 K

(2) 1446 K

(3) 727.1 K

(4) 981.22 K

2) Given below are two statements :-
Statement-I :- In a mixture of potassium permaganate ($KMnO_4$) and oxalic acid ($H_2C_2O_4$), $KMnO_4$ gets decolourised faster at a higher temperature than that at a lower temperature.
Statement-II :- For a chemical reaction with rise in temperature by 10°C, the rate constant becomes four times.

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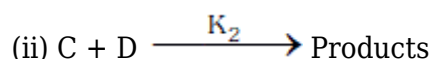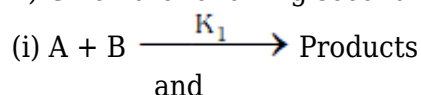
(4) Statement I is false but statement II is true.

3) First order rate constant for the decomposition of ethyl iodide
$C_2H_5I(g) \rightarrow C_2H_4(g) + HI(g)$
at 600 K is 1.60×10^{-5} sec^{-1}. Its activation energy is 209 kJ/mol. Calculate the rate constant at 700 K ?

(1) 2.599

(2) –4.796

(3) 6.36×10^{-3}

(4) 1.60×10^{-5}

4) Given the following second order reactions occuring at a certain temperature (T_1) –
(i) $A + B \xrightarrow{K_1}$ Products
      and
(ii) $C + D \xrightarrow{K_2}$ Products
The activation energy for reaction (i) is Ea_1 and for (ii) it is Ea_2 such that $Ea_1 > Ea_2$. If the temperature of both the system is increased from T_1 to T_2, choose the correct relation from the following –

(1) $\dfrac{K_1(T_2)}{K_2(T_1)} = \dfrac{K_2(T_2)}{K_2(T_1)}$

(2) $\dfrac{K_1(T_2)}{K_1(T_1)} > \dfrac{K_2(T_2)}{K_2(T_1)}$

(3) $\dfrac{K_1(T_2)}{K_1(T_1)} < \dfrac{K_2(T_2)}{K_2(T_1)}$

(4) None of the above

5)

Column - I (Order of reaction)	Column - II (Characteristics)

(P)	0	(1)	Half life period does not depends on initial concentration
(Q)	2	(2)	Second half life is double of I^{st} half life
(R)	1	(3)	Reaction gets completed in a two half lives

Which of the following code is correct. (Assume single reactant is involved in rate law)

(1) P - 2, Q - 4, R - 1

(2) P - 3, Q - 2, R - 1

(3) P - 3, Q - 1, R - 2

(4) P - 1, Q - 2, R - 4

6) For reaction A → B, rate constants at 200 K and 300 K are 0.03 min^{-1} and 0.05 min^{-1} respectively, then activation energy for the reaction is approximately-

(1) 1.1 kJ

(2) 5.06 kJ

(3) 2.53 kJ

(4) 25.3 kJ

7) For a complex reaction A $\xrightarrow{k}$ products
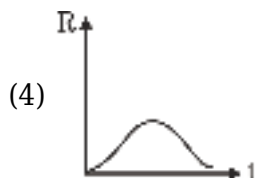E_{a_1} =180 kJ/mol; E_{a_2} =80 kJ/mol; E_{a_3} = 50 kJ/mol
If overall rate constant k is related to individual rate constant by the equation
$k = \left(\dfrac{k_1.k_2}{k_3}\right)^{2/3}$. Activation energy (in kJ/mol) for the overall reaction is :-

(1) 100

(2) 43.44

(3) 150

(4) 140

8) If decomposition reaction A(g) → B(g) follows first order kinetics then the graph of rate of consumption (R) of A against time t will be :-

(1)

(2)

(3)

(4)
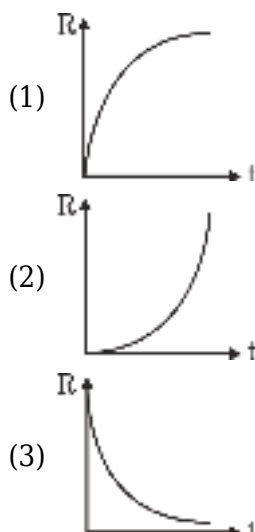
9) For preparing 0.1 M solution of H_2SO_4 in one litre, we need H_2SO_4 :

(1) 0.98 g
(2) 4.9 g
(3) 49.0 g
(4) 9.8 g

10) What is the molarity of H_2SO_4 solution that has a density of 1.84 g cm^{-3} at 35ºC and contains 98% H_2SO_4 by mass ?

(1) 1.84 M
(2) 81.4 M
(3) 18.4 M
(4) 184 M

11) Which of the following statement is incorrect :

(1) In a binary solution $x_1 + x_2 = 1$ (x = mole fraction)
(2) Molarity of solution is affected by temperature change
(3) Mole fraction of a solute in an aqueous solution can be calculated if its molality is known but its molar mass and density of solution is not known.
(4) The value of molality of K_2SO_4 solution can never be greater than its molarity.

12) The molarity of 800 g of pure water is ?

(1) 20M
(2) 55.5M
(3) 4M
(4) Can't be determined

13) Mole fraction of a solute in an aqueous solution is 0.2. The molality of the solution will be

(1) 13.88
(2) 1.388
(3) 0.138
(4) 0.0138

14) What will be molarity of "20V H_2O_2" solution?

(1) 1.78 M
(2) 1.87 M

(3) 10 M

(4) 0.28 M

15) 25 mL of 3.0 M HNO_3 are mixed with 75 mL of 4.0M HNO_3. If the volumes are additive, the molarity of the final mixture would be-

(1) 3.25 M

(2) 4.0 M

(3) 3.75 M

(4) 3.50 M

16) The volume of water V_2 which must be added to V_1 ml of concentrated soution of molarity M_1 to give a solution of molarity M_2, will be:-

(1) $\dfrac{M_1 V_1}{M_2}$

(2) $\dfrac{V_1(M_2 - M_1)}{M_2}$

(3) $\dfrac{V_1(M_1 - M_2)}{M_2}$

(4) $\dfrac{V_1(M_1 - M_2)}{M_1}$

17) One litre of 0.15 M HCl and one litre of 0.3 M HCl is given. What is the maximum volume of 0.2 M HCl which one can make from these two solutions. No water is added :-

(1) 1.2 L

(2) 1.5 L

(3) 1.3 L

(4) 2.25 L

18) Consider the plots for the types of reaction A → P.
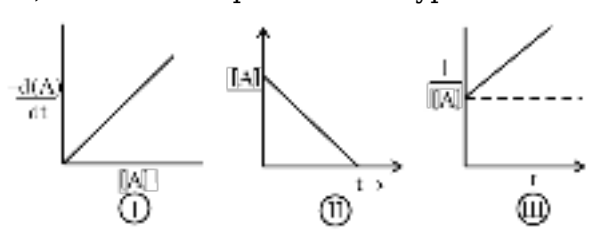
The plots are corresponding to orders is -

(1) 0, 1, 2

(2) 1, 0, 2

(3) 1, 1, 2

(4) 0, 0, 1

19) Out of following related statements-
A. For zero order reaction amount of product formed is proportional to time.
B. For I^{st} order reaction higher will be initial concentration of reactant higher will half life period.

C. Pre-exponential factor has same unit as rate constant.

D. Unit of velocity constant for a 2nd order reaction is $M^{-1}s^{-1}$.

E. Stoichiometry of reactant tells about order of on elementary reaction.

F. Fractional order reaction is always complex reaction.

G. $t_{2/3} = \dfrac{4}{3} \times t_{1/2}$ is correct for 1st order reaction.

The correct number of statements is-

(1) 4

(2) 6

(3) 5

(4) 6

20) For a reaction $A + B \rightarrow C$, rate = k[A] [B] if
k = 6.93 × 10^{-4} M^{-1} S^{-1} and starting from
[A] = 1M, [B] = 2M what is rate when [A] is changes to 0.25M ?

(1) 2.16 × 10^{-4}

(2) 2.16 × 10^{-7}

(3) 4.64 × 10^{-4}

(4) 8.64 × 10^{-3}

21) The rate constant for the 1st order decomposition of H_2O_2 is given by equation logk = 14.34 – $\dfrac{1.25 \times 10^4}{T}$. The value of frequency factor is.

(1) 14.34 s^{-1}

(2) 1.25 × 10^4 s^{-1}

(3) 2.2 × 10^{14} s^{-1}

(4) 5.4 × 10^{-15} s^{-1}

22) For the reaction $N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)} + 22\ kcal$ and activation energy is 70 kcal. What will be activation energy (Ea) for reaction
$2NH_{3(g)} \rightarrow N_{2(g)} + 3H_{2(g)}$

(1) 92 kcal

(2) 70 kcal

(3) –70 kcal

(4) –92 kcal

23) For a Ist order reaction $t_{1/4}$ is time taken for concentration of reaction to drop to 3/4 is of initial value. if rate constant is k. Then $t_{1/4}$ can be written as-
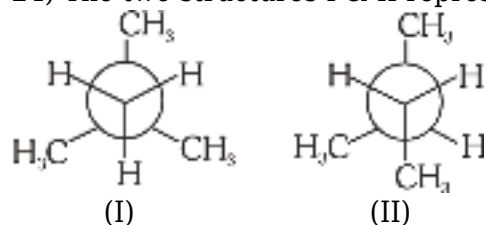
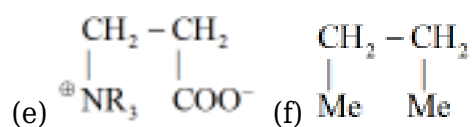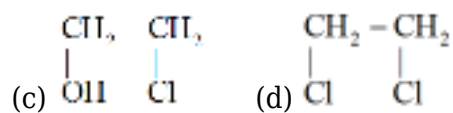(1) $\dfrac{0.10}{k}$

