PHYSICS

1) An electric dipole is placed at an angle 30° to a non -uniform electric field. the dipole will experience :

(1) A translational force only in a direction normal to the direction of the field
(2) A torque as well as a translational force
(3) A torque only
(4) A translational force only in the direction of the field

2)

There is a uniform electric field of strength 10^3 V/m along y–axis. A body of mass 1 g and charge 10^{-6} C is projected into the field from origin along the positive X - axis with a velocity 10m/s. Its speed in m/s after 10 s is:- (neglect gravitation)

(1) 10
(2) $5\sqrt{2}$
(3) $10\sqrt{2}$
(4) 20

3) An oil drop is found floating freely between the plates of a charged parallel plate capacitor carrying equal and opposite charges with the plates being horizontal and the lower plate carrying a charge of +Q. The area of each plate is A and the distance of separation between them is D. The mass of the oil drop is M. In CGS units the charge of the drop must be : (g is the acceleration due to gravity) [Given that In C.G.S. unit system $\frac{1}{4\pi\varepsilon_0} = 1$]

(1) (A/Q)(g/M)
(2) (MgA)/(4πQ)
(3) –(gA/D)Q
(4) –(MgA)/(4πQ)

4) **Statement 1 :** Electric potential is a scalar quantity.
Statement 2 : Units of electric field intensity and electric potential are same.

(1) Statement-1 is true, Statement-2 is true
(2) Statement-1 is false, Statement-2 is true
(3) Statement-1 is true, Statement-2 is false
(4) Statement-1 is false, Statement-2 is false

5) Two particles of masses m and 2m with charges 2q and q are placed in a uniform electric field E and allowed to move for the same time. The ratio of their kinetic energies will be :–

(1) 1 : 2

(2) 8 : 1

(3) 4 : 1

(4) 1 : 4

6) A particle of mass ma and charge q is released from rest in an electric field E. Then the K.E. after time t will be :–

(1) $\frac{2E^2t^2}{mq}$

(2) $\frac{E^2q^2t^2}{2m}$

(3) $\frac{Eq^2m}{2t^2}$

(4) $\frac{Eqm}{2t}$

7) **Statement -1 :** Potential energy of a system of point charges may be zero.
Statement -2 : Potential energy of individual point charges in a system of point charges may be zero

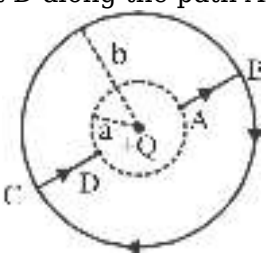
(1) Statement-1 is true, Statement-2 is true

(2) Statement-1 is false, Statement-2 is false

(3) Statement-1 is true, Statement-2 is false

(4) Statement-1 is false, Statement-2 is true

8) Two circles are drawn with a centers at a charge + Q. Now a small test charge q is taken from point A to point D along the path ABCD. If the radii of the circles are a and b, then the amount of



work done is :-

(1) $kqQ\left(\frac{1}{a}-\frac{1}{b}\right)$

(2) $kqQ\left(\frac{1}{a}+\frac{1}{b}\right)$

(3) zero

(4) none of the above

9)

A point charge Q is placed in uniform electric field $\vec{E} = E_1\hat{i} + E_2\hat{j}$ at position (a, b). Find work done in moving it to position (c, d) :-

(1) Zero

(2) $\{E_1(c - a) + E_2(d-b)\}Q$

(3) $\{E_1\, ac + E_2\, bd\}Q$

(4) $\{E_1c + E_2d\}Q$

10) The electric field in a certain region is given by $\vec{E} = 5\hat{i} - 3\hat{j}$ V/m. Find the difference in potential $V_B - V_A$. If A is at the origin and point B is at (4, 0, 3)m :-

(1) – 20 V

(2) +20 V

(3) – 10 V

(4) – 15 V

11) Consider the following statements about electric dipole and select the correct ones for short electric dipole.

S1 : Electric dipole moment vector $\vec{p}$ is directed from the negative charge to the positive charge.

S2 : The electric field of a dipole at a point with position vector $\vec{r}$ depends on $|\vec{r}|$ as well as the angle between $\vec{r}$ and $\vec{p}$.

S3 : The electric dipole potential falls off as $\frac{1}{r^2}$ and not as $\frac{1}{r}$.

S4 : In a uniform electric field, the electric dipole experiences no net forces but a torque $\vec{\tau} = \vec{p} \times \vec{E}$.

(1) S_2, S_3 and S_4

(2) S_3 and S_4

(3) S_2 and S_3

(4) All four

12) Match the Column :

Column I		**Column II**	
A.	The force acting in between two point charges	**P.**	$\frac{1}{4\pi\varepsilon_0}\frac{q}{r^2}$
B.	Electric field intensity due to a point charge	**Q.**	$\frac{q}{\varepsilon_0}$
C.	Electric flux linked with closed surface with a charge enclosed	**R.**	$\frac{1}{4\pi\varepsilon_0}\frac{q_1q_2}{r^2}$

(1) A-P, B-Q, C-R

(2) A-R, B-P, C-Q

(3) A-R, B-Q, C-P

(4) A-Q, B-P, C-R

13) A thin spherical conducting shell of radius R has a charge q. Another charge Q is placed at the centre of the shell. The electrostatic potential at a point P at a distance R/2 from the centre of the

shell is :-

(1) $\frac{2Q}{4\pi\in_0 R}$

(2) $\frac{2Q}{4\pi\in_0 R} - \frac{2q}{4\pi\in_0 R}$

(3) $\frac{2Q}{4\pi\in_0 R} + \frac{q}{4\pi\in_0 R}$

(4) $\frac{(q + Q)}{4\pi\in_0}\frac{2}{R}$

14) Two conducting spheres of radii r and R carry charges q and Q respectively. When they are connected by a conducting wire, there will be no loss of energy of the system if :-

(1) qr = QR

(2) qR = Qr

(3) $qr^2 = QR^2$

(4) $qR^2 = Qr^2$

15)

The electric potential V at any point O (x, y, z all in metres) in space is given by

$V = 4x^2$ volt. The electric field at the point (1m, 0, 2m) in volt/metre is :-

(1) 8 along negative X-axis

(2) 8 along positive X-axis

(3) 16 along negative X-axis

(4) 16 along positive Z-axis

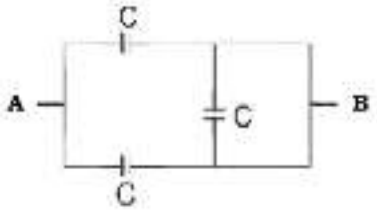
16) **Statement-I :-** For a surface charge distribution electric field is discontinuous across the surface.
Statement-II :- Electric field due to a distance charge configuration is not defined at the location of discrete charges.

(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.



17) The equivalent capacitance of the combination across A and B.

(1) 2C

(2) 4C

(3) C/2

(4) 5/3C

18) **Assertion :** Electrons moves from low potential region to high potential region. **Reason :** Because electrons are negatively charged.

(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.

19) Three charges proton, deutron and alpha released from rest in uniform electric field simultaneously. The respective ratio of their instantaneous acceleration :

(1) 2 : 2 : 1

(2) 2 : 1 : 1

(3) 1 : 2 : 2

(4) 1 : 1 : 2

20) **Statement-I:** As body acquires positive charge, its mass decreases.
Statement-II: A body acquires positive charge, if it loses electrons.

(1) Both Statement-I and Statement-I are true and the Statement-II is the correct explanation of Statement-I.

(2) Both Statement-I and Statement-I are true but Statement-II is not the correct explanation of Statement-I.

(3) Both Statement-I and Statement-II are false

(4) Statement-I is true, but Statement-II are false

21) Three identical spheres, each having a change q and radius R, are kept in such a way that each touches other two. The magnitude of the electric force an any sphere due to the other two is :-

(1) $\frac{1}{4\pi\varepsilon_0}\left(\frac{q}{R}\right)^2$

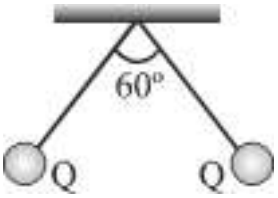
(2) $\frac{\sqrt{3}}{4\pi\varepsilon_0}\left(\frac{q}{R}\right)^2$

(3) $\frac{\sqrt{3}}{16\pi\varepsilon_0}\left(\frac{q}{R}\right)^2$

(4) $\frac{\sqrt{5}}{16\pi\varepsilon_0}\left(\frac{q}{R}\right)^2$

22) Two small spherical balls each carrying a charge Q = 10μC (10 micro-coulomb) are suspended by two insulating threads of equal lengths 1m each, from a point fixed in the ceiling. It is found that in equilibrium threads are separated by an angle 60º between them, as show in the figure. What is

the tension in the threads (Given : $\frac{1}{(4\pi\varepsilon_0)} = 9 \times 10^9$ Nm/C^2)

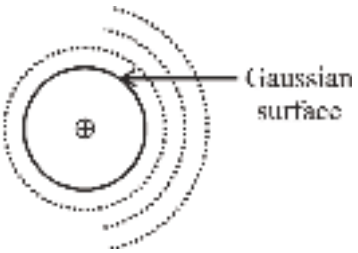


(1) 18 N

(2) 1.8 N

(3) 0.18 N

(4) None of the above



23) A charge q is enclosed by an imaginary Gaussian surface. If radius of surface is increasing at a rate $\frac{dr}{dt} = K$, then

(1) flux linked with surface is increasing at a rate $\frac{d\phi}{dt} = K$

(2) flux linked with surface is decreasing at a rate $\frac{d\phi}{dt} = -K$

(3) flux linked with surface is decreasing at a rate $\frac{d\phi}{dt} = \frac{1}{K}$

(4) flux linked with surface is $\frac{q}{\varepsilon_0}$

24) If a charge is shifted from a low potential region to high potential region, the electric potential energy :

(1) Increases

(2) Decreases

(3) Remains constant

(4) May increase or decrease

25) In a region of space the electric field is given by $\vec{E} = 8\hat{i} + 4\hat{j} + 3\hat{k}$. The electric flux through a surface of area 100 units in the x-y plane is :

(1) 800 units

(2) 300 units

(3) 400 units

(4) 1500 units

26) Statement I : The force acting on a test charge inside a uniformly charged spherical shell is zero.

Statement II : The electric field inside a uniformly charged spherical shell is zero.

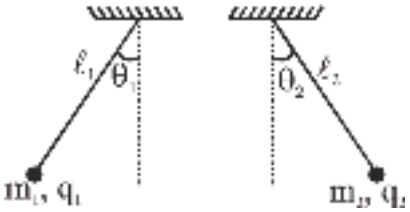
(1) If both Statement I and Statement II are correct, and Statement II is the correct explanation of the Statement I.

(2) If both Statement I and Statement II are correct, but Statement II is not the correct explanation of the Statement I.

(3) If Statement I is correct, but Statement II is incorrect

(4) If Statement I is incorrect, but Statement II is correct.