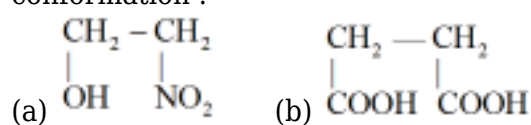(2) $\dfrac{0.28}{k}$

(3) $\dfrac{0.69}{k}$

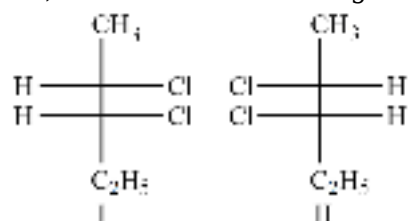(4) $\dfrac{0.75}{k}$

24) The two structures I & II represents :

(I)   (II)

(1) Conformational isomers
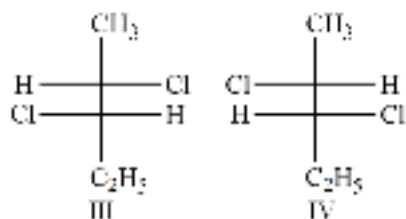
(2) Stereoisomers

(3) Structural isomers

(4) Identical

25) How many following compound have Gauche Conformation is more stable than anti (staggered) conformation :

(a)
$$CH_2 - CH_2$$
$$||$$
$$OHNO_2$$

(b)
$$CH_2 - CH_2$$
$$||$$
$$COOHCOOH$$

(c)
$$CH_2CH_2$$
$$||$$
$$OHCl$$

(d)
$$CH_2 - CH_2$$
$$||$$
$$ClCl$$

(e)
$$CH_2 - CH_2$$
$$||$$
$$^{\oplus}NR_3COO^-$$

(f)
$$CH_2 - CH_2$$
$$||$$
$$MeMe$$

(1) 6

(2) 5

(3) 4

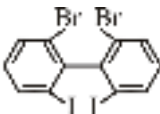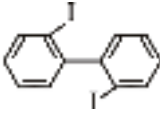(4) 3

26) Consider the following compound
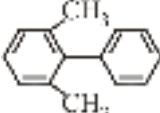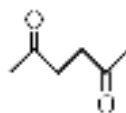

I   II
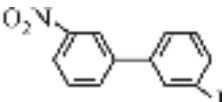
Which of the following relation is not true.
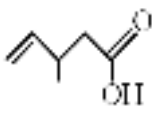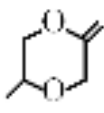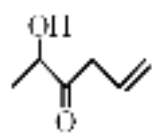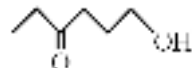
(1) I - II = Enantiomer

(2) III - IV = Enantiomer

(3) I - III = Homomer

(4) I - IV = Diastereomer

27) Which of the following biphenyls is optically active?
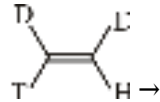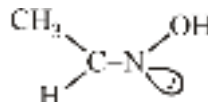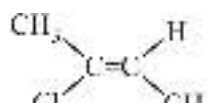
(1)

(2)

(3)

(4)

28) Which of the following is not isomer of given compound :
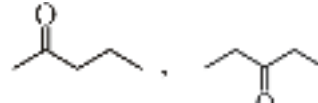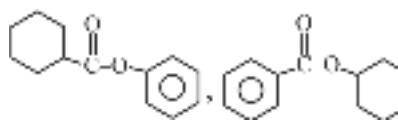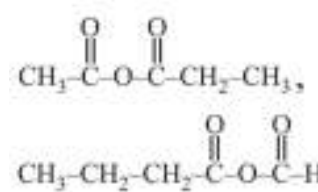
(1)

(2)

(3)

(4)
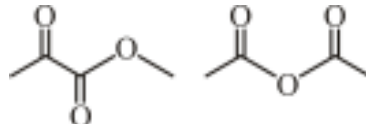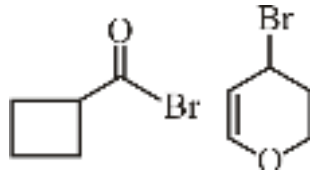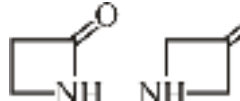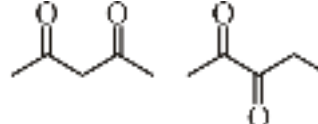
29) Which having correct configuration.

(1)

 T → E and cis

(2)

 → Anti and Z

(3)

 → Z and trans

(4) All of these
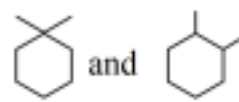
30) Which is not metamers :-

(1)

(2)

(3)

$CH_3-\overset{O}{\overset{||}{C}}-O-\overset{O}{\overset{||}{C}}-CH_2-CH_3$,

$CH_3-CH_2-CH_2-\overset{O}{\overset{||}{C}}-O-\overset{O}{\overset{||}{C}}-H$
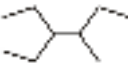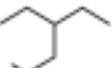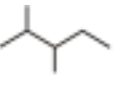
(4)

31) Which is not functional isomers.

(1)

(2)

(3)

(4)

32) Which pair is chain isomers of each other :-

(1) and

(2) and

(3) and

(4) and
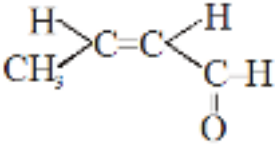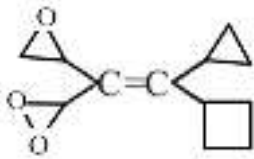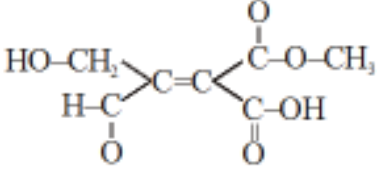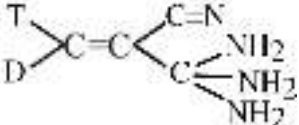
33) Which of the following is correct set of physical properties of the geometrical isomers?

(I)   and   (II)
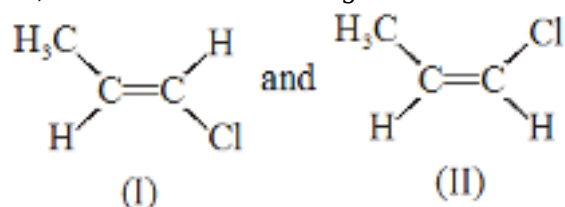
	Dipole	Boiling point	Melting point	Stability
(1)	I > II	I > II	II > I	I > II
(2)	II > I	II > I	II > I	II > I
(3)	I > II	I > II	I > II	I > II
(4)	II > I	II > I	I > II	I > II

(1) 1
(2) 2
(3) 3
(4) 4

34) Which of the following isomer have 'E' configuration?

(1)

(2)

(3)

(4)

35) Order of energy in conformer of butane are ?

(1) Anti > Gauche > Partially eclipsed > Fully eclipsed

(2) Anti < Gauche < Partially eclipsed < Fully eclipsed

(3) Partially eclipsed > Fully eclipsed > Gauche > Anti

(4) Partially eclipsed < Fully eclipsed < Gauche < Anti

36) Choose the correct statement :-

(1) Fisher projection always drawn in staggered form

(2) Meso compound have atleast two chiral centre with CoS or PoS or both

(3) Meso compound are optically inactive due to external compensation

(4) equimolar mixture of enantiomers (d & ℓ) are always optically active.

37) Total number of geometrical isomer in given structure will be ?
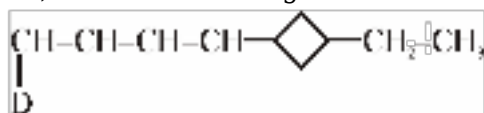
(1) 2

(2) 4

(3) 6

(4) 8

38) Which of the following compound show geometrical isomerism?

(i)   (ii)

(iii)   (iv)

(v)   (vi)
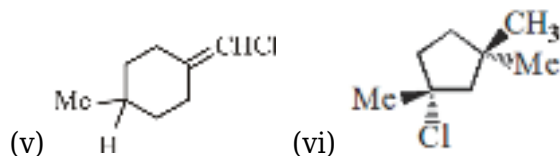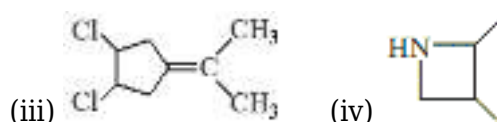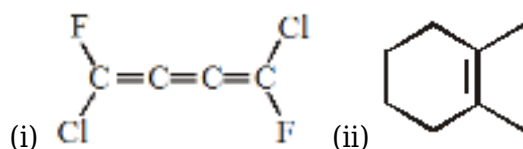
(1) i, ii, v, vi

(2) i, iii, iv

(3) ii, iv, v, vi

(4) i, iii, iv, v

39) Which of the following does not show optical isomerism :-

(1)

(2)

(3)

(4)

40)
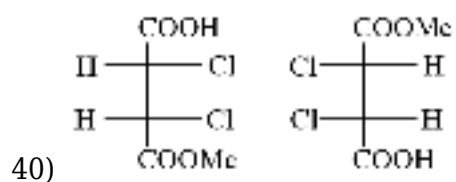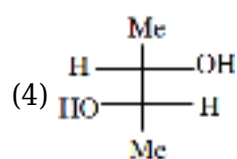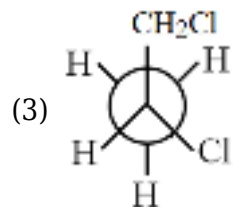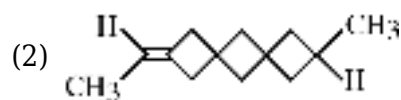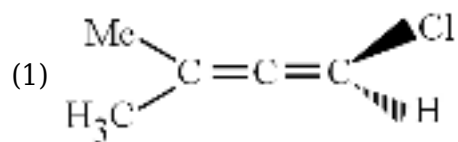
Structure I and II are :-

(1) Enantiomers

(2) Diastereomers

(3) Meso compounds

(4) Homomers

41) How many total stereo isomers of following structure

$$CH_3-\underset{\underset{Cl}{|}}{CH}-CH=CH-CH=CH_2$$

(1) 2

(2) 3

(3) 6

(4) 4
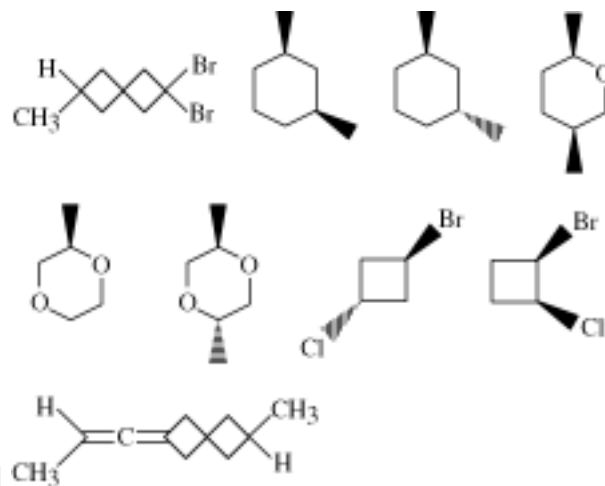
42) How many compounds are optical active or chiral

(1) 4
(2) 5
(3) 6
(4) 7
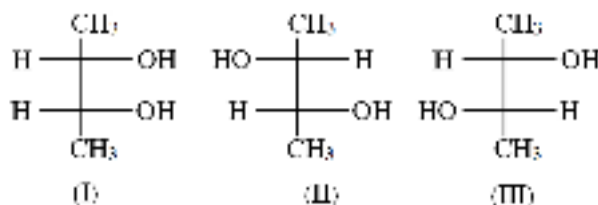
43) Choose the correct option?

(1) If container contains only (I) then it is optically inactive due to external compensation.
(2) If container contain(II) and (III) then it is optically inactive due to internal compensation.
(3) If container contains (I) and (III) then net rotation will be observed as non zero towards PPL.
(4) If container contains (I) and (II) then zero rotation will observed towards PPL.
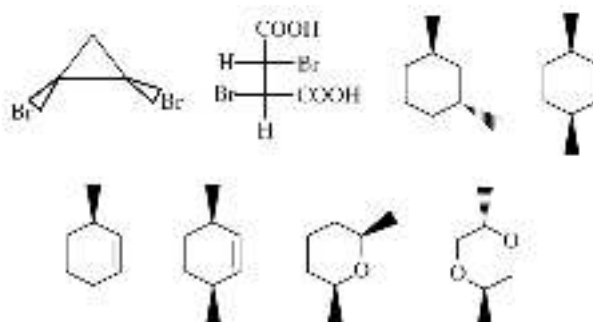
44) How many meso compounds in following structure.

(1) 3
(2) 4
(3) 5
(4) 6

45)

How many compounds having only D-configuration in following structure

(1) 2

(2) 1

(3) 3

(4) 4
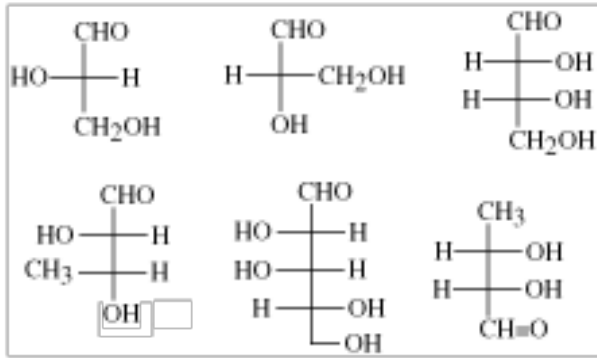
1) The nerve cord of cockroach is

(1) Double, ventral and solid

(2) Double, dorsal and hollow

(3) Single, dorsal and solid

(4) Single, ventral and hollow

2)

Female frog can be distinguished from male frog by :

(1) Presence of vocal sac and copulatory pad.

(2) Presence of vocal sac and 5 digits in fore limb.

(3) Presence of vocal sac and 4 digits in fore limb.

(4) Absence of vocal sac and copulatory pad.

3) **Assertion :-** In cockroach gizzard helps in grinding the food particles.
Reason :- It has thick inner cuticle forming six highly Chitinous plates called teeth.

(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.

4) In frog urinogenital duct receives :-

(1) Sperms

(2) Urine

(3) Faecal matter

(4) Both (1) and (2)

5) On average how many oothecae are produced by female cockroach :

(1) 7–8
(2) 9–10
(3) 12–13
(4) 19
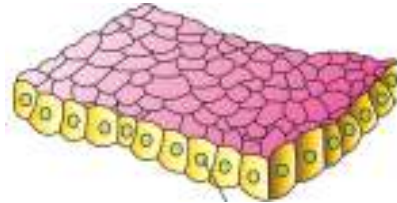
6) Identify incorrect statement w.r.t. above diagram.

(1) Above shown epithelium is found in thyroid follicles.
(2) It is simple cuboidal epithelium present in nephron's bowman eapsule
(3) The cells of this epithelium are cube like
(4) Main function is secretion and absorption.

7) In *Periplaneta americana*, glandular and ciliated cells are present in

(1) Crop
(2) Anterior aorta
(3) Malpighian tubules
(4) Ileum

8) **Statement-I :** Morphology refers to study of form or externally visible feature. In case of plants or microbes, the term morphology precisely means only this. In case of animals this refer to the external appearance of the organs or part of body.
Statement-II : The word anatomy conventionally is used for the study of morphology of internal organs in animals.

(1) Both statement-I and II are incorrect.
(2) Statement-I is incorrect while statement-II is correct.
(3) Both statement-I and II are correct.
(4) Statement-I is correct while statement-II is incorrect.

9) Brood or genital pouch in female cockroach is formed by

(1) 7th, 8th and 9th Terga
(2) 7th, 8th and 9th Sterna
(3) 7th, Terga 8th and 9th Sterna
(4) 7th, Sterna 8th and 9th Terga

10) At a time mature femal frog can lay...ova at a time:

(1) 2000-2500

(2) 2500-3000

(3) 1000-2000

(4) 1500-2000
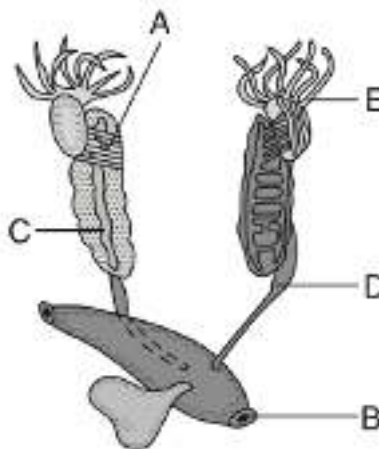
11) Identify the A, B, C, D and E in this figure.

(1) A-Vasa efferentia, B-Cloacal aperture,
C-Adrenal gland, D-Urino genital duct,
E-Fat bodies

(2) A-Urino genital duct, B-Vasa efferentia,
C-Fat bodies, D-Cloacal aperture,
E-Adrenal gland

(3) A-Adrenal gland, B-Urino genital duct,
C-Cloacal aperture, D-Vasa efferentia,
E-Fat bodies

(4) A-Fat bodies, B-Adrenal gland,
C-Cloacal aperture, D-Vasa efferentia,
E-Urino genital duct

12) A single thin layer of flattened cells with irregular boundaries constitutes epithelial lining in :-

(1) Inner surface of hollow organs like fallopian tubes

(2) Inner surface of bronchioles

(3) PCT of nephrons in kidneys

(4) Walls of blood vessels

13) Frog respires through___on land as well as in water

(1) Lungs

(2) Buccal cavity

(3) Trachea

(4) Skin

14) Match the following with reference to cockroach and choose the correct option ?

	Column-I		Column-II
(A)	Phallomere	(i)	Chain of developing ova

(B)	Spermatheca	(ii)	Bundle of sperm
(C)	Spermatophore	(iii)	Storage of sperm in female
(D)	Ovarioles	(iv)	The external genitalia in male

	A	B	C	D
(1)	(iii)	(iv)	(ii)	(i)
(2)	(iv)	(iii)	(ii)	(i)
(3)	(iv)	(ii)	(iii)	(i)
(4)	(ii)	(iv)	(iii)	(i)

(1) 1

(2) 2

(3) 3

(4) 4

Multilayered cells

15) The sketch given below represent a type of animal tissue. Which of the following statement is not related with above tissue ?

(1) It has a limited role in secretion and absorption.

(2) It's main function is to provide protection against chemical and mechanical stresses.

(3) Cells are compactly packeted with little intercellular matrix.

(4) It is found in the lining tubular part of nephron.

16) Tendon is an example of :

(1) Loose connective tissue

(2) Specialized connective tissue

(3) Fluid connective tissue

(4) Dense connective tissue

17) Bidder's canal in frog is present in

(1) Testes

(2) Kidney

(3) Ovary

(4) Brain

18) **Assertion :** Compound epithelium has a major role in protection, secretion and absorption all.
Reason : Compound epithelium is made up of a single layer of cells and provide protection against chemical and mechanical stresses.

(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.

19) Given below are two statements:
Statement-I : The ground substances of bone is solid, pliable and resist compression.
Statement-II : The bone marrow of all bones is site of production of blood cells.
In the light of the above statements, choose the **most appropriate** answer from the options given below :

(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.

20) Identify the correct set of statements.
(a) Loose connective tissue has cells and fibres compactly arranged in a semi-fluid ground substance.
(b) Tendons attach skeletal muscles to bones.
(c) Chondrocytes are enclosed in small cavities within the matrix.
(d) All cells in epithelium are held together with the little intercellular material (matrix).
Choose the correct answer from the options given below.

(1) (a) and (b) only

(2) (a) and (d) only

(3) (a), (b) and (c) only

(4) (b), (c) and (d) only

21) The supportive skeletal structures in the human external ears pinna and in the nose tip are example of:

(1) Loose connective tissue

(2) That connective tissue which have non-pliable and calcium rich matrix.

(3) That connective tissue which can be haemopoietic.

(4) That connective tissue which have solid and pliable matrix.