27) Two small spheres with mass m_1 and m_2 hanges by string of length ℓ_1 and ℓ_2 having charges q_1 and q_2. The spheres hang such that they are on same horizontal level and strings makes angle θ_1 and θ_2 with vertical. Which condition is required if $\theta_1 = \theta_2$:-



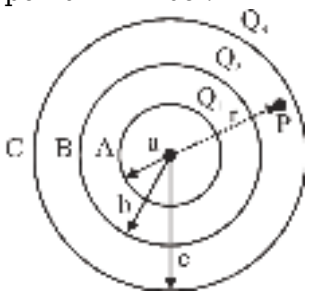
(1) $m_1 = m_2$

(2) $|q_1| = |q_2|$

(3) $\ell_1 = \ell_2$

(4) $\frac{q_1}{m_1} = \frac{q_2}{m_2}$

28) Three concentric spherical conductors are arranged as shown in the figure. The potential at point P will be :-



(1) $\frac{1}{4\pi\varepsilon_0}\left[\frac{Q_1}{r}+\frac{Q_2}{r}+\frac{Q_3}{r}\right]$

(2) $\frac{1}{4\pi\varepsilon_0}\left[\frac{Q_1+Q_2}{r}+\frac{Q_3}{c}\right]$

(3) $\frac{1}{4\pi\varepsilon_0}\left[\frac{Q_1}{a}+\frac{Q_2}{b}+\frac{Q_3}{c}\right]$

(4) $\frac{1}{4\pi\varepsilon_0}[Q_1+Q_2+Q_3]$

29) ***Assertion :-*** A parallel plate capacitor is connected across battery through a key. A dielectric slab of constant K is introduced between the plates while the battery remains connected. The energy which is stored becomes K times.
Reason :- The surface density of charge on the plate remains constant or unchanged.

(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.

30) **Assertion (A)** :- The capacitance of a capacitor depends on the shape, size and geometrical placing of the conductors and the medium between them. **Reason (R)** :- When a charge q passes through a battery of emf E from the negative terminal to the positive terminal, an amount of work qE is done by the battery.

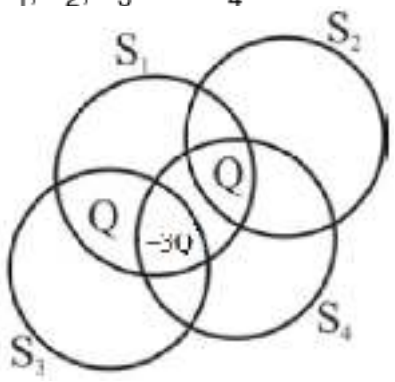
(1) Both (A) and (R) are true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are true and (R) is NOT the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true.

31) Following figure shows four Gaussian surfaces S_1, S_2, S_3 and S_4.



Match the Column I & II and select the correct option.

Column - I	Column - II
(A) ϕ_{S_1}	(P) $+\frac{Q}{\varepsilon_0}$
(B) ϕ_{S_2}	(Q) 0
(C) ϕ_{S_3}	(R) $-\frac{Q}{\varepsilon_0}$
(D) ϕ_{S_4}	(S) $-\frac{2Q}{\varepsilon_0}$

(1) A - Q, B - S, C - R, D - P

(2) A - R, B - P, C - S, D - S

(3) A - R, B - S, C - P, D - Q

(4) A - Q, B - R, C - S, D - P

32) **Assertion(A)** :- The flux crossing through a closed surface is independent of the location of charge within the surface.
Reason(R) :- On displacement of charges within a closed surface, electric field at any point on the

surface does not change.

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

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

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

33) **Statement I :** The net force acting on an electric dipole in an uniform electric field is zero.
Statement II : A torque acts on an electric dipole, when it is inclined at certain angle ($\neq$ 0°,180°) in an uniform electric field.

(1) If both Statement I and Statement II are correct, and Statement II is the correct explanation of the Statement I.

(2) If both Statement I and Statement II are correct, but Statement II is not the correct explanation of the Statement I.

(3) If Statement I is correct, but Statement II is incorrect

(4) If Statement I is incorrect, but Statement II is correct.

34) If a capacitor 900mF is charged to 100V and its total energy is transferred to a capacitor of capacitance 100mF then its potential is :-

(1) 200V

(2) 30V

(3) 300V

(4) 400V

35)

If K is the dielectric constant of a medium and ε_0 permittivity of free space, then the energy stored per unit volume of the medium is given by :-

(1) $\frac{1}{2}K^2\varepsilon_0^2/E$

(2) $\frac{1}{2}K\varepsilon_0^2E$

(3) $\frac{1}{2}K\varepsilon_0E^2$

(4) $\frac{1}{2}K\varepsilon_0E$

36) A 6 μF capacitor charged from 10 volt to 20 volt. Calculate increase in energy.

(1) 50 μJ

(2) 100 μJ

(3) 300 μJ

(4) 900 μJ

37) Which of the following does not represent the energy density in parallel plate capacitor :-

(1) $\frac{1}{2}\in_0 E^2$

(2) $\frac{\sigma^2}{2\in_0}$

(3) $\frac{Q^2}{2\in_0 A}$

(4) $\frac{1}{2}\in_0 \cdot \frac{V^2}{d^2}$

38) Match the source of charge given in Column I with expressions of electric field produced by them in Column II.

Column-I	**Column-II**
(A) Point charge	(i) $\frac{\lambda}{2\pi\varepsilon_0 r}$
(B) Infinitely long straight uniformly charged wire	(ii) $\frac{\sigma}{2\varepsilon_0}$
(C) Uniformly charged infinite plane sheet	(iii) 0
(D) At a point inside a uniformly charged thin spherical shell.	(iv) $\frac{q}{4\pi\varepsilon_0 r^2}$

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

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

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

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

39) A parallel plate capacitor with air between plates has a capacitance of 8μF what will be capacitance if distance between plates is reduced by half, and the space between them is filled with a substance of dielectric constant 6 ?

(1) 96 μF

(2) 24μF

(3) 50 μF

(4) 10 μF

40) A solid conducting sphere of radius R_1 is surrounded by another concentric hollow conducting sphere of radius R_2 which is earthed. The capacitance of this assembly is proportional to :-

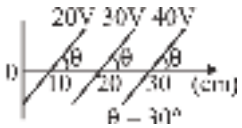
(1) $\frac{R_2 - R_1}{R_1 R_2}$

(2) $\frac{R_2 + R_1}{R_1 R_2}$

(3) $\frac{R_1R_2}{R_1+R_2}$

(4) $\frac{R_1R_2}{R_2-R_1}$

41) Some equipotential surfaces are shown in the figure. The magnitude and direction of the electric field is -



(1) 100 V/m making angle 120° with the x-axis

(2) 100 V/m making angle 60° with the x-axis

(3) 200 V/m making angle 120° with the x-axis

(4) none of the above

42) A spherical drop of capacitance 1 μF is broken into eight drops of equal radius. Then, the capacitance of each small drop is ....

(1) $\frac{1}{8}\mu F$

(2) 8 μF

(3) $\frac{1}{2}\mu F$

(4) $\frac{1}{4}\mu F$

43) Capacitance of a parallel plate capacitor does not depend upon:

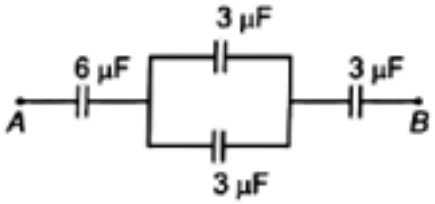
(1) Medium between the plates

(2) Separation between the plates

(3) Charge on the plates

(4) Area of plates

44) In the given diagram, the potential difference between A and B is 80 V. The potential



difference across 6 μF capacitor is

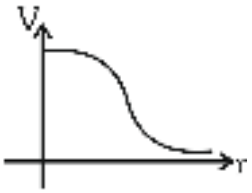
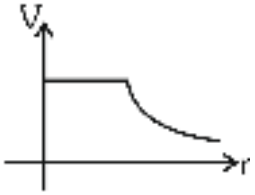
(1) 10 V

(2) 30 V

(3) 20 V

(4) 40 V

45) Match the Column :

Column I		Column II	
A.	Electric potential at centre of uniformly charged non conducting solid sphere	**P.**	
B.	Electric potential at centre of uniformly charged conductor	**Q.**	
C.	Variation of electric potential in a uniformly charged non conducting solid sphere	**R.**	$\frac{3}{2}\frac{KQ}{R}$
D.	Variation of electric potential in a uniformly charged conducting sphere	**S.**	$\frac{KQ}{R}$

(1) A-R, B-S, C-P, D-Q

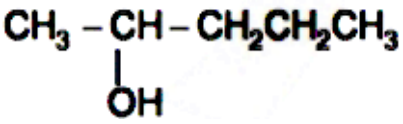
(2) A-P, B-S, C-Q, D-R

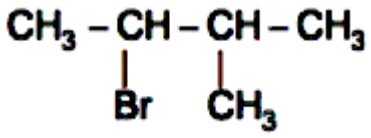
(3) A-S, B-Q, C-R, D-P

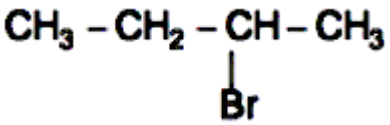
(4) A-Q, B-R, C-S, D-P

CHEMISTRY

1) Which of the following contain chiral carbon atom :

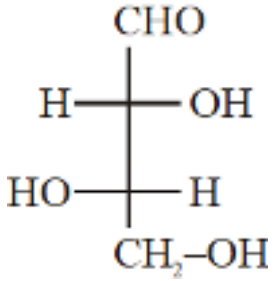
(1) 

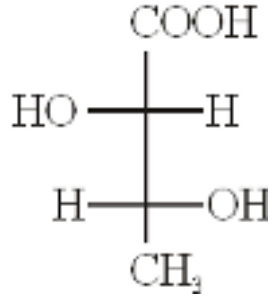
(2) 

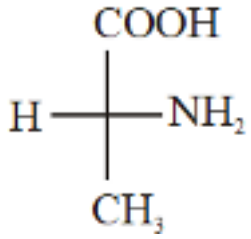
(3) 

(4) All the above

2) L-configuration are :-

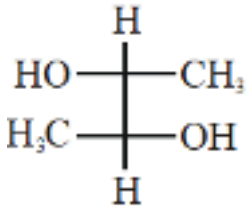
(1) 

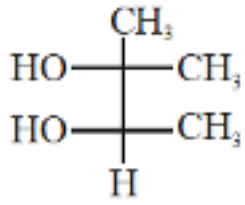
(2) 

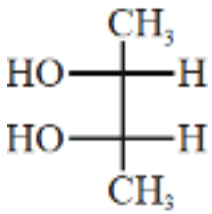
(3) 

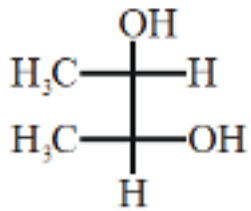
(4) 1 & 2 both

3) Which of the following compound is optically inactive :-

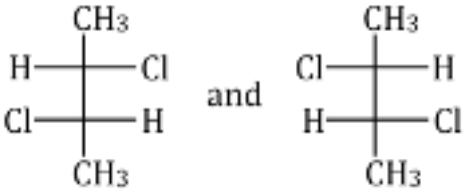
(1) 

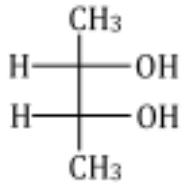
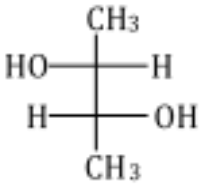
(2) 

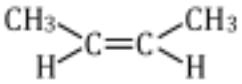
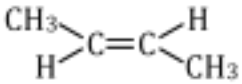
(3) 