22) Exchange of gases in cockroach take place at the level of -

(1) Trachea

(2) Tracheoles

(3) Spiracles

(4) Ostia
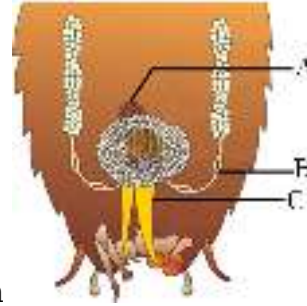
23) Select correct labelling for A,B,C in given diagram

(1) A - Phallic duct , C - Seminal vesicle,
    B - Vas deferens

(2) C - Ejaculatory duct , B - Phallic gland,
    A - Vasa efferens

(3) C - Phallic gland , B - Vas deference,
    A - Ejaculatory duct

(4) C - Ejaculatory duct , A - Phallic gland,
    B - Vas deferens

24) Select the incorrect statement :-

(1) Metamorphosis is paurometabolus type in cockroach

(2) Cilia move particles or mucus in a specific direction

(3) Each ootheca of cockroach contains about 14-16 eggs

(4) Ciliated epithelium is present in stomach because in stomach a lot of mucus is present

25) The correct pathway of blood circulation in cockroach :-

(1) Sinus → Ostia → Heart → Anterior to body

(2) Sinus → Ostia → Heart → Posterior to body

(3) Posterior → Heart → Ostia → Sinus

(4) Heart → Ostia → Sinus → Anterior to body

26) Excess of nutrient get converted in fat and stored in -

(1) Liver cells

(2) Alveolar tissue

(3) Adipose tissue

(4) Lymph glands

27) Given below a list of some products.
Ear wax, sebum, mucus, saliva, milk, digestive enzymes.
How many from light above are related to exocrine glands.

(1) Five

(2) Four

(3) Three

(4) Six

28) **Assertion (A) :** In frog special arterial connection between liver and intestine as well as the kidney and lower parts of body are present. The former is called hepatic portal system and the latter is called renal portal system.
Reason (R) : Blood vessels that carry blood form one organ to another organ instead of heart called potal veins.

(1) A and R both are correct and R is correct explanation of A.

(2) A is incorrect while R is correct.

(3) A and R both are correct but R is not correct explanation of A.

(4) A is correct while R is incorrect.

29) Read the following statements and choose the correct option :
Statement-A : In cockroach compound eyes are situated at the ventral surface of the head.
Statement-B : In cockroach the head holds a bit of a nervous system while the rest is situated along the ventral (belly-side) part of its body.

(1) Both statements A and B are correct.

(2) Both statements A and B are incorrect.

(3) Only statement A is correct.

(4) Only statements B is correct.

30) Choose correct option for A, B and C of given paragraph-
In cockroach, the head region, the brain is represented by __A__, which supplies nerves to __B__ and __C__

(1) (A) Supra pharyngeal ganglion, (B) Antennae, (C) Compound eyes

(2) (A) Supra-oesophageal ganglion, (B) Antennae, (C) Compound eyes

(3) (A) Supra-oesophageal ganglion, (B) Labrum, (C) Mandible

(4) (A) Circumpharyngeal ganglion, (B) Labium, (C) Hypopharynx

31) Identify the **wrong** statement with respect to cockroach?

(1) Heart is non muscular elongated tube and located in mid-dorsal line of thorax and abdomen.

(2) Hemolymph is composed of colourless plasma and haemocytes.

(3) Blood from sinuses enter in heart chambers ostia and is pumped anteriorly.

(4) Alary muscles help in blood circulation.

32)

How many ganglia are present respectively in thorax and abdomen of cockroach.

(1) 3, 6

(2) 6, 3

(3) 3, 10

(4) 3, 9

33) The air sacs of lung are made up of simple

(1) cuboidal epithelium

(2) squamous epithelium

(3) columnar epithelium

(4) non-ciliated columnar epithelium

34) Frog has -

(1) 5 fingers in forelimb and 5 fingers in hindlimb

(2) 5 fingers in forelimb and 4 fingers in hindlimb

(3) 4 fingers in forelimb and 5 fingers in hindlimb

(4) 6 fingers in forelimb and 5 fingers in hindlimb

35) In cockroach, the respiratory system consists of a network of trachea, that open outside the body by the help of :

(1) Atrium

(2) Tracheal end cells

(3) Spiracles

(4) Tracheal capillaries

36) For female frog, which of the following is false :-

(1) One pair ovary is situated near kidney.

(2) Ovary has functional connect with kidney.

(3) Oviduct and ureter open separately in ceoaca cloaca.

(4) Vocal sac is absent.

37) Match the following cell structure with its characteristic feature :

	Column-I		Column-II
A.	Tight junctions	(i)	Cement neighbouring cells together to form sheet
B.	Adhering junctions	(ii)	Transmit information through chemicals to another cells
C.	Gap junctions	(iii)	Establish a barrier to prevent leakage of fluid across epithelial cells
D.	Synaptic junctions	(iv)	Cytoplasmic channels to facilitate communications between adjacent cells

Select the most appropriate option.

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

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

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

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

38) Areolar and adipose connective tissue are present beneath the skin while dense irregular

connective tissue is present :

(1) Beneath skin
(2) Above skin
(3) In the skin
(4) In cartilage

39) Number of cranial nerves found in frog

(1) 10
(2) 12
(3) 20
(4) 24

40) Select the correct route for the passage of sperm in frog.

(1) Testis → Vas deferens → Bidder's canal → Ureter → Cloaca
(2) Testis → Vas deferens → Ureter → Bidder's canal → Cloaca
(3) Testis → Bidder's canal → Vas deferens → Ureter → Cloaca
(4) Testis → Vas deferens → Bidder's canal → Cloaca → Ureter

41) **Statement-1 :** In frog testes is structurally connected with kidney.
Statement-2 : In frog there is no functional connection between ovary and kidneys.

(1) Both statement (1) and (2) are true
(2) Both statement (1) and (2) are false
(3) Statement (1) is true but (2) is false
(4) Statement (1) is false but (2) is true

42) **Assertion:** Heart of frog is muscular and three chambered.
Reason: Heart of frog pumps mixed blood into lungs and body by or with the help of conus arteriousus.

(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.

43) Head is connected with thorax via neck which is a short extension of

(1) Head
(2) Prothorax
(3) Mesothorax
(4) Pronotum

44) Areolar tissue :

(1) Does not have fibroblast cells

(2) Possesses macrophages but lacks mast cells

(3) Is a type of dense connective tissue

(4) Serves as a support framework for epithelium

45) Read column-I, II & III and identify their correct match :-

Column-I		Column-II		Column-III	
(A)	Anal cerci	(P)	On 9th sternum	(i)	Sound receptor
(B)	Anal style	(Q)	On mesothorax	(ii)	Sperm storage
(C)	Tegmina	(R)	On 10th tergum	(iii)	Covers full abdomen
(D)	Spermatheca	(S)	6th abdominal segment	(iv)	Copulation

(1) (A)-(R)-(i), (B)-(P)-(iv), (C)-(S)-(iii), (D)-(Q)-(ii)

(2) (A)-(R)-(i), (B)-(S)-(iv), (C)-(P)-(iii), (D)-(Q)-(ii)

(3) (A)-(P)-(i), (B)-(Q)-(ii), (C)-(R)-(iii), (D)-(S)-(iv)

(4) (A)-(R)-(i), (B)-(P)-(iv), (C)-(Q)-(iii), (D)-(S)-(ii)

46) When spores of moss germinate, they form-

(1) Leafy gametophyte

(2) Sporophyte

(3) Prothallus

(4) Protonema

47) Sexual reproduction is oogamous and accompanied by "complex post fertilization development" in a group of algae in which :-

(1) Vegetative cells are covered by algin.

(2) Presence of chlorophyll 'a' and chlorophyll 'b'

(3) Asexual spores and gametes are non-motile

(4) Within chloroplast/s pyrenoids act as storage body commonly.

48) **Statement-I :** In gymnosperms, the pollen tube carrying the male gametes grows towards antheridia in the ovules and discharge their contents near the mouth of the antheridia.
Statement-II : In gymnosperm, zyyote develops into an embryo and the ovule in to seeds.

(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.

49) The four sketch (A,B, C and D) given below represent four different types of organism. Which one of these is correctly identified in the options given, along with its correct stored food and class
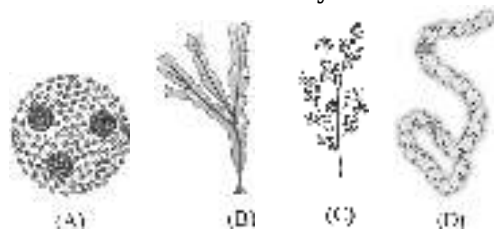
		Name of Organism	Stored Food	Class
(1)	(D)	*Nostoc*	Glycogen	Chlorophyceae
(2)	(A)	*Volvox*	Floridean starch	Chlorophyceae
(3)	(B)	*Laminaria*	starch	Phaeophyceae
(4)	(C)	*Polysiphonia*	Floridean starch	Rhodophyceae

(1) 1

(2) 2

(3) 3

(4) 4

50) Which of the following doesn't belong to the sporophytic generation of gymnosperm ?

(1) Seed

(2) Ovule

(3) Megaspore

(4) Embryo

51) Which option is not related with Cycas :-

(1) Unbranched stem

(2) Symbiosis with cyanobacteria

(3) More than one archegonia

(4) Monoecious sporophyte

52) Which option is not related with Pteridophytes ?

(1) Free living gametophyte

(2) Mainly Monoecious sporophytes.

(3) Precursor of seed habit

(4) Zygote produces a multicellular well-differentiated sporophyte

Air bladder
Frond
Midrib
Holdfast
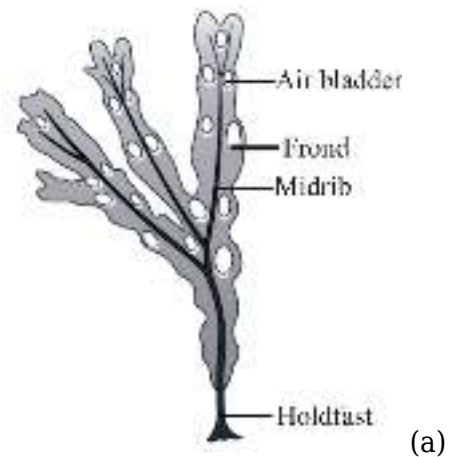
53) Study the given algae and answer the following questions :-   (a) Name of algae?
(b) Type of sexual reproduction?
(c) Name of division?
(d) Stored food?

(1) *Laminaria* : Isogamous : Chlorophyta : Starch

(2) *Volvox* : Oogamous : Chlorophyta : Starch

(3) *Fucus* : Oogamous : Phaeophyta : Laminarin & mannitol

(4) *Chara* : Oogamous : Rhodophyta : Glycogen

54) Roots in some genera have fungal association in the form of mycorrhiza is character of which gymnosperm :-

(1) *Pinus*

(2) *Cycas*

(3) *Cedrus*

(4) *Lycopodium*

55) Which of the following does not belongs to sporophytic generation of homosporous pteridophyta ?

(1) Leaf

(2) Stem

(3) Prothallus

(4) Zygote

56) Which of the following has independent gametophyte and dependent sporophyte ?

(1) *Adiantum*, a fern

(2) *Marchantia*, a bryophyta

(3) *Pinus*, a gymnosperm

(4) *Salvinia*, a fern

57) "They are useful in medicinal purposes and as soil binders. They are frequently grown as ornamentals. Evolutionarily, they are the first terrestrial plants to possess vascular tissues. They occur in cool, damp and shady places"

Above description is about which plants ?

(1) Bryophytes
(2) Brown algae
(3) Pteridophytes
(4) Gymnosperms

58) The members of rhodophyceae commonly called red algae because :

(1) They are found in greater concentrations in warmer area of ocean.
(2) They have floridean starch as a stored food.
(3) Predominance of r-phycoerythrin in their body.
(4) They have complex body organisation.

59) Which one of the following is not a ecological importance of moss plants?

(1) Some mosses provide food for herbaceous mammals birds and other animals
(2) Very high water holding capacity of mosses is useful for trans-shipment of living materials
(3) Mosses along with lichens are the pioneering organism to colonise rocks
(4) Mosses form dense mats on the soil and reduce the impact of falling rain

60) Oogamous type of sexual reproduction is found in :-

(1) *Chlamydomonas* & *Spirogyra*
(2) *Chlamydomonas* & *Ulothrix*
(3) *Spirogyra* & *Ulothrix*
(4) *Volvox* & *Chara*

61) In which of the following, all listed genus are of the same class of algae?

(1) *Chara*, *Fucus*, *Polysiphonia*
(2) *Volvox, Spirogyra, Chlamydomonas*
(3) *Porphyra, Ectocarpus, Ulotrix*
(4) *Sargassum, Laminaria, Gracillaria*

62) In which plant, the female gametophyte is retained on the parent sporophyte for some periods ?

(1) *Lycopodium*
(2) *Cycas*
(3) *Salvinia*
(4) *Equisetum*

63) Stored food of red algae is similar to :-

(1) Chitin
(2) Mannitol

(3) Amylopectin and glycogen

(4) Glycogen and chitin

64) In phaeophyceae, the gametes are

(1) Pyriform and bear 2 flagella (one is apical and other is lateral)

(2) Pear-shaped and bear 2 flagella that are laterally attached

(3) Pyriform and bear 2-8, equal and apical flagella

(4) Pear-shaped and bear 8-16, equal and apical flagella

65) To which group would you assign a plant which produces spores, embryo but lack seed & vasculature?

(1) Bryophyte

(2) Pteridophyte

(3) Algae

(4) Gymnosperm

66) Which statement is correct for pteridophyta ?

(1) Gametophyte is autotrophic, while sporophyte is parasitic.

(2) Sporophyte is semiparasite and gametophyte is autotrophic.

(3) Both gametophyte and sporophyte are usually autotrophic.

(4) Only sporophyte is autotrophic, while gametophyte is parasite.

67) 'The non-photosynthetic sporophyte which is not free-living but attached to the photosynthetic gametophyte and derives nutrition from it :-
This statement is related with :-

(1) Homosporous pteridophytes

(2) Bryophytes

(3) Heterosporous pteridophytes

(4) Gymnosperms

68) Algin, floridean starch, Oogamy, Pyriform gametes, Pyrenoids, Phycoerythrin, Carrageen, Polysulphate esters, Fucoxanthin, *Porphyra*.
How many of the above are related with Rhodophyceae?

(1) Four

(2) Six

(3) Seven

(4) Eight

69) **Assertion:-** The colour of thallus of brown algae vary in colour from olive green to various shades of brown.
Reason:- The colour variation in thallus of brown algae is depending upon the amount of xanthophyll pigment.

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

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

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

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

70) Which of the following character can be used to distinguish gymnosperm to angiosperm -

(1) Presence of pollen chamber in gymnosperm.

(2) Presence of stomata in angiosperm.

(3) Presence of naked ovules in gymnosperm.

(4) Presence of seed coat on seed in Angiosperm

71) Read the given paragraph carefully and answer the question.
Sexual reproduction takes place through fusion of two gametes. These gametes can be flagellated and similar in size or non-flagellated but similar in size. Such reproduction is called isogamous. Fusion of two gametes dissimilar in size is termed as anisogamous. Fusion between one large, nonmotile (static) female gamete and a smaller, motile male gamete is termed oogamous.
Statement-I : One organism can have more than one type of syngamy.
Statement-II : Members of phaeophyceae have all types of syngamy.

(1) Both statements are incorrect

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

(3) Statement I is incorrect and statement II is correct

(4) Both statement are correct

72) In Phaeophyceae, the vegetative cells have a cellulosic wall usually covered on the outside by a gelatinous coating of :-

(1) Algin

(2) Carrageen

(3) Agar

(4) Starch

73) Gemmae are :-

(1) Asexual reproductive structure of moss

(2) Sexual reproductive structure of liverwort

(3) Sexual reproductive structure of moss

(4) Asexual reproductive structure

74) **Assertion (A) :** In gymnosperms seed are naked.
Reason (R) : The gymnosperms are plants in which the ovules are not enclosed by any ovary wall and remain exposed both before and after fertilization.

(1) Both **Assertion** and **Reason** are true but **Reason** is NOT the correct explanation of **Assertion**.

(2) **Assertion** is true but **Reason** is false.

75) Which structure is formed in the life cycle of moss, between spore and main plant body ?

(1) Prothallus

(2) Embryo

(3) Spore mother cell

(4) Protonema

76) Which one of the following is not related with heterosporous pteridophytes?

(1) Produces two kinds of spores

(2) Produce monoecious gametophyte

(3) Gametophyte retained on the parent sporophyte for variable periods.

(4) *Selaginella and Salvinia*

77) A fern is different from moss in terms of having :-

(1) Gametes producing gametophyte

(2) Vascular tissue

(3) Swimming antherozoids

(4) Presence of alternation of generation

78) The predominant stage of the life cycle of moss is gametophyte, which consist of two stages they are respectively:-

(1) Protonema, prothallus

(2) Spore mother cell, protonema

(3) Protonema, leafy stage

(4) Protonema, zygote

79) In pteridophyte, the spore germinate to give rise to inconspicous, small but multicellular, free living, mostly photosynthetic thalloid structure called :-

(1) Protonema

(2) Prothallus

(3) Endosperm

(4) Zygote

80) Which of the following is true for alternation of generation :–

(1) The sporophyte undergoes syngamy to produce spores

(2) The sporophyte undergoes meiosis to produce spores

(3) The gametophyte undergoes syngamy to produce spores

(4) The gametophyte undergoes meiosis to produce gametes

81) Read the following statements carefully :
(A) Usually members are grass green
(B) Pyrenoids located in chloroplast
(C) Cell wall made up of an inner layer of pectose and an outer layer of cellulose
(D) Stored food is floridean starch
(E) Asexual spores are non motile
How many statements are correct for algae having chlorophyll a and b?

(1) Four

(2) Three

(3) Two

(4) Only one

82) What is common among *Porphyra, Sargassum, Chlorella* and *Spirullina* ?

(1) They all are photosynthetic

(2) They all have eukaryotic cell organization

(3) They all are single celled

(4) They all either used as food or food supplements

83) Which of the following statement is correct :-

(1) Bryophytes include the various ferns and liverworts

(2) Bryophytes play an important role in plant succession on bare rocks/soil

(3) The sex organs in bryophytes are unicellular

(4) In bryophytes, the gametophyte is differentiated into a foot, seta and capsule

84) How many statements are correct regarding gymnosperms ?
(i) All gymnosperms are heterosporous.
(ii) Multicellular female gametophyte is not retained within megasporangium.
(iii) Male and female gametophytes have independent free-living existence.
(iv) Female gametophyte bears two or more archegonia.

(1) Two

(2) One

(3) Four

(4) Three

85) Examine the figure given below and select the right option in which all the three laballed parts
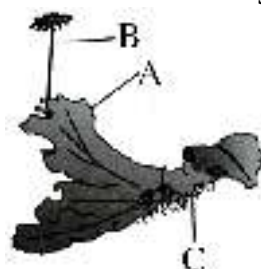
(a, b, c) are correctly identified :-

	A	B	C

(1)	Female Thallus	Archaegoniophore	Rhizoids
(2)	Male Thallus	Antheridiophore	Rhizoids
(3)	Female Thallus	Antheridiophore	Gemma cup
(4)	Male Thallus	Archaegoniophore	Gemma cup

(1) 1

(2) 2

(3) 3

(4) 4

86) _____ is used as packing material for transhipment of living material, because of their capacity to hold water

(1) *Selaginella*

(2) *Sphagnum*

(3) *Salvinia*

(4) *Sargassum*

87) Which one of the following is **not found** in fern gametophyte ?