(4) 

4) Which are not diastereomers :-

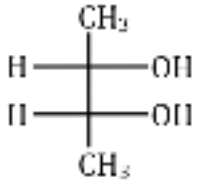
(1)  and

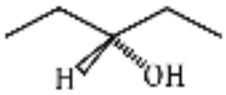
(2)  and 

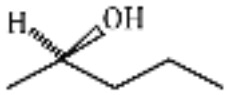
(3)  and 

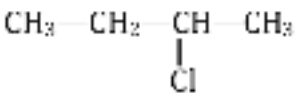
(4) All of these

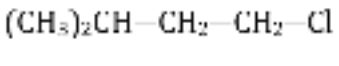
5) Total number of optically active compounds from the following is :-

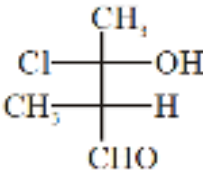










6) Absolute configuration of 

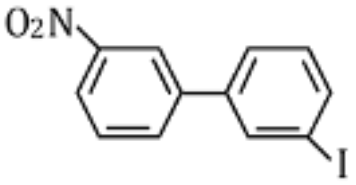
(1) 2R, 3R

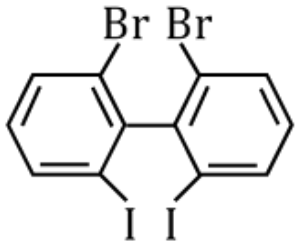
(2) 2S, 3R

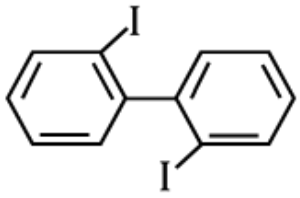
(3) 2S, 3S

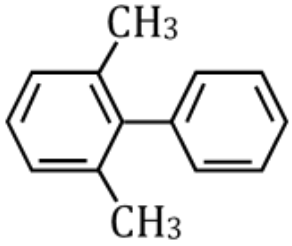
(4) 2R, 3S

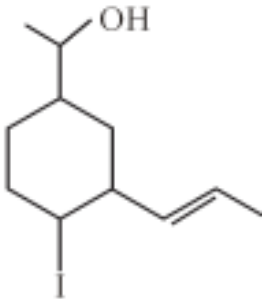
7) Which of the following biphenyls is optically active?

(1) 

(2) 

(3) 

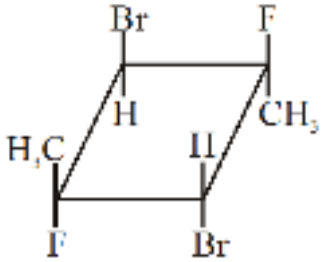
(4) 



8) Calculate total number of optical isomers for given compound :

(1) 8
(2) 16
(3) 32
(4) 34

9) The compound has :-



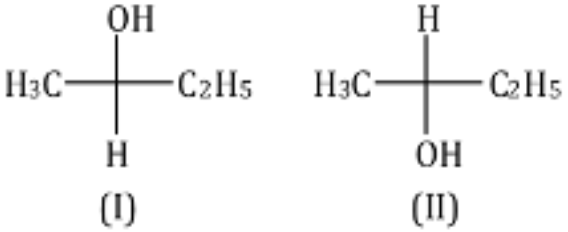
(1) Plane of symmetry

(2) Two pos

(3) Center of symmetry

(4) No symmetry

10) Relation between given compound is



(I) (II)

(1) Homomer

(2) Enantiomer

(3) Functional isomer

(4) Chain isomer

11) Stereoisomers which are not mirror image of each other are

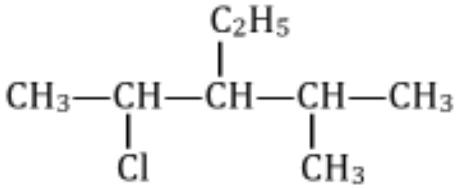
(1) Enantiomers

(2) Diastereomers

(3) Meso compounds

(4) Racemic mixture

12) How many chiral carbon atom are present in following molecules :-



(1) 1

(2) 2

(3) 3

(4) 4

13) The separations of enantiomers from racemic mixture is known as :-

(1) External compansation

(2) Precipitation

(3) Resolution

(4) Desolution

14) The method which is suitable for the preparation of unsymmetrical alkanes

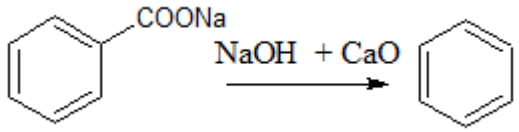
(1) Wurtz reaction

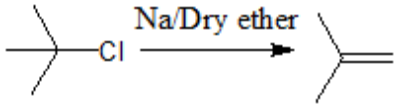
(2) Kolbe's electrolysis

(3) Corey-house reaction

(4) None of these

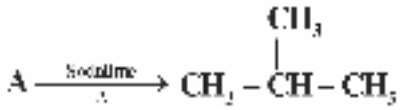
15) Which of the following reaction is incorrect?

(1) 

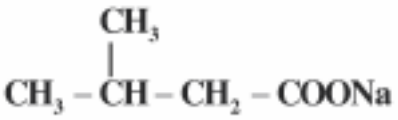
(2) 

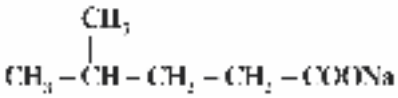
(3) $(CH_3)_2CuLi + CH_3CH_2—Br \longrightarrow$

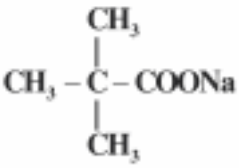
(4) $CH_3—CH_2—I \xrightarrow[\Delta]{\text{Red P + HI}} CH_3—CH_3$

16) 

The possible structure of A is :

(1) 

(2) 

(3) 

(4) Both (1) and (3)

17)

Which of the following compound can not be obtained from single alkyl halide by Wurtz reaction ?

(1) Ethane

(2) 2,3-dimethyl butane

(3) Isopentane

(4) Octane

18)

Find the rate of decarboxylation for the following

(a) 

(b) 

(c) 

(d) 

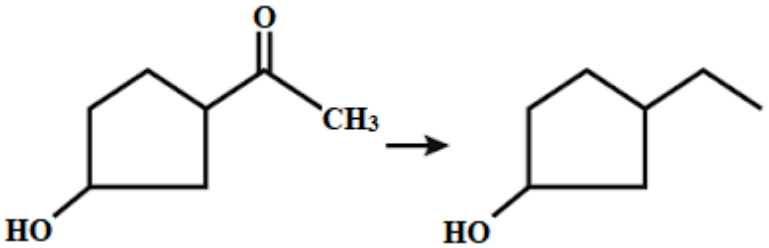
(1) d > b > a > c

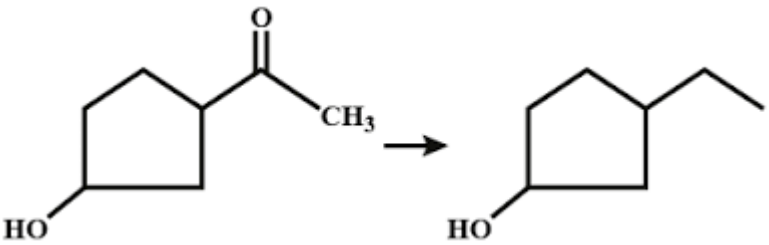
(2) c > a > d > b

(3) b > d > a > c

(4) a > b > d > c

19) The appropriate reagent for the transformation





is

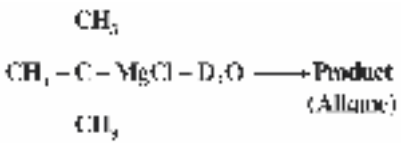
(1) $NaBH_4$

(2) NH_2NH_2, OH^-

(3) Both (1) & (2)

(4) None of these

20)



Structure of alkane is :

(1) $(CH_3)_3CH$

(2) $(D_3C)_3CD$

(3) $(CH_3)_3CD$

(4) $(D_3C)_3CH$

21) Which is correct about Wurtz reaction ?
(a) It can proceed through free radical mechanism
(b) Alkanes having even no. of C-atom can be prepared
(c) Sodium in Ammonia is used
(d) Sodium in dry ether is used

(1) c, d

(2) a, b, d

(3) b, c

(4) a, b, c, d

22) **Assertion:** Sodium salt of butanoic acid on heating with soda lime gives butane.
Reason: Decarboxylation reaction yields alkanes having same number of carbon atoms as the parent acid.

(1) If both assertion and reason are true and reason is the correct explanation of assertion.

(2) If both assertion and reason are true but reason is not the correct explanation of assertion.

(3) If assertion is true but reason is false.

(4) If both assertion and reason are false.

23) Match the column :-

List - I		**List - II**	
(A)	Wurtz reaction	(I)	Zn
(B)	Corey House synthesis	(II)	Li
(C)	Ullmann Reaction	(III)	Na
(D)	Frankland reaction	(IV)	Cu

Codes are :-

	A	B	C	D
(1)	II	I	III	IV
(2)	III	II	IV	I
(3)	III	IV	II	I
(4)	III	I	IV	II

(1) 1

(2) 2

(3) 3

(4) 4

24) 1g of a non-electrolyte when dissolved in 50g benzene, its freezing point is decreased by 0.40 K. K_f of benzene is 5.12 K kg mol^{-1}. Molar mass of solute will be :-

(1) 128

(2) 256

(3) 512

(4) 64

25) The density of 2 M aqueous solution of NaOH is 1.28 g/cm^3. The molality of the solution is [Given that molecular mass of NaOH = 40 g mol^{-1}

(1) 1.20 m

(2) 1.56 m

(3) 1.67 m

(4) 1.32 m

26) Which one of the following is **incorrect** for ideal solution ?

(1) $\Delta P = P_{obs} - P_{calculated\ by\ Raoult's\ law} = 0$

(2) $\Delta G_{mix} = 0$

(3) $\Delta H_{mix} = 0$

(4) $\Delta U_{mix} = 0$

27) At 100°C the vapour pressure of a solution of 6.5g of a solute in 100 g water is 732 mm. If K_b = 0.52 °C m^{-1}, the boiling point of this solution will be :-

(1) 101°C

(2) 100°C

(3) 102°C

(4) 103°C

28) In the match of Column I with Column II :-

Column-I		Column-II	
(A)	$P_{gas} = K_H x_{gas}$	(P)	Raoult's law
(B)	$P_1 = P°x_1$	(Q)	Henry's law
(C)	$P_{total} = P_1 + P_2$	(R)	Dalton's law
(D)	$\frac{d}{dt}\ln P = +\frac{\Delta H_v}{RT^2}$	(S)	Clasius clayperon equation

The correct one is :-

(1) (A-P), (B-Q), (C-R), (D-S)

(2) (A-Q), (B-P), (C-R), (D-S)

(3) (A-Q), (B-R), (C-P), (D-S)

(4) (A-P), (B-S), (C-Q), (D-R)

29) What would be the osmotic pressure of 0.1 M K_2SO_4 solution (90% dissociated) at 27°C :-

(1) 6.89 atm

(2) 0.689 atm

(3) 0.344 atm

(4) 3.4 atm

30) The freezing point of equimolal aqueous solution will be highest for :

(1) urea

(2) $Ca(NO_3)_2$

(3) $Al(NO_3)_3$

(4) NaCl

31) Consider following statements.
(a) Ideal solutions are one which obeys Raoult's law at all temperature & concentration
(b) Very dilute solution can be treated as ideal solution.
(c) Ideal solution form azeotropic mixture
(d) Azeotropic mixture are not constant boiling mixture.
Which are correct :-

(1) a, b

(2) b, c

(3) a, c

(4) c, d

32) Which of the two processes occur at the same rate in order to achieve this equilibrium ?
Solute + Solvent $\rightleftharpoons$ Solution

(1) Saturation, unsaturation

(2) Saturation, crystallization

(3) Dissolution, crystallization

(4) Unsaturation, crystallization

33) ___(A)____ injection are dissolved in water containing salts at particular ___(B)____ concentrations that matches ___(C)____ concentration. Here A, B and C refer to :

(1) Intravenous, ionic, blood plasma

(2) Intravenous, blood plasma, ionic

(3) Blood plasma, intravenous, ionic

(4) Blood plasma, ionic, intravenous

34) For the reaction, $N_2 + 3H_2 \rightarrow 2NH_3$, if $\frac{d[NH_3]}{dt} = 2 \times 10^{-4}$ mol $L^{-1}s^{-1}$, the value of $\frac{-d[H_2]}{dt}$ would be :-

(1) 1×10^{-4} mol L^{-1} s^{-1}

(2) 3×10^{-4} mol L^{-1} s^{-1}

(3) 4×10^{-4} mol L^{-1} s^{-1}

(4) 6×10^{-4} mol L^{-1} s^{-1}

35) For a certain reaction, the rate = $k[A]^2[B]$, when the initial concentration of A is tripled keeping concentration of B constant, the initial rate would

(1) increase by a factor of six

(2) increase by a factor of nine

(3) increase by a factor of three

(4) decrease by a factor of nine

36) The bromination of acetone that occurs in acid solution is represented by this equation

$CH_3COCH_3(aq) + Br_2(aq) \rightarrow$

$CH_3COCH_2Br(aq) + H^+(aq) + Br^-(aq)$

The kinetic data were obtained for given reaction at different concentrations.

$[CH_3COCH_3]$	$[Br_2]$	$[H^+]$	ROD of Br_2, Ms^{-1}
0.30	0.05	0.05	6×10^{-5}
0.30	0.10	0.05	6×10^{-5}
0.30	0.10	0.10	1.2×10^{-4}
0.40	0.05	0.20	3×10^{-4}

Based on these data, the rate equation is :

(1) Rate = $k[CH_3COCH_3][Br_2]$

(2) Rate = $k[CH_3COCH_3][Br_2][H^+]^2$

(3) Rate = $k[CH_3COCH_3][Br_2][H^+]$

(4) Rate = $k[CH_3COCH_3][H^+]$

37) For an elementary process $2X + Y \rightarrow Z + W$, the molecularity is –

(1) 3

(2) 1

(3) 2

(4) Unpredictable

38)

Select the rate law that corresponds to the data shown for the reaction $A + B \rightarrow C$

Exp.	[A]	[B]	Rate
1	0.012	0.035	0.10
2	0.024	0.070	0.80
3	0.024	0.035	0.10
4	0.012	0.070	0.80

(1) Rate = $k[B]^3$

(2) Rate = $k[B]^4$

(3) Rate = $k[A][B]^3$

(4) Rate = $k[A]^2[B]^2$

39) In the following reaction, $2H_2O_2 \rightarrow 2H_2O + O_2$

rate of formation of O_2 is 36 g L^{-1} min^{-1}, what is rate of disappearance of H_2O_2 in mol L^{-1} min^{-1}

(1) 2.25

(2) 3.50

(3) 1.50

(4) 2.75

40) The rate of a reaction is expressed in different ways as follows:

$$+\frac{1}{2}\frac{d[C]}{dt} = -\frac{1}{3}\frac{d[D]}{dt} = +\frac{1}{4}\frac{d[A]}{dt} = -\frac{d[B]}{dt}$$.

The reaction is

(1) $4A + B \rightarrow 2C + 3D$

(2) $B + 3D \rightarrow 4A + 2C$

(3) $A + B \rightarrow C + D$

(4) $B + D \rightarrow A + C$

41) For the reaction, $2NO(g) + 2H_2(g) \rightarrow N_2(g) + 2H_2O(g)$ the rate expression can be written in the following ways :

$$\left\{\frac{d[N_2]}{dt}\right\} = k_1[NO][H_2];$$

$$\left\{\frac{d[H_2O]}{dt}\right\} = k[NO][H_2]$$

$$\left\{\frac{-d[NO]}{dt}\right\} = k_1'[NO][H_2];$$

$$\left\{\frac{-d[H_2]}{dt}\right\} = k_1''[NO][H_2]$$

The relationship between k, k_1, k_1' and k_1'' is

(1) $k = k_1 = k_1' = k_1''$

(2) $k = 2k_1 = k_1' = k_1''$

(3) $k = 2k_1' = k_1 = k_1''$

(4) $k = k_1 = k_1' = 2k_1''$

42) In a reaction 2A → Products, the Concentration of A decreases from 0.8 $molL^{-1}$ to 0.3 $molL^{-1}$ in 5 minutes then what is the average rate during this interval ?

(1) 2.5×10^{-2} $M.min^{-1}$

(2) 10^{-1} $M.min^{-1}$

(3) 1.25×10^{-2} $M.min^{-1}$

(4) 5×10^{-2} $M.min^{-1}$

43) For the reaction, 4A + B → 2C + 2D.
The statement not correct is :-

(1) The rate of disappearance of B is one fourth the rate of disappearance of A.

(2) The rate of appearance of C is half the rate of disappearance of B.

(3) The rate of formation of D is half the rate of consumption of A.

(4) The rates of formation of C and D are equal.

44)

For the reaction A + B → C, rate = k[A] $[B]^2$. If volume of container become half then what will be the new rate ?

(1) 8 times

(2) 4 times

(3) 2 times

(4) $\frac{1}{8}$ times

45) For the reaction A + B → C + D, on doubling the concentration of both the reactants increase the reaction rate by 8 times and on doubling the concentration of only B simply doubles the reaction rate. The rate law is given as :

(1) r = k[A] [B]

(2) r = $k[A]^2$ [B]

(3) r = k[A] $[B]^2$

(4) r = $k[A]^{1/2}$ $[B]^{1/2}$

BIOLOGY

1) In Mendelian genetics, if a pea plant with yellow and round seeds (YYRR) is crossed with a plant with green and wrinkled seeds (yyrr), what will be the phenotype of the offspring according to Mendel's findings?

(1) All offspring will have green colour and round shape seeds.

(2) All offspring will have yellow colour and wrinkled shape seeds.

(3) All offspring will have green colour and wrinkled shape seeds.

(4) All offspring will have yellow colour and round shape seeds.

2) Given below are two statements:
Statement I: Females produce only one type of ovum with an X-chromosome, and the sex of the child is determined by the ovum's genetic makeup.
Statement II: There is a 50 per cent probability of either a male or a female child in each pregnancy, and it is the genetic makeup of the sperm that determines the sex of the child.
In the light of the above statements, choose the correct answer from the options given below:

(1) Statement I is true but Statement II is false.

(2) Both Statement I and Statement II are true.

(3) Both Statement I and Statement II are false.

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

3) The presence of continuous phenotypic variation in F2 generation suggests that the character shows

(1) Gene linkage
(2) Epistasis
(3) Polygenic inheritance
(4) Recombination

4) **Assertion A:** Individuals with a genotype of AABBCC will exhibit the darkest skin colour due to the polygenic inheritance of skin colour.
Reason R: In polygenic traits, the presence of dominant alleles like A, B, and C contribute additively to the phenotype, resulting in darker skin colour.

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

5) **Assertion A:** A recessive trait is expressed when the allele produces a non-functional enzyme or no enzyme at all.
Reason R: The dominant allele is the one that represents the original functioning phenotype and masks the effect of the recessive allele.

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

6) Select the **incorrect** statement from the following.

(1) Sutton and Boveri noted that behaviour of genes and chromosomes was parallel during meiosis
(2) The two alleles of a gene pair are located on homologous site on homologous chromosomes
(3) Experimental verification of the chromosomal theory of inheritance was given by Strutevant
(4) Closely located genes stays together due to linkage

7) Crossing over in diploid organisms is responsible for:

(1) Dominance of gene
(2) Linkage between genes
(3) Recombination of linked genes
(4) Segregation of alleles

8) What would be the number of chromosomes in a male honey bee, if the number of chromosomes in the egg of female honey bee is 16?

(1) 8
(2) 16

(3) 24

(4) 32

9) Females are heterogametic in

(1) Birds

(2) Human

(3) Drosophila

(4) Both 1 and 3

10) Why Drosophila melanogaster is suitable for the study of sex linked inheritance?

(1) Could be grown on simple synthetic medium in laboratory.

(2) Complete life cycle is 2 weeks and single mating produces a large number of progeny flies.

(3) Clear sexual dimorphism is present and many types of heredity variation can be seen with low power microscope.

(4) All of these

11) Identify the **correct** statement from the following

(1) Sickle cell anaemia is caused by substitution of valine by glutamic acid

(2) For ABO blood group gene I is present 11th chromosome

(3) Flower colour in Antirrhinum majus shows codominance

(4) Lethal gene causes death in homozygous condition

12) If maximum weight of lemon is 100 g and minimum weight is 40g. What will be the weight of lemon variety with AaBBcc genotype :-

(1) 60 g

(2) 70 g

(3) 80 g

(4) 30 g

13) Match the column

	Column I		**Column II**
(I)	Test cross	(a)	Blood group
(II)	Multiple allelism	(b)	Hbs Hbs
(III)	Morgan	(c)	Tt × tt
(IV)	Lethal gene	(d)	Experimental genetics

(1) I-c, II-a, III-d, IV-b

(2) I-c, II-a, III-b, IV-d

(3) I-c, II-d, III-a, IV-b

(4) I-a, II-c, III-d, IV-b

14) Which of the following disorder is not an example of pleiotropic gene :-

(1) Phenylketonuria
(2) Sickle cell Anaemia
(3) Starch grain size in pea
(4) Colourblindness

15) Identify the **incorrect** statement.

(1) In male grasshopper, 50% of the sperms have no sex chromosome.
(2) Usually, female birds produce two types of gametes based on sex chromosome.
(3) The human males have one of their sex chromosome much shorter than other.
(4) In fowls, the sex of the progeny depends on the type of sperm rather than the egg.

16) One of the Mendel's pure strain of pea plants had green peas. How many different kinds of eggs could such a plant produce with regard to pea colour?

(1) One
(2) Two
(3) Four
(4) Eight

17) Which one of the following differentiates nuclear inheritance from cytoplasmic inheritance?

(1) Monohybrid cross
(2) Reciprocal cross
(3) Out cross
(4) Test cross

18) In heterozygous condition, the individual expression of both the alleles in the phenotype is exemplified by :-

(1) Rh factor
(2) AB blood group
(3) O blood group
(4) A and B blood group

19) Identify P & Q w.r.t. sex determination in Birds:

PP PQ

(1) X & Y
(2) X & O
(3) Z & W
(4) Z & O

20) **Assertion –** Multiple alleles are present at different loci on the same chromosome.
Reason – Polygenes are present on same locus of the chromosome.