(1) Chlorophyll

(2) Vascular tissue

(3) Rhizoids

(4) Sex organ

88) Pyrenoids are made up of –

(1) Core of starch surrounded by sheath of protein

(2) Core of protein surrounded by fatty sheath

(3) Proteinaceous centre and starchy sheath

(4) Core of nucleic acid surrounded by protein

89) Which of the following option is **correct** in respect of given diagram ?

(1) Independent sporophyte

(2) Gametophyte well differentiated in to root, stem and leaf

(3) Sparophytic body forms spores by meiosis

(4) Gametophyte is partially dependent on sporophyte for food and water

90) In which of the following zygotes do not undergo reduction division immediately -

(1) Blue green algae

(2) Bryophytes

(3) Green algae

(4) Euglenoids

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.	3	3	4	4	3	2	1	1	3	1	3	2	1	4	2	1	1	3	1	1
Q.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
A.	2	3	3	3	2	1	1	3	3	2	2	4	3	3	3	1	4	1	2	4
Q.	41	42	43	44	45															
A.	2	2	1	1	1															

CHEMISTRY

Q.	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65
A.	1	3	3	2	2	3	4	3	4	3	4	2	1	2	3	3	2	2	3	1
Q.	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85
A.	3	1	2	3	3	3	2	4	4	4	4	4	3	3	2	2	4	2	1	4
Q.	86	87	88	89	90															
A.	4	2	3	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.	1	4	1	4	2	2	3	3	2	2	1	4	4	2	4	4	2	4	1	4
Q.	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
A.	4	2	4	4	1	3	4	2	4	2	1	1	2	3	3	2	4	3	3	1
Q.	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
A.	1	2	2	4	4	4	3	3	4	3	4	2	3	1	3	2	3	3	2	4
Q.	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170
A.	2	3	3	2	1	3	2	2	4	3	3	1	4	4	4	2	2	3	2	2
Q.	171	172	173	174	175	176	177	178	179	180										
A.	2	4	2	1	1	2	2	3	3	2										

SOLUTIONS

PHYSICS

1) $V_d = \dfrac{I}{n \times e \times A}$

$= \dfrac{24 \times 10^{-3}}{3 \times 10^{23} \times 1.6 \times 10^{-19} \times 10^{-4}} = 5 \times 10^{-3}$ m/s

2) $i = \dfrac{dQ}{dt} = 10t + 3$

at t = 5   i = 10(5) + 3

       i = 53 A

3) $I_{av.} = \dfrac{\Delta q}{\Delta t} = \dfrac{area}{15}$

$I_{av.} = \dfrac{\frac{1}{2}(15)\,(10)}{15} = 5A$

4)

NCERT Pg # 95

5)

$R_T = R_O (1 + \alpha T)$

$50 = R_O [1 + \alpha(100)]$ ...(i)

$150 = R_O [1 + \alpha(T)]$ ...(ii)

(ii)/(i) $\Rightarrow$ $3 = \dfrac{1 + \alpha T}{1 + 100\alpha} \Rightarrow 3 + 300\,\alpha = 1 + \alpha T$

$\alpha(T - 300) = 2$

$T - 300 = \dfrac{2}{0.005} = 400 \Rightarrow T = 700°C$

6)

$m_A = m_B$

$\left(\dfrac{\pi r^2}{4}\right) \square_1 d = (\pi r^2)\square_2 d$

$\Rightarrow \dfrac{\ell_1}{\ell_2} = 4$ ...... (1)

Now $\dfrac{R_1}{R_2} = \dfrac{\ell_1}{\ell_2} \times \left(\dfrac{r_2}{r_1}\right)^2$

$$= 4 \times \left(\frac{r}{r/2}\right)^2$$
$$= 16$$
$$\Rightarrow R_2 = \frac{24}{16} = 1.5\ \Omega$$

7) $R_{Al} = R_{Cu}$

$$\rho_{Al}\frac{l}{A_{Al}} = \rho_{Cu}\frac{l}{A_{Cu}}$$

$$1.5 = \frac{A_{Al}}{A_{Cu}}$$

$$\frac{m_{Cu}}{m_{Al}} = \frac{lA_{Cu}\cdot\rho_{Cu}}{lA_{Al}\rho_{Al}} = \frac{1}{1.5}\times 3 = 2$$

8)

(a) Elastic collision So $\boxed{e = 1}$

(b) perfectly Inelastic collision so $\boxed{e = 0}$

(c) Super Elastic (KE increases) so $\boxed{e > 1}$

(d) Inelastic collision so $\boxed{0 < e < 1}$

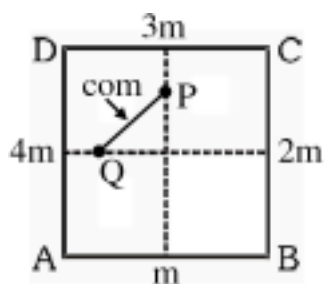9) $m_1\Delta\vec{r}_1 + m_2\Delta\vec{r}_2 = 0$

30(3 – x) = 90x

x = 0.75 m

10) Relative velocity after collision:

$$e = \frac{V_{relative,\ final}}{V_{relative,\ initial}}$$

$$0.5 = \frac{V_2 - V_1}{4} \Rightarrow V_2 - V_1 = 2$$

11) As C.M will follow the original projectile path :

$$∴ \text{Range} = \frac{2u^2\sin\theta\cos\theta}{g}$$

12)

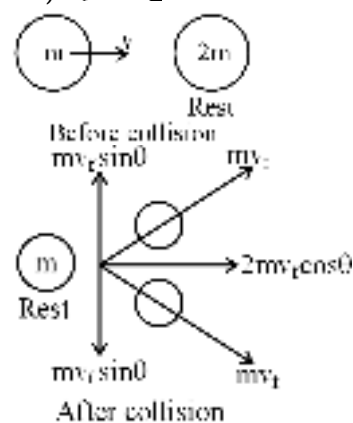(i) Consider Each rod as point mass at their respective centre of mass.

(ii) Now COM of m & 3m is at P & com of 2m & 4m is at Q.

(iii) Now final COM of system lie at line PQ which is in region (2).

13)

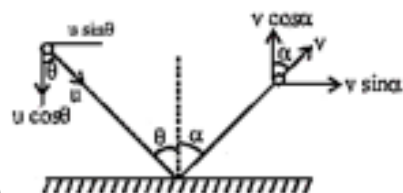The force has to be applied at the centre of mass of the system for pure translation motion.

14) $\vec{P}_f = \vec{P}_L$

Before collision

After collision

$2m\,V_f\cos\theta = mv$

$V_f\cos\theta = \left(\dfrac{V}{2}\right)$

So $\boxed{V_f > \dfrac{V}{2}}$

15)
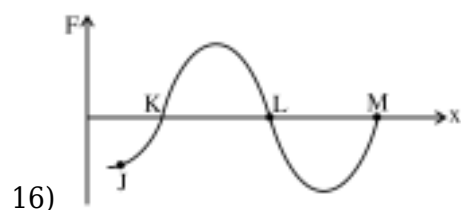

$v\cos\alpha = e\,u\cos\theta$

and $v\sin\alpha = u\sin\theta$

Eq. (ii)/ Eq. (i)

$\dfrac{v\sin\alpha}{v\cos\alpha} = \dfrac{u\sin\theta}{eu\cos\theta}$

$\tan\alpha = \dfrac{\tan\theta}{e} \rightarrow \dfrac{\tan\theta}{\tan\alpha} = e$

16)

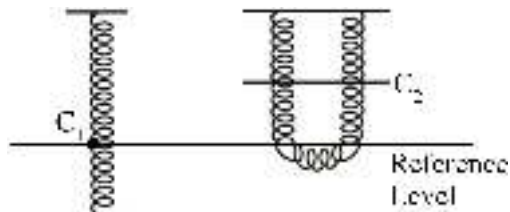| At K | F = 0 | $\dfrac{dF}{dx} \Rightarrow \oplus$ | $\dfrac{d^2U}{dx^2} \Rightarrow \ominus$ | means unstable equilibrium |

At L	F = 0	$\dfrac{dF}{dx} \Rightarrow \ominus$	$\dfrac{d^2U}{dx^2} \Rightarrow \oplus$	means stable equilibrium
At M	F = 0	$\dfrac{dF}{dx} = 0$	$\dfrac{d^2U}{dx^2} = 0$	means Neutral equilibrium

At J $f \neq 0$ so No Equilibrium.

17) $U = \dfrac{2}{x^2} - \dfrac{4}{x}$

$F = \dfrac{-dU}{dx}$

$F = -\left(\dfrac{2(-2)}{x^3} - \dfrac{4(-1)}{x^2}\right)$

$F = \dfrac{4}{x^3} - \dfrac{4}{x^2}$

$(F)_{x=1} = 4 - 4 = 0$

$(a)_{x=1} = 0$

18)

$U_i = 0$

$U_f = mg\dfrac{L}{4}$

WD against gravity

$W = U_f - U_i$

$W = \dfrac{mgL}{4}$
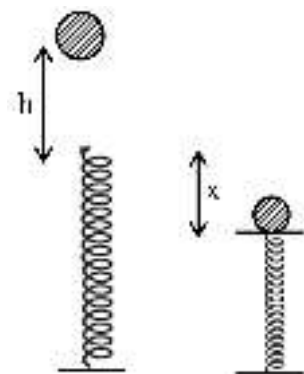
19)

By work energy theorem $w_{gravity} + w_{spring} = \Delta KE$

$Mg(h + x) - \dfrac{1}{2}kx^2 = 0$

$mgh + mgx = \dfrac{1}{2}kx^2$

Given that $x = \dfrac{3mg}{k}$

So mgh + mg × $\dfrac{3mg}{k}$ = $\dfrac{1}{2}k\left(\dfrac{3mg}{k}\right)^2$

h + $\dfrac{3mg}{k}$ = $\dfrac{9}{2k}$mg

$\boxed{h = \dfrac{3mg}{2k}}$

20) $\dfrac{1}{2}\mu v_{rel}^2 = \dfrac{1}{2}kx^2$

$\dfrac{1}{2}\left(\dfrac{3\times 6}{3+6}\right)(3)^2 = \dfrac{1}{2}(200)x^2$

x = 0.3m or 30cm

21)