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

21) In Morgan's experiment, the F2 ratio deviated very significantly from 9 : 3 : 3 : 1. This is due to

(1) Independent assortment
(2) Crossing over
(3) Linkage
(4) Dominance

22) How many types of gametes are produced by a pentahybrid AaBbCcDdEe, if A and B are completely linked gene.

(1) 32
(2) 16
(3) 8
(4) 4

23) What would be blood group of the progeny of father having A blood group and mother with homozygous B blood group.

(1) A and B
(2) AB and A
(3) O
(4) AB and B

24) **Statement - I:** Completely linked genes do not show independent assortment.
Statement - II: Incomplete dominance shows same phenotypic and genotypic ratio.

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

25) How many of the following statements are **incorrect**
(i) The sex determination in honey bee is based on the number of sets of chromosomes.
(ii) An offspring formed from the union of a sperm and an egg always develops as a fertile female.
(iii) An unfertilized egg develops as a male by parthenogenesis.
(iv) Males have same number of chromosome than females
(v) Males produces sperm by mitosis.

(1) 3

(2) 4

(3) 2

(4) 1

26) Select the **incorrect** statement from the following for chromosome

(1) During anaphase of meiosis – I, the two chromosome pairs can align at the metaphase plate independently of each other

(2) Occurs in pair

(3) Segregates at gamete formation and only one of each pair is transmitted to a gamete

(4) Independent pairs can only segregate independently of each other

27) What will be the number of linkage groups in maize (Aleurone layer has 30 chromosomes)?

(1) Zero

(2) 10

(3) 20

(4) 30

28) Consider the following statements regarding linkage
(i) The linked genes are located on the same chromosome
(ii) Crossing over between linked genes is rare if distance between them is more.
(iii) Linked genes are always inherited together
(iv) Total number of linkage group in an organism is equal to the number of chromosomal pair

(1) i, iii and iv are correct

(2) i, ii and iv are correct

(3) i, and iv are correct

(4) ii, iii are correct

29) X-body was observed by Henking in

(1) W.B.C

(2) R.B.C

(3) Sperm

(4) Ovum

30) Distance between genes on a chromosome can be mapped by using

(1) Test cross

(2) Recombination frequency

(3) Segregation ratio

(4) Pleiotropy

31) Which of the following is not **true**

(1) Two organism with same genotype may have different phenotypes

(2) Two organism with same phenotype may have different genotypes

(3) A heterozygous organism may have the same phenotype as a homozygous organism

(4) A heterozygous organism has the same number of alleles for a given gene as a homozygous organism

32) Occasionally, a single gene may express more than one effect. The phenomenon is called

(1) Multiple allelism

(2) Mosaicism

(3) Pleiotropy

(4) Polygeny

33) Sex determination in Drosophila is based on:-

(1) XY-chromosome

(2) Whether the egg is fertilised or develops by parthenogenesis

(3) Genetic balance between the X-chromosome and autosome

(4) The ratio of pairs of X-chromosomes to the pairs of autosomes

34) A test cross is performed:

(1) By selfing of F2 - generation plants

(2) By selfing of F1 - generation plants

(3) To determine whether F1 -plant is homozygous or heterozygous

(4) Between a homozygous dominant and homozygous recessive plant

35) Dihybrid test cross ratio for 'linked' genes

(1) 3:1

(2) 9:3:3:1

(3) 1:1

(4) 1:1:1:1

36) Complete linkage though rare in nature; can be seen in:
(a) Female Drosophila
(b) Male Drosophila
(c) Male Silkworm
(d) Female Silkworm

(1) a, b & c are correct

(2) a & b are correct

(3) b & d are correct

(4) a & c are correct

37) Number of linkage group(s) present in Escherichia coli :

(1) One

(2) Two
(3) Four
(4) Seven

38) Genotype of male plant is TT and genotype of female plant is tt. What would be genotype of endosperm

(1) TTt
(2) Ttt
(3) Tt
(4) tt

39) Punnet square is graphical presentation by which we can calculate the possible?

(1) Gene location on chromosomes.
(2) Genotype of offspring.
(3) Linkage group.
(4) All of these

40) Flower colour in dog flower is a good example to understand

(1) Co-dominance
(2) Incomplete dominance
(3) Linkage
(4) Epistasis

41) Who discovered linkage?

(1) Bateson and Punnet
(2) Morgan
(3) Mendal
(4) Johnson

42) Drosophila with AAA + XX is

(1) Normal male
(2) Normal female
(3) Inter sex
(4) Meta male

43) Eggs fertilised by sperms having __(A)__ chromosomes becomes females and those fertilised by sperms that do not have an __(B)__ chromosomes becomes male in human.

(1) A – Y, B - X
(2) A –X, B - X
(3) A – X, B - Y

(4) A – XX, B - Y

44) Distance between the genes and percentage of recombination show

(1) A direct relationship
(2) No relationship
(3) A parallel relationship
(4) An inverse relationship

45) What will be the distribution of phenotypic features in the first filial generation after a cross between a homozygous female and a heterozygous male for a single gene locus?

(1) 1 : 0
(2) 1 : 2
(3) 1 : 1
(4) Both (1) and (3)

46)

Inner cell mass give rise to all of the following except-

(1) Embryonic ectoderm
(2) Chorion
(3) Embryonic mesoderm
(4) Embryonic endoderm

47) What procedure follows for functional maturation of sperms in epididymis ?

(1) Cholesterol layer covers the acrosome of sperm
(2) Inhibitory proteins are released by epididymis which conserve the energy of sperms
(3) Epididymis provides more ATP energy to sperms
(4) Both (1) and (2)

48) Consider the following statements (a-d) and select the option which includes all the **correct** ones only:
(a) In human allantois does not function to store the excretory wastes. (b) During parturition, secretion of progesterone decreases but secretion of estrogen increases from placenta (c) Progesteron, hCG, hPL and estrogens are produced in women only during pregnancy (d) The first movement of the foetus and appearance of hairs on the head are usually observed during the third month of pregnancy

(1) Statements (a), (c) and (d)
(2) Statements (a), (b) and (c)
(3) Only (a) and (b)
(4) All statements (a), (b), (c) and (d)

49) Identify the correct match from columns I, II and III.

Column-I		Column-II		Column-III	
(1)	Sertoli cells	(a)	Epididymis	(i)	Androgens
(2)	Leydig cells	(b)	Scrotum	(ii)	Blood testis barrier
(3)	Dartos muscles	(c)	Testis	(iii)	Temperature regulation of scrotum
(4)	Stereocilia	(d)	Seminiferous tubule	(iv)	Absorption of dead sperm components

(1) 2 – a – iii, 1 – c – iv, 3 – b – i, 4 – d – ii

(2) 1 – c – iv, 2 – d – iii, 3 – b – i, 4 – a – ii

(3) 1 – d – ii, 2 – c – i, 3 – b – iii, 4 – a – iv

(4) 3 – b – iv, 4 – a – ii, 2 – d – i, 1 – c – iii

50) Which one of the following is not the function of placenta ?

(1) Facilitates removal of carbon dioxide and waste material from embryo.

(2) Secretes oxytocin during parturition.

(3) Facilitates supply of oxygen and nutrients to embryo.

(4) Secretes estrogen.

51) The major difference between spermatogenesis and oogenesis is

(1) Gamete production and release in oogenesis starts during embryonic period while in spermatogenesis it occurs at puberty

(2) Oogonia are continuously added in the ovary even after birth of a female just like spermatogonia are added in testes of males

(3) Primary oocyte enters the process of meiosis – I in embryonic period while primary spermatocyte enters in meiosis – I at puberty

(4) Both primary oocyte and primary spermatocyte are suspended during the process of meiosis at a certain stage

52) Match the following for the levels of menstrual hormones

A.	Peak at 14^{th} day.	I.	Estrogen
B.	First Peak at $13/14^{th}$ and second peak at $24/25^{th}$ day.	II.	Inhibin
C.	Negligible level during first 14 days.	III.	LH
D.	High level on the 10^{th} day and inhibits FSH.	IV.	Progesterone

(1) A – III; B – IV; C – I; D – II

(2) A – I; B – III; C – IV; D – II

(3) A – IV; B – I; C – III; D – II

(4) A – III; B – I; C – IV; D – II

53) If fertilization does not occur which of the following event is most unlikely to occur ?

(1) Corpus luteum will disintegrate

(2) Menstrual flow will come out of vagina

(3) Placenta development will start

(4) Progesterone level declines

54) During mestrual cycle LH surge is more than FSH surge because of :-

(1) Estrogen

(2) Progesterone

(3) Inhibin

(4) Relaxin

55) Which of the following structure of the secondary oocyte undergoes changes during fertilization and prevents polyspermy?

(1) Zona pellucida

(2) Vitelline membrane

(3) Corona radiata

(4) Zona radiata

56) Why the chances of pregnency are very low in a lactating women till six months after delivery ?

(1) High levels of HCG in women kill sperms.

(2) High levels of estrogen and progesterone, secreted by the corpus luteum, that inhibit the secretion of gonadotropins.

(3) High levels of prolactin, inhibit the secretion of gonadotropins.

(4) All of these

57)

If in a sperm, proximal centriole becomes

non-functional, which of the following process will be affected?

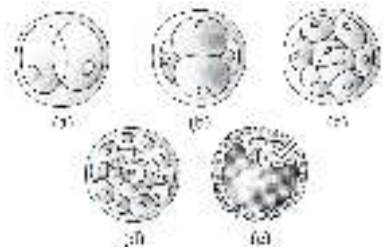
(1) Fertilization

(2) Spermiogenesis

(3) Movement of sperm

(4) Cleavage

58) In the following structures identify morula and Blastocyst respectively :-



(1) c & e

(2) c & d

(3) b & e

(4) a & d

59) Read following statements regarding mammary glands in human female.
(A) Milk is stored in mammary alveoli cavity in mammary glands.
(B) Milk synthesis occurs in them throughout the pregnancy.
(C) Total 15 – 20 mammary lobes are present in both breasts
(D) Mothers milk contains antibodies
Which of the above statements are **incorrect** ?

(1) A, B and C

(2) A, B and D

(3) A, C and D

(4) B and C

60) Which type of cells have the potency to give rise to all the tissue and organs in embryo ?

(1) Trophoblast of trophoectoderm

(2) Stem cells of inner cell

(3) Ectoderm

(4) Amniogenic cells

61) Consider the following statements:
a. In amniocentesis, small sample is taken from the foetus blood.
b. Foetal sex can be determined through amniocentesis by studying the chromosomal pattern in amniotic fluid.
Select the **correct** option.

(1) (a) is true, (b) is false

(2) Both (a) and (b) are false

(3) (a) is false, (b) is true

(4) Both (a) and (b) are true

62) **Statement - I :** Placenta facilitates the supply of oxygen and nutrients to the mother and also removal of CO_2 and excretory waste materials produced by the embryo.
Statement - II : Placenta form a structural and functional unit between developing embryo and maternal body.
Choose the correct answer from the given options:

(1) Both statement - I and statement - II are correct.

(2) Statement - I is correct but statement II is not correct.

(3) Both statement - I and statement - II are not correct.

(4) Statement - I is not correct but statement - II is correct.

63) Given below are two statements :
Statement-I : Primary oocyte grows in size and completes its first meiotic division within the secondary follicle.
Statement-II : During oogenesis first meiotic division is unequal division resulting in the formation of secondary oocyte and first polar body.

(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.

64) Two statements are given as Assertion (A) and Reason (R) : **Assertion (A) :** The corpus luteum secrete large amounts of progestrone which is essential for maintenance of the endometrium.
Reason (R) : Endometrium of uterus is necessary for implantation of the fertilised ovum and other event of pregnancy.
Which of the following option is correct regarding given statements :

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

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

(3) (A) is correct but (R) is not correct.

(4) (A) is incorrect but (R) is correct.

65) ***Statement-I :*** The female external genitalia include, cervix, mons pubis, labia major, labia minora, hymen, clitoris etc.
Statement-II : *Lactobacillus acidophilus* present within the vagina metabolise glycogen to lactic acid, rendering vaginal environment acidic.

(1) Both statement I and statement II are correct

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

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

(4) Both statement I and statement II are incorrect

66) **Assertion :** In post menopaused woman. FSH and LH level increased.
Reason : Low level of estrogen and progesterone give positive feedback.

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

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

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

(4) Both Assertion and Reason are false.

67) **Assertion :-** The endometrium undergoes cyclic changes during menstrual cycle.

Reason :- Changes in uterus are induced by changes in level of ovarian hormones.

(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.

68) In the given columns, column-I contain features of developing child and column-II contain the time of their occurrence. Select the correct match.

Column-I (Features of occurrence)		**Column-II (Time of there developing child)**	
A	Heart sound	I	By the end of the second month of pregnancy
B	Foetus develops limbs and digit	II	During the fifth month
C	Formation of major organ system	III	First sign of growing foetus
D	First movement of foetus and appearance of hair on head	IV	By the end of 12 weeks
E	Body covered with hair, eyelid separate, eyelashes are formed	V	By the end of 24 weeks

(1) A – I; B – II; C – III; D – IV; E – V

(2) A – III; B – I; C – IV; D – II; E – V

(3) A – II; B – I; C – III; D – V; E – IV

(4) A – III; B – IV; C – II; D – V; E – I

69) Which one of the following option gives the correct categorisation of component release from reproductive glands :-

	A Seminal vesicle	**B Prostate gland**	**C Cowpers gland**
(1)	Fructose fibrinogen	Citric acid lactic acid	Lubricant acidic fluid
(2)	Fructose prostaglandin	Phosphate sulphate	Profibrinolysin allkaline fluid
(3)	Fructose fibrinogen	Citric acid profibrinolysin	Lubricant alkaline fluid
(4)	Citrate Inositol	Citric acid calcium	Citric acid clotting enzym

(1) 1

(2) 2

(3) 3

(4) 4

70) In a female undergoing tubectomy, which one of the following event will not occur?

(1) Menstruation cycle
(2) Ovulation
(3) Fusion of sperm and ovum
(4) Formation of graafian follicle

71) Lack of menstruation (amenorrhoea) may be indicative of

(1) Pregnancy
(2) Stress and poor health
(3) Lactation
(4) All of these

72) Estrous cycle differs from menstrual cycle as

(1) There is no discharge of blood
(2) Found in mammalian females other than primates
(3) Found in all mammalian females
(4) Both (1) & (2)

73) Select the **incorrectly** matched pair w.r.t. the term and its related explanation

(1) Menarche – Start of menstruation
(2) Menorrhagia – Excessive bleeding
(3) Dysmenorrhea – Irregular menstruation
(4) Amenorrhea – Absence of menstruation

74) Which phase of menstrual cycle remains fairly constant even if cycle is of 34 days?

(1) Follicular phase
(2) Secretory phase
(3) Menstrual / bleeding phase
(4) Proliferative phase

75) Rapid secretion of LH leading to its maximum level during the mid-cycle called LH surge induces rupture of Graafian follicle and thereby the release of ovum known as :

(1) Ovulation
(2) Menstruation
(3) Both (1) & (2)
(4) Oogenesis

76) Foetal ejection reflex during parturition triggers by the release of which hormone?

(1) Oxytocin
(2) Vasopressin
(3) Inhibin

(4) Relaxin

77) Hormone **not** released by placenta is

(1) hCG
(2) hPL
(3) ADH
(4) Progestogens

78) The zona pellucida membrane is

(1) Example of primary egg membrane
(2) Non cellular membrane
(3) Made up of glycoprotein
(4) All

79) During child birth oxytocin is released from

(1) Placenta
(2) Mother's pituitary
(3) Foetal pituitary
(4) All

80) Which one of the following is the correct matching of the events occuring during menstruation cycle?

(1) Menstruation : Breakdown of myometrium
(2) Proliferative : Estrogen gradually derease phase
(3) Ovulation : Due to FSH surge
(4) Secretory : Development of corpus Luteum phase

81)

Relaxin is produced by

(1) Ovary
(2) Adrenal cortex
(3) Pituitary gland
(4) Thyroid gland

82) What are the source of inhibin in female :-

(1) Granulosa cells
(2) Corpus Luteum
(3) Ovary
(4) All of the above

83) Which hormone initiate parturition process:-

(1) Oestrogen
(2) LH
(3) Progesterone
(4) Cortisol

84) LH surge causes :-

(1) Release of secondary oocyte
(2) Release of second polar body
(3) Release of corpus luteum
(4) Release of primary oocyte

85) Which one of the following is **incorrect** match?

(1) Myometrium : Exhibits strong contractions during delivery of the baby
(2) Endometrium : Undergoes cyclical changes during menstrual cycle
(3) Perimetrium : Serosa of uterus
(4) Uterus : Birth canal

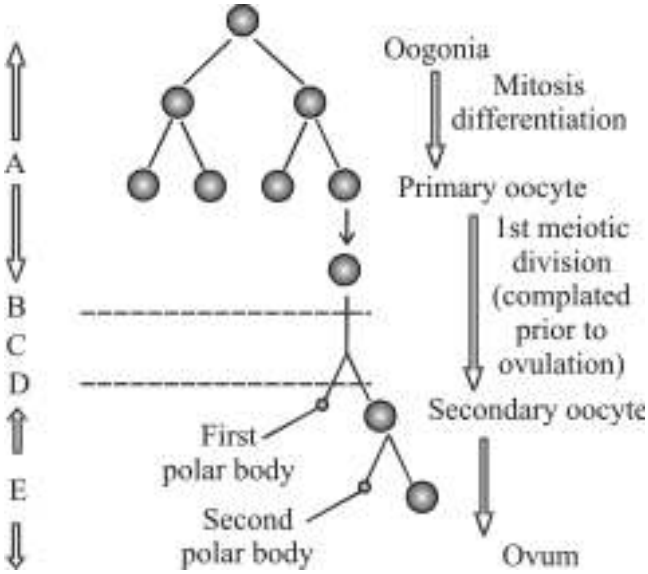
86) Read the following statements and select the correct option
Statement A: All copulations do not lead to fertilization and pregnancy.
Statement B: Fertilization is possible only if ovum and sperms are transported simultaneously to the ampullary region.

(1) A is true and B is incorrect statement
(2) Both A and B statements are correct
(3) Only B statement is correct
(4) Both A and B are incorrect

87) Menstruation is initiated by

(1) A sudden release of FSH from the anterior pituitary
(2) A lack of estrogen and progesterone due to degeneration of the corpus luteum
(3) An increased release of estrogen and progesterone from the corpus luteum
(4) A sudden drop in FSH

88) The following refers to schematic representation of oogenesis.
Identify A to E **correctly** :



(1) A - Fetal life, B - Birth, C - Puberty, D - Adult reproductive life, E - Child body

(2) A - Fetal life, B - Birth, C - Child hood, D - Puberty, E - Adult reproductive life

(3) A - Adult reproductive life, B - Birth, C - Puberty, D - Child hood, E - Fetal life

(4) A - Birth, B - Child hood, C - Fetal life, D - Puberty, E - Adult reproductive life

89) **Assertion (A) :-** Spermatogenesis starts at the age of puberty.
Reason (R) :- Significant increase in the secretion of gonadotropin releasing hormone (GnRH)

(1) Both (A) & (R) are correct but (R) is not the correct explanation of (A)

(2) (A) is correct but (R) is not correct.

(3) (A) is not correct but (R) is correct.

(4) Both (A) & (R) are correct and (R) is the correct explanation of (A)

90) **Assertion (A):-** The second meiotic division of the secondary oocyte completes during fertilisation.
Reason (R) :- The second meiotic division is unequal and results in the formation of a second polar body and a diploid ovum.

(1) A is false but R is true

(2) A is true but R is false

(3) Both A and R are true and R is not the correct explanation of A

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

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

CHEMISTRY

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

BIOLOGY

Q.	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110
A.	4	4	3	1	2	3	3	2	1	4	4	2	1	4	4	1	2	2	3	3
Q.	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
A.	3	2	4	1	3	4	2	1	3	2	1	3	3	3	3	3	1	2	2	2
Q.	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
A.	1	3	2	1	4	2	4	3	3	2	3	4	3	3	1	3	4	1	4	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	3	1	3	3	1	2	3	3	4	4	3	2	1	1	3	4	2	4
Q.	171	172	173	174	175	176	177	178	179	180										
A.	1	4	4	1	4	2	2	2	4	2										

PHYSICS

1)

whenever a dipole is placed In a non uniform electric field then it may experience a force as well as a torque depending on the type of external electric field.

2)

CONCEPTUAL

3) If charge of oil drop is q then

$q\vec{E} + \vec{Mg} = \vec{0}$

Here $\vec{E}$ is upwards and Mg is downwards so

$E = \frac{Q}{A\epsilon_0}$

q = Mg,

So in SI

$q = \frac{MgA\epsilon_0}{Q}$ but in CGS $\frac{1}{4\pi\epsilon_0} = 1$

In CGS

$q = \frac{MgA}{4\pi Q}$

4)

Conceptual

5)

K.E. $= \frac{1}{2}Mv^2 = \frac{1}{2}M(at)^2$

acceleration $a = \frac{QE}{M}$

$KE = \frac{1}{2}M\left(\frac{QE}{M}t\right)^2 = \frac{Q^2E^2t^2}{2M}$

So $KE \propto \frac{Q^2}{M}$

$\frac{KE_1}{KE_2} = \left(\frac{(2q)^2}{m}\right) \times \left(\frac{2m}{q^2}\right) = 8$

6)

CONCEPTUAL

7) If

$$\sum \frac{q_i q_j}{r_{ij}} = 0$$

then U = 0.

A. The system's potential energy can be zero if the sum of pairwise potential energies cancels out.
B. The potential energy of an individual charge can be zero if the reference is chosen at the charge's location.

Correct answer: Statement-1 is true, Statement-2 is true Hence, option (1) is correct.