By COLM,

$m_0 v = 5\,m_0 v_1$

$v_1 = v/5$

By conservation of M.E,

$\dfrac{1}{2}m_0 v^2 = m_0 g(4) + \dfrac{1}{2}(5m_0)\left(\dfrac{v}{5}\right)^2$

$\dfrac{v^2}{2} = 40 + \dfrac{1}{2}(5)\dfrac{v^2}{25}$

$\dfrac{v^2}{2}\left[1 - \dfrac{1}{5}\right] = 40$

$\dfrac{v^2}{2} \times \dfrac{4}{5} = 40$

v = 10 m/s

22) $P_{out} = \dfrac{mgh}{t} = \dfrac{400 \times 10 \times 10}{40} = 1000w$

$\eta = \dfrac{P_{out}}{P_{in}} \Rightarrow 0.8 = \dfrac{1000}{P_{in}}$

$\Rightarrow P_{in} = \dfrac{1000}{0.8}$

$\Rightarrow P_{in} = 1250$ w or 1.25 kw

23) $P = \dfrac{3t^2}{2}$

$Fv = \dfrac{3t^2}{2}$

$(ma)v = \dfrac{3t^2}{2}$

$\displaystyle\int_0^v v\,dv = \dfrac{3}{2m}\cdot\int_0^2 t^2 dt$

$\dfrac{v^2}{2} = \dfrac{3}{4}\left[\dfrac{t^3}{3}\right]_0^2$

$$v^2 = \frac{1}{2}[8 - 0]$$
$$v^2 = 4$$
$$\boxed{v = 2m/s}$$

24)

Find maximum to minimum range of magnitude of resultant of any two vector if magnitude of third vector lies in this range than they are in equilibrium

25)

4 kg ————————————— 16 kg

2 m   1 m

$$V = -\frac{G \times 4}{2} - \frac{G \times 16}{4} = -6G \text{ J/kg}$$

26)
$$\tan \alpha = \frac{1}{0} = \frac{10\sin\theta}{5 + 10\cos\theta}$$
$$\cos\theta = -\frac{1}{2}$$
$$\theta = \frac{2\pi}{3}$$

27) $(3 + P)\hat{i} + (q - 4)\hat{j} = \hat{j}$
$3 + P = 0 \quad q - 4 = 1$
$P = -3 \quad\quad q = 5$

28) $\vec{A} = \hat{i} + \hat{j} + \sqrt{2}\hat{k}$
$\left|\vec{A}\right| = 2$
$$\cos\alpha = \frac{Ax}{A} = \frac{1}{2} \Rightarrow \alpha = 60°$$
$$\cos\beta = \frac{Ay}{A} = \frac{1}{2} \Rightarrow \beta = 60°$$
$$\cos\gamma = \frac{Az}{A} = \frac{\sqrt{2}}{2} = \frac{1}{\sqrt{2}} \Rightarrow \gamma = 45°$$

29) $|\hat{a}| = |\hat{b}| = 1, |\hat{a} + \hat{b}| = \sqrt{3}$
$\Rightarrow |\hat{a}|^2 + |\hat{b}|^2 + 2|\hat{a}||\hat{b}|\cos\theta = 3$
$\Rightarrow \cos\theta = \frac{1}{2}$
$\Rightarrow \theta = 60°$(Angle between $\hat{a}$ and $\hat{b}$)
Now,
$(2\hat{a} - 5\hat{b}).(3\hat{a} + \hat{b})$
$= 6\hat{a}.\hat{a} - 15\hat{b}.\hat{a} + 2\hat{a}.\hat{b} - 5\hat{b}.\hat{b}$
$= 1 - 13 \hat{a}.\hat{b}$
$= 1 - 13 (1.1.\cos60°)$

$$= 1 - \frac{13}{2} = -\frac{11}{2}$$

30) $\vec{A} = i + j, \vec{B} = 3\hat{i} + 4\hat{j}$

$$A \cos \theta = \left(\frac{\vec{A}.\vec{B}}{B}\right) \hat{B}$$

$$= \frac{(3+4)}{5} \frac{\left(3\hat{i} + 4\hat{j}\right)}{5}$$

$$= \frac{7}{25} \left(3\hat{i} + 4\hat{j}\right)$$

31)

$$\text{Area} = |\vec{A} \times \vec{B}|$$

$$g_{eff} = \frac{g}{\left(1 + \frac{3R}{R}\right)^2} = \frac{g}{16}$$

32)
mg = 144

$$mg_{eff} = \frac{144}{g} \times \frac{g}{16} = 9N$$
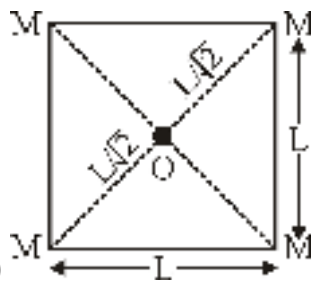
33)

$$I_1 = \frac{Gm_1}{a^2}$$

$I_2 = 0$

$I = I_1 + I_2$

$$I = \frac{Gm_1}{a^2}$$

34)
$V_{net} = V_1 + V_2 + V_3 + V_4$

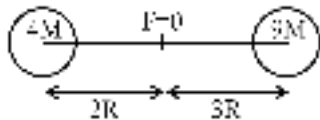$$= \frac{-\frac{GM}{\left(\frac{L}{\sqrt{2}}\right)} \times 4}$$

$$= -4\sqrt{2}\frac{GM}{L} = -\sqrt{32}\frac{GM}{L}$$

35) $(PE)_{surface} = -\dfrac{GMm}{R}$

$(PE)_{at\ height\ h} = -\dfrac{GMm}{R+h}$ $\qquad \left[h = \dfrac{R}{7} \right]$

$= \dfrac{-7GMm}{8}$

$\Delta U = (PE)_{at\ height\ h} - (PE)_{Surface}$

$= -\dfrac{7GMm}{8R} - \left(-\dfrac{GMm}{R} \right)$

$= \dfrac{GMm}{8R} = \dfrac{1}{8}mgR = \dfrac{7}{8}mgh$

36) $V = \sqrt{\dfrac{2GM}{R}}$

$V' = \sqrt{\dfrac{2G(6M)}{2R}}$

$V' = \sqrt{3}V$

37) $F_g \propto \dfrac{1}{r^{5/2}}$

$m\omega_0^2 r \propto \dfrac{1}{r^{5/2}}$

$m\left(\dfrac{2\pi}{T} \right)^2 \propto \dfrac{1}{r^{7/2}}$

$T^2 \propto r^{7/2}$

$T^2 \propto r^{3.5}$

38)
COME

$K_1 + U_1 = K_2 + U_2$

$\dfrac{1}{2}mv^2 - \dfrac{G \times 4Mm}{R} - \dfrac{G \times 9Mm}{4R}$

$= -\dfrac{G \times 4Mm}{2R} - \dfrac{G \times 9Mm}{3R}$

$v^2 = \dfrac{2GM}{R}\left[\dfrac{5}{4} \right]$

$v = \sqrt{\dfrac{5GM}{2R}}$

39)

$Q = 8.6 \times 236 - 7.6 \times 236 = 236\ MeV$

40)

It's fact

41) $x = \dfrac{a^2 b^3}{c\sqrt{d}}$

$\dfrac{\Delta x}{x} \times 100 = 2\dfrac{\Delta a}{a} \times 100 + 3\dfrac{\Delta b}{b} \times 100$
$\qquad\qquad\quad + \dfrac{\Delta c}{c} \times 100 + \dfrac{1}{2}\dfrac{\Delta d}{d} \times 100$

$= 2(2) + 3(1) + 3 + \dfrac{1}{2}(4)$
$= 4 + 3 + 3 + 2$
$= 12\%$

42) Mean value $= \dfrac{1.51 + 1.53 + 1.53 + 1.52 + 1.54}{5} = 1.53$

Absolute errors are $(1.53 - 1.51 = 0.02)$,
$(1.53 - 1.53 = 0.00)$, $(1.53 - 1.53 = 0.00)$
$(1.53 - 1.52 = 0.01)$ and $(1.54 - 1.53 = 0.01)$
Mean absolute error is
$\dfrac{0.02 + 0.00 + 0.00 + 0.01 + 0.01}{5}$

$= \dfrac{0.04}{5} = 0.008 \approx 0.01$
So choice (a) is correct.

Relative error $= \dfrac{0.01}{1.53} = 0.00653 \approx 0.01$

% error $= \dfrac{0.01}{1.53} \times 100 = 1\%$

so choice b,d are also correct.

43) $x_1 + x_2 = \dfrac{a_1 a_2 t^2}{2(a_1 + a_2)}$

$m + m = \dfrac{\frac{m}{s^2} \times \frac{m}{s^2} \times s^2}{2\left(\frac{m}{s^2} + \frac{m}{s^2}\right)}$

$m = \dfrac{\frac{m}{s^2} \times \frac{m}{s^2} \times s^2}{\frac{m}{s^2}}$

$m = m$

44) $T \propto C^a G^b h^c$
$T = K\, C^a\, G^b\, h^c$

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

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

Comparing of dimensions M, L and T
$-b + c = 0 \Rightarrow a + 3b + 2c = 0 \Rightarrow -a - 2b - c = 1$
on solving we get

$a = -5/2 \quad b = \dfrac{1}{2} \quad c = 1/2 \Rightarrow T = C^{-5/2}\, G^{1/2}\, h^{1/2}$

45) $X(t) = \frac{v_0}{\alpha}(1 - e^{-\alpha t})$

As $[\alpha t] = [M^0 L^0 T^0]$

$\Rightarrow [\alpha] = [T^{-1}]$

As $X = \frac{v_0}{\alpha}$ $\Rightarrow [v_0] = [X\alpha]$

$= [LT^{-1}]$

CHEMISTRY

46) $R_1 = R_2$

$10^{16}e^{-3000/T} = 10^{15}e^{-2000/T}$

$10 = e^{\left(\frac{-2000+3000}{T}\right)}$

$10 = e^{\frac{1000}{T}}$ ...(1)

Taking ln in (1)

$\ln 10 = \frac{1000}{T}\ln e$

$2.303 \log 10 = \frac{1000}{T} \times 1$

$T = \frac{1000}{2.303}K$

$T = 434.22 \text{ K}$

47)

The rate of most chemical reactions increases with temperature, but the specific increase for a 10ºC rise is not universally fixed.
Solution
Statement-I: The reaction between $KMnO_4$ and oxalic acid is a chemical reaction.
According to the principles of chemical kinetics, increasing the temperature increases the kinetic energy of the reacting molecules. This leads to more frequent and more energetic collisions, thus increasing the reaction rate. Therefore, the decolorization of $KMnO_4$ will be faster at a higher temperature. This statement is true.
Statement-II: This statement describes the temperature coefficient. The general rule of thumb is that for a 10ºC rise in temperature, the rate constant approximately doubles or triples (a factor of 2 to 3). Stating that it becomes four times larger is not a generally accepted rule and is an overstatement. The actual factor depends on the activation energy of the specific reaction. Therefore, this statement is false.
Final answer
Option 3: Statement I is true but statement II is false.