8)

$W = q(V_D - V_A)$ where $V_D = V_A = \frac{kQ}{a} = 0$

9) $W = Q\vec{E}.\Delta\vec{r} = \left[\left(E_1\hat{i} + E_2\hat{j}\right).(c-a)\hat{i} + (d-b)\hat{j}\right](Q)$

$= [E_1(c\text{-}a) + E_2(d\text{-}b)Q]$

10) $\vec{r}_{AB} = \vec{r}_B - \vec{r}_A = 4\hat{i} + 3\hat{k}$

$V_B - V_A = -\int \vec{E}.d\vec{r} = \vec{E}.\vec{r}_{AB}$

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

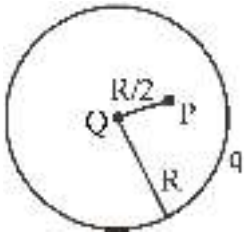
$= -20$ V

11) Conceptual

12)

Conceptual

13)



$\boxed{V_{in} = V_s = kq/R}$

$$V_p = \frac{kQ}{R/2} + \frac{kq}{R}$$

$$V_p = \frac{2Q}{4\pi\in_0 R} + \frac{q}{4\pi\in_0 R}$$

14)

There will be no loss of energy if the potential of the spheres is the same i.e. if

$V = \frac{q}{4\pi\varepsilon_0 r} = \frac{Q}{4\pi\varepsilon_0 R}$

or $\frac{q}{r} = \frac{Q}{R}$. Hence the correct choice is (2)

15) $\vec{E} = -\frac{\partial V}{\partial x}\hat{i}$

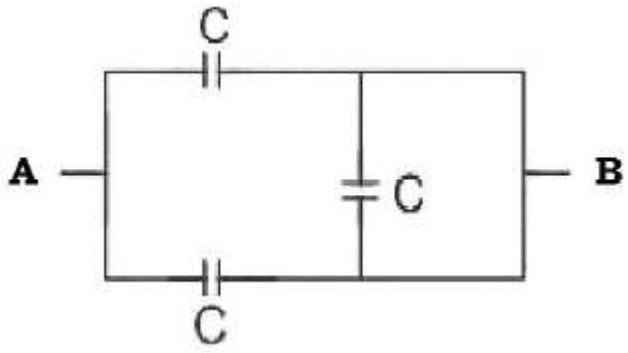
$= -8x\hat{i}$

at x=1,

$\vec{E} = -8\hat{i}$

so, 8 V/m along negative x axis.

16) NCERT Pg. # 45



17)

conceptual

18)

Assertion :- True → electron are negatively charged so they move opposite to the direction of electric field from low to high potential.

Reason is correct explanation of assertion because negative charges move towards higher potential from lower potential and electrons are negatively charged.

19)

Formula:

$a = qE/m \Rightarrow a \alpha \frac{q}{m}$

Calculation:

For proton- $\frac{q}{m} = \frac{e}{m_p}$

For deuteron- $\frac{q}{m} = \frac{e}{2m_p}$

For alpha particle- $\frac{q}{m} = \frac{e}{4m_p} = \frac{e}{2m_p}$

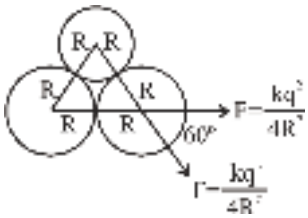
Taking ratios-

Proton : Deuteron : Alpha= $\frac{e}{m_p} : \frac{e}{2m_p} : \frac{e}{2m_p} = 2 : 1 : 1$

Final Answer:
2 : 1 : 1

Correct Option- (2)

20) When a body acquires positive charge, it means that it lost few electrons. In this way its mass decreases.

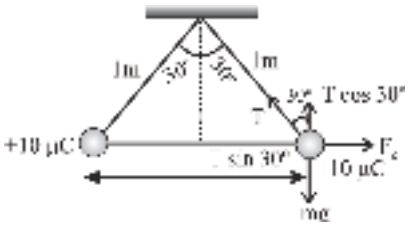
21) 

$= F_{net} = \sqrt{3}\frac{Kq^2}{4R^2}$

$= \frac{\sqrt{3}}{16\pi\varepsilon_0} \cdot \left(\frac{q}{R}\right)^2$

22)

In the following figure, in equilibrium
$F_e = T \sin 30º$, r = 1 m



$\Rightarrow 9 \times 10^9 . \frac{Q^2}{r^2} = T \times \frac{1}{2} \Rightarrow 9 \times 10^9 . \frac{\left(10 \times 10^{-6}\right)^2}{1^2} = T \times \frac{1}{2} \Rightarrow T =$ 1.8 N

23) From the Gauss' law $\phi = \frac{q_{enclosed}}{\varepsilon_0}$ in which $q_{enclosed}$ is the net charge inside an imaginary closed surface

24) $\Delta U = q\Delta V$
Sign of ΔU depends on sign of q.

25) $\vec{A} = 100\hat{k}$
$\vec{E} = 8\hat{i} + 4\hat{j} + 3\hat{k}$
Flux = $\vec{E} \cdot \vec{A} = 300$

26)

(i) electric field inside a unformely charged shell is zero

(ii) force on any charge = QE

Calculation:

Assertion is true:-

F = qE = q (0)= 0

Reason is correct explanation formation the force is zero because electric field inside shell is zero.

27) $\tan\theta = \frac{kq_1q_2}{mgr^2}$

28)

For point P(a < r < b):

Due to Q_1 on sphere A: $V_1 = \frac{1}{4\pi\varepsilon_0}\frac{Q_1}{r}$

Due to Q_2 on sphere B: $V_2 = \frac{1}{4\pi\varepsilon_0}\frac{Q_2}{r}$

Due to Q_3 on sphere C: $V_3 = \frac{1}{4\pi\varepsilon_0}\frac{Q_3}{C}$

Total Potential:

$V_P = V_1 + V_2 + V_3 = \frac{1}{4\pi\varepsilon_0}\left(\frac{Q_1}{r} + \frac{Q_2}{r} + \frac{Q_3}{C}\right)$

Final Answer:

Thus, the correct Answer if option 3.

$\left[V_P = \frac{1}{4\pi\varepsilon_0}\left(\frac{Q_1+Q_2}{r} + \frac{Q_3}{C}\right)\right]$

29)

$U = \frac{1}{2}CV^2$

 V is constant

 $U \propto C$

on inserting dielectric slab.

C becomes K times $\left(\text{as } C = \frac{\in_0 A}{d}\right)$

So U will also become K times.

Now $\sigma = \frac{Q}{A} = \frac{CV}{A}$

 V and A are constants.

$\therefore \sigma \propto C$

On inserting dielectric slab, C becomes K times

So, σ will also become K times.

30)

NCERT

31) $\left[\phi_{G.S} = \frac{q_{enclosed}}{\in_0}\right]$

32)

R is not true

33)

F_{net} = 0, Torque = pE sin θ

34) $U_1 = U_2$

$\frac{1}{2}C_1V_1^2 = \frac{1}{2}C_2V_2^2$

(900 mF) × $(100)^2$ = (100 mF) V_2^2

V_2 = 300 V

35)

Energy density $= \frac{1}{2}\varepsilon E^2$

here ε = kε₀

36) $U = \frac{1}{2}C\left(V_2^2 - V_1^2\right)$

$U = \frac{1}{2} \times 6 \times 10^{-6}(400 - 100)$

= 900 μJ

37)

Energy density = u

$u = \frac{1}{2}E_0E^2$, if $E = \frac{\sigma}{\varepsilon_0}$

$u = \frac{1}{2}\varepsilon_0\left(\frac{\sigma}{\varepsilon_0}\right)^2 = \frac{\sigma^2}{2\varepsilon_0}$

If $E = \frac{v}{d}$, $u = \frac{1}{2}\varepsilon_0\left(\frac{v}{d}\right)^2$

$\sigma = \frac{Q}{A} \Rightarrow u = \left(\frac{Q}{A}\right)\frac{2}{2E} = \frac{Q^2}{2A^2\varepsilon_0}$

option (3) is not energy density

38)

Conceptual

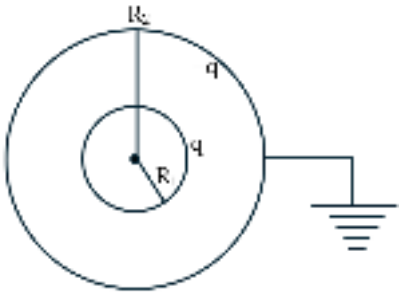
39) $C' = \frac{k\varepsilon_0 A}{d'} = \frac{6\varepsilon_0 A}{d/2} = \frac{12\varepsilon_0 A}{d}$

$C = \frac{\varepsilon_0 A}{d} = 8\mu F$

$\frac{C'}{C} = 12 \Rightarrow C' = 12 \times C$

C' = 12×8 = 96

40) **Question Explanation:** We need to find capacitance of given system.
Concept : Capacitance of spherical capacitor.
Solution :



The potential difference (V)

$= \frac{kq}{R_1} - \frac{kq}{R_2}$

$\Rightarrow V = \frac{1}{4\pi\varepsilon_0} \cdot q \cdot \left\{\frac{R_2 - R_1}{R_1 R_2}\right\}$

$\Rightarrow q = \left\{4\pi\varepsilon_0 \frac{R_1 R_2}{(R_2 - R_1)}\right\} V$

q = {e} V

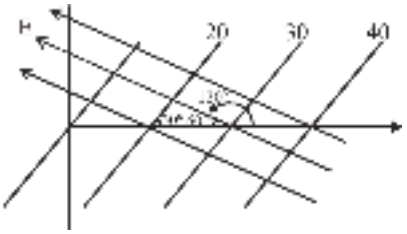
$\Rightarrow C = 4\pi\varepsilon_0 \frac{R_1 R_2}{R_2 - R_1}$

$\Rightarrow \boxed{C \propto \frac{R_1 R_2}{R_2 - R_1}}$

Final Answer : option (4).

41) $E \Rightarrow \frac{\Delta V}{\Delta r} \Rightarrow \frac{10}{10 \sin 30 \times 10^{-2}}$

$\Rightarrow$ 200 V/m



42)

Given original capacitance = 1μF.
(V = volume)
$V_{inital} = V_{final}$

$$\frac{4}{3}\pi R^3 = 8 \times \frac{4}{3}\pi r^3$$

$$r = \frac{R}{2}$$

Each drop has radius R/2, so its capacitance becomes 1/2 μF.
Answer: Option:3

$$\frac{1}{2}\mu F$$

43) **(C) Formula :** $C = \frac{\varepsilon A}{d}$
where:
C is capacitance
ε is permittivity of the medium,
A is plate area,
d is plate separation.
(E) Final Answer : (3)

44)

CONCEPTUAL

45)

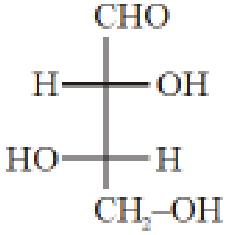
Draw direction forces and apply principle of superpostion.

CHEMISTRY

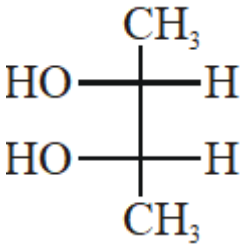
46)

All the above

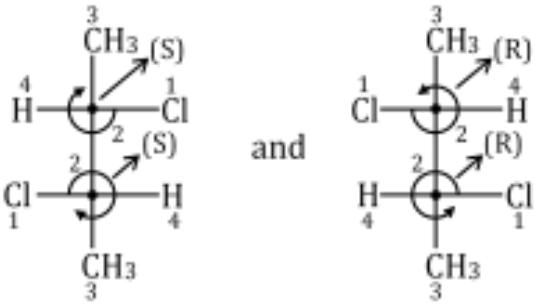
47) ⇒ When – NH_2 / – OH in correct Fischer projection formula is on lift hand side on last chiral carbon then we assign L



∴ is assigned as "L"



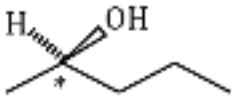
48)



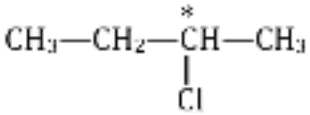
49)

So they are not diastereomers.