48)

Use

$\log \frac{K_2}{K_1} = \frac{Ea}{2.303R}\left[\frac{1}{T_1} - \frac{1}{T_2}\right]$

$\log \frac{K_2}{K_1} = \frac{209 \times 3}{2.303 \times 25} \times 10^3 \left[\frac{1}{600} - \frac{1}{700}\right]$

$K_2 = 6.36 \times 10^{-3}\,s^{-1}$

49)

Relevant Formulas: The Arrhenius equation:

$$k(T) = Ae^{-\frac{E_a}{RT}}$$

where: - $k(T)$ is the rate constant at temperature T - A is the frequency factor - E_a is the activation energy - R is the gas constant - T is the absolute temperature

From this, the ratio of rate constants at two temperatures T_1 and T_2 is:

$$\frac{k(T_2)}{k(T_1)} = e^{\frac{E_a}{R}\left(\frac{1}{T_1}-\frac{1}{T_2}\right)}$$

Step-by-Step Calculation: For reaction (i):

$$\frac{K_1(T_2)}{K_1(T_1)} = e^{\frac{E_{a1}}{R}\left(\frac{1}{T_1}-\frac{1}{T_2}\right)}$$

For reaction (ii):

$$\frac{K_2(T_2)}{K_2(T_1)} = e^{\frac{E_{a2}}{R}\left(\frac{1}{T_1}-\frac{1}{T_2}\right)}$$

Since $E_{a1} > E_{a2}$, the exponential factor for reaction (i) is larger, so:

$$\frac{K_1(T_2)}{K_1(T_1)} > \frac{K_2(T_2)}{K_2(T_1)}$$

50)

Theory based

51)

$$\log\left(\frac{k_{300}}{k_{200}}\right) = \frac{E_a}{2.303R}\left(\frac{1}{200} - \frac{1}{300}\right)$$

52)

$$k = \frac{\left(k_1.k_2\right)^{2/3}}{k_3}$$

$$= \left[\frac{\left(A_1 \cdot e^{-\frac{E_{a1}}{RT}}\right).\left(A_2 \cdot e^{-\frac{E_{a2}}{RT}}\right)}{\left(A_3 \cdot e^{-\frac{E_{a3}}{RT}}\right)}\right]^{2/3}$$

$$= \left[A' . e^{-\frac{E_{a1}}{RT}-\frac{E_{a2}}{RT}+\frac{E_{a3}}{RT}}\right]^{2/3} = (A')^{2/3} \cdot e^{\left[\frac{-E_{a1}-E_{a2}+E_{a3}}{RT}\right]^{2/3}}$$

On comparison with Arrhenius Eq :

$$E_a = \frac{2}{3}\left[Ea_1 + Ea_2 - Ea_3\right]$$

$\Rightarrow E_a = \dfrac{2}{3}[180 + 80 - 50] = 140 \text{ kJ}$

53) Rate of reaction exponentially decreases with time for first order

54) $n_{H_2SO_4} = 0.1 \times 1$
$w_{H_2SO_4} = 0.1\,N \times$ molar mass
$\qquad = 0.1 \times 98 = 9.8\ g$

55) $M = \dfrac{\text{mass}\% \times d \times 10}{MM}$
$= \dfrac{98 \times 1.84 \times 10}{98}$
$= 18.4\ M$

56)

4th statement is incorrect because, if comparision between molality and molarity has to be done then density of solution is also required.

57) $d_{H_2O} = 1\text{g/mL}$
so, $800g = 800\ ml$
$M = \dfrac{W_s}{Mw \times V(L)} = \dfrac{800 \times 1000}{18 \times 800} = 55.5M$

58) $X_{solute} = 0.2$
$X_{solvent} = 0.8$
$\dfrac{n_{solute}}{n_{solvent}} = \dfrac{1}{4}, \quad \dfrac{X_B}{X_A} = \dfrac{m \times M_A}{1000}$

59) $M = \dfrac{\text{volume strength}}{11.2}$
molarity $= \dfrac{20}{11.2} = 1.87\ M$

60) $M_R = \dfrac{3 \times 25 + 4 \times 75}{25 + 75}$
$M_R = 3.75\ \text{mol/L}$

61)

Moles of solute remains constant.
$M_1V_1 = M_2(V_1 + V_2)$

$$V_1 + V_2 = \frac{M_1 V_1}{M_2}$$

$$V_2 = \frac{M_1 V_1}{M_2} - V_1$$

$$V_2 = \frac{M_1 V_1 - M_2 V_1}{M_2}$$

$$V_2 = \frac{V_1(M_1 - M_2)}{M_2} ml$$

62)

$0.15 \times 1 + 0.3(x) = 0.2 (1+x)$

x = 0.5 L

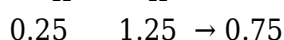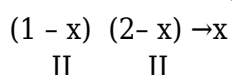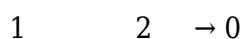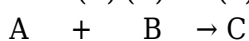For maximum volume 0.15 M solution should be taken completly.

63) $r = \frac{-d[A]}{dt} = k[A]$; gives straight line passing through origin (I^{st} order)

$A_t = A_0 - kt$; straight line with (+)w intercept of (–)w slope (zero order)

$\frac{1}{A_t} = \frac{1}{A_0} + kt$; straight line with (+)w intercept (+)w slope (2nd order)

64) $A \checkmark : B \times : C \checkmark : D \checkmark : E \checkmark : F \checkmark : G \times$

5 correct

65)

r = k(A) (B)   ----(1)

A + B → C

1   2   → 0

(1 – x) (2- x) →x

   II   II

0.25   1.25 → 0.75

x = 0.75

from eq^n (1)

$r = 6.93 \times 10^{-4} \times 0.25 \times 1.25$

$r = 6.93 \times 0.3125 \times 10^{-4}$

$r = 2.16 \times 10^{-4} Ms^{-1}$

66) $\log k = 14.34 - \dfrac{1.25 \times 10^4}{T}$ ...(i)

$\log k = \log A - \dfrac{E_a}{2.303R} \times \dfrac{1}{T}$ ...(ii)

from (i) and (ii)

log A = 14.34

A = anti (14.34)

$A = 10^{14.34} = 10^{14} \times 10^{0.34}$

A = 2.2×10^{14} s^{-1}

67) $\Delta H = Ea_{(f)} - Ea_{(b)}$
$-22 = 70 - Ea_{(b)}$
$Ea_{(b)} = 70 + 22 = 92$ kcal

68) $t_{1/4} = \dfrac{2.303}{K} \log \dfrac{1}{3} \times 4$

$t_{1/4} = \dfrac{2.303}{K}[\log 4 - \log 3]$

$t_{1/4} = \dfrac{0.12 \times 2.303}{K}$

$t_{1/4} = \dfrac{0.27636}{K}$

69)

Carbon connectivity differ

70)

By H-bonding ionic altration

71)

Theory Based

72)

By POS and COS

73)

Check M.F.

74)

Theory Based

75)

NCERT Line

76)

On the basis of structure

77)

Molecular formula same but side chain size different so these are chain isomers.

78)

Physical proparties of cis and trans

79)

E-Z system

80)

NCERT Based

81)

Theory Based

82)

G.I. $= 2^n = 2^3 = 8$

83)

By D.B. $>C=N-OH$ and cycl.-alkane

84)

By DOS and COS

85)

Homomer

86)

S.I. $= 2^n = 2^2 = 4$

87)

By POS and COS

88)

- I is meso compound as POS is present and III is enantiomeric form (optically active)
- Se, A mixture of I & III will have non zero not rotation of PPl
- Only meso form has zero net rotation in PP1
- A racemic mixture (equimolar mixture of enantiomer) has zero net rotation in ppl

89)

Meso = C.C. > 2 +POS/COS

90) On last chiral carbon → check the position of –OH/–NH$_2$ sp

BIOLOGY

91)

Module-4, Pg. No. # 131

92)

NCERT-XI, Pg. No. # 81

93) Module-4, Pg. No. # 125

94) NCERT-XI, Pg. No. # 83

95)

Module-4, Pg. No. # 136

96)

Module-4, Pg. No. # 81

97) Module-4, Pg. No. # 125

98)

NCERT-XI, Pg. No. # 80

99) Module-4, Pg. No. # 135

100)

NCERT-XI, Pg. No. # 84

101)

NCERT-XI, Pg. No. # 83

102)

Module-4, Pg. No. # 81

103)

NCERT-XI, Pg. No. # 82

104) Module-4, Pg. No. # 133 to 136

105)

Module-4, Pg. No. # 83

106)

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131) NCERT-XI, Pg. No. # 83

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Prothallus is haploid.

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Floridean starch, Oogamy, Phycoerythrin, Carrageen, Polysulphate esters, *Porphyra*.

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