They are enantiomers.



Chiral centre



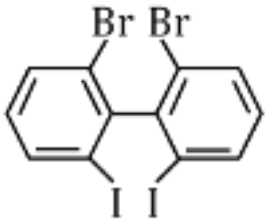
Chiral centre

Optically active = 2

50)

51)

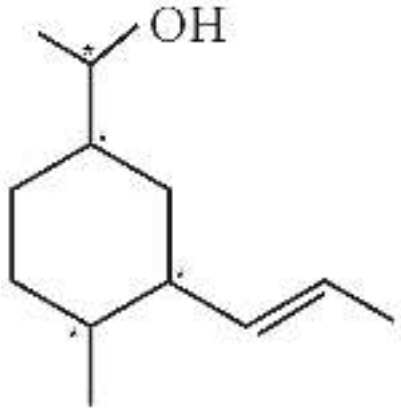
2S, 3R



52)

All four ortho positions are occupied by bulky groups, so rings become ⊥ to each other to minimize repulsion.

So, this compound is optically active.



53)

unsymmetrical compound

n = no of system about which stereo isomers possible.

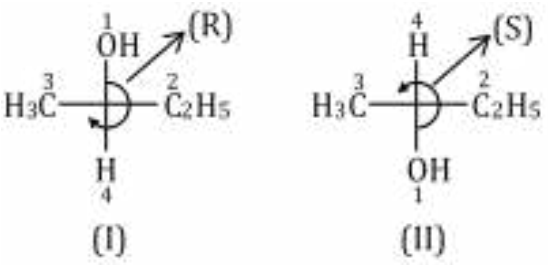
Total no of oprical isomers = 2^n

n = 5

Total ***stereoisomers*** = $2^5 = 32$

54)

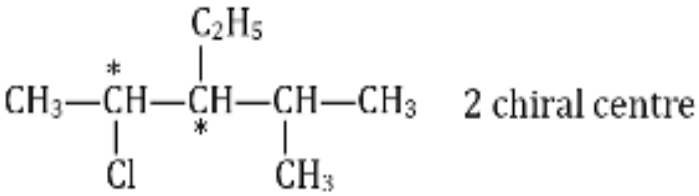
Center of symmetry



55)

So the compounds are enantiomers.

56) Diastereomers



57)

58)

Resolution

59)

Corey-house reaction

60) Product is propane

61)

Both (1) and (3)

62)

Isopentane

63)

b > d > a > c

64)

NCERT

65)

NCERT pg. #

66)

In Wurtz Reaction →
(a) It can proceed through free radical mechanism
(b) Alkanes having even no. of C-atom can be prepared
(d) Sodium in dry ether is used

67)

NCERT pg. #

68)

NCERT

69) Weight of solute = 1g
(non-electrolyte)
Weight of solvent = 50 g
(Benzene)
$\Delta T_f = 0.40$ K, $K_f = 5.12$ K kg mol^{-1}
Molar mass of solute = ?

$$\Delta T_f = K_f \times \frac{w_{solute}}{(Mw)_{solute}} \times \frac{1000}{w_{solvent\ (g)}}$$

$$0.40 = 5.12 \times \frac{1}{(Mw)_{solute}} \times \frac{1000}{w_{solvent}}$$

$$(Mw)_{solute} = \frac{5.12 \times 1000}{0.40 \times 50} = \frac{5120}{4 \times 5} = 256g$$

70) **Solution/Explanation:**
Molarity = 2m
density = 1.28 g/cm^3
m = ?

$$m = \frac{1000\ m}{1000\,d - MM_A}$$

$$m = \frac{1000 \times 2}{1000 - 1.28 - 2 \times 40}$$

m = 1.67 mol/ y
Hence the correct answer is option (3)

71)

Explaining the question : Incorrect concept for ideal solutions.
Concept : Raoult's law.
Solution : For an ideal solution, (Enthalpy change) $\Delta H_{mix}=0$, (ΔU_{mix}) are also zero and (Volume change)$\Delta V_{mix} = 0$, (Entropy change) ($\Delta S_{mix}>0$).
Also, $\Delta P=0$ (obeys Raoult's law).
For an ideal solution, $\Delta G_{mix}=-T\Delta S_{mix}<0$
However, ΔG_{mix} for spontaneous mixing is always negative, not zero.

Final Answer Option : (2)

72) **Solution/Explanation:**
Relative lowering of vapour pressure

$$\frac{P^\circ - P_S}{P^\circ} = \frac{w_A \times m_B}{m_A \times w_B}$$

$$\frac{760 - 732}{760} = \frac{6.5 \times 18}{m_A \times 100}$$

$m_A = 31.75$

$$\Delta T_b = \frac{6.5 \times 1000}{31.75 \times 100} \times 0.52$$

$\Delta T_b = 1.064$
$T_{Solution} = 100 + 1.064 = 101.064°C$
Final Answer = 101 °C
Hence the correct answer is option (1)

73) **Solution/Explanation:**
$P_{gas} = K_m X_{gas} \rightarrow$ Henrys law
$P_1 = \overset{o}{P} X_1$ Raoult's Law
$P_{Total} = P_1 + P_2 \rightarrow$ Dalton's Law

$\frac{d}{dt} = \frac{+\Delta Hv}{RT^2}$ → Clausius clooperon equation
Hence the correct answer is option (2)

74) **Solution/Explanation:**
π = i × CRT
π = 2.8 × 0.1 × 0.0821 × 300
π = 6.89 atm

$i = 1 - \alpha + n\alpha$
$i = 1 - 0.9 + 3 \times 0.9$
$i = 0.1 + 2.7$
i = 2.8
Final answer 6.89 atm.
Hence the correct answer is option (1)

75) **Solution/Explanation:**
Molality of all is same then depression is freezing point directly proportional to varthoff factor.
$\Delta T_f = i \times m \times k_f$
i for Urea = 1
i for $Ca(NO_3)_2$ = 3
i for Al $(NO_3)_3$ = 4
i for NaCl = 2
Freezing point $\propto \frac{1}{i}$
i low freezing point high
Final answer = Urea
Hence the correct answer is option (1)

76)

Non ideal solution form azeotropic mixture which are constant boiling azeotropes.

77) **Question Explanation :** The question asks which two processes occur at the same rate to establish the equilibrium between a solute, solvent and solution. Equilibrium is a dynamic state where the rates of forward and reverse processes are equal.

Given Data :
The equilibrium is represented as : Solute + Solvent ⇌ Solution.

Concept :
Solution

Solution :
In the given equilibrium :
The forward process is the dissolution of the solute into the solvent to form the solution.
The reverse process is the crystallization of the solute from the solution.

At equilibrium, the rate of dissolution must be equal to the rate of crystallization. If the rate of dissolution were higher, the concentration of the solution would increase. If the rate of crystallization were higher, the concentration of the solution would decrease. Only when these rates are equal does the concentration of the solution remain constant, which is the definition of equilibrium.

Hence,
Option (3) is correct : Dissolution, crystallization

Level : Easy

78)

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79)

Question Explanation :
For the reaction, $N_2 + 3H_2 \rightarrow 2NH_3$, if $d[NH_3]/dt = 2 \times 10^{-4}$ mol $L^{-1}s^{-1}$ the value of $-d[H_2]/dt$ would be?
Given Data:
Chemical equation : $N_2 + 3H_2 \rightarrow 2NH_3$
$d[NH_3]/dt = 2 \times 10^{-4}$ mol L^{-1} s^{-1}

Concept:
This question based on rate law.

Formula :
$$\frac{d[NH_3]}{dt} = 2 \times 10^{-4} \text{ mol } L^{-1}S^{-1}$$
$$\text{R.O.R.} = \frac{\text{Rate of disappearance of Reactant}}{\text{S.C.}} = \frac{\text{Rate of appearance of product}}{\text{S.C.}}$$

Solution/Explanation/Calculation:
Rate of appearance of NH_3 is given and rate of disappearance of H_2 is to found.
$N_2 + 3H_2 \rightarrow 2NH_3$

$$\frac{-d[H_2]}{3dt} = \frac{1}{2}\frac{d[NH_3]}{dt}$$

$$\frac{-d[H_2]}{dt} = \frac{3}{2} \times 2 \times 10^{-4}$$
$= 3 \times 10^{-4}$mol $L^{-1}S^{-1}$

Hence,
Option (2) is correct.

80)

A. Question Explanation

The question describes a reaction with a rate law: rate = $k[A]^2[B]$. It asks how the initial rate changes when the initial concentration of A is tripled while keeping the concentration of B constant.

B. Given Data

A. Rate law: rate = $k[A]^2[B]$

B. $[A]_2 = 3[A]_1$ (New concentration of A is three times the initial concentration)

C. $[B]_2 = [B]_{11}$(Concentration of B remains constant)

C. Concept

The rate law describes how the rate of a reaction depends on the concentration of reactants. Since the concentration of A is changing, we need to see how that affects the overall rate.

D. Mathematical Calculation

A. Initial rate: $rate_1 = k[A]_1^2[B]_1$

B. New rate: $rate_2 = k[A]_2^2[B]_2$

C. Substitute the given changes in concentration: $rate_2 = k(3[A]_1)^2[B]_1$

D. Simplify: $rate_2 = k \times 9[A]_1^2[B]_1$

E. Compare the new rate to the initial rate: $rate_2 = 9 \times (k[A]_1^2[B]_1) = 9 \times rate_1$

E. Final Answer

The new rate ($rate_2$) is 9 times the initial rate ($rate_1$).

Therefore, the correct answer is 2. increase by a factor of nine.

F. Question Level-EASY

81)

A. Question Explanation: The question provides experimental data for the bromination of acetone and asks for the rate equation. The options are:

B. Given Data

$[CH_3COCH_3]$ (M)	$[Br_2]$ (M)	$[H^+]$ (M)	ROD of Br_2 (Ms^{-1})
0.30	0.05	0.05	6×10^{-5}
0.30	0.10	0.05	6×10^{-5}
0.30	0.10	0.10	1.2×10^{-4}
0.40	0.05	0.20	3×10^{-4}

C. Concept: Rate Law

D. Mathematical Calculation

A. Order with respect to $[Br_2]$:

Comparing experiments 1 and 2, $[CH_3COCH_3]$ and $[H^+]$ are constant, while $[Br_2]$ is doubled, and the rate remains the same.(Rate2 / Rate1) = $([Br_2]_2 / [Br_2]_1)$ x $(6 \times 10^{-5\,/\,6} \times 10^{-5}) = (0.10 / 0.05) \times 1 = 2^x$ x = 0The reaction is zero order with respect to $[Br_2]$.

B. Order with respect to $[H^+]$:

Comparing experiments 2 and 3, $[CH_3COCH_3]$ and $[Br_2]$ are constant, while $[H^+]$ is doubled, and the rate is doubled.(Rate3 / Rate2) = $([H^+]_3 / [H^+]_2)$ y $(1.2 \times 10^{-4} / 6 \times 10^{-5}) = (0.10 / 0.05)$y 2 = 2 y y = 1The reaction is first order with respect to $[H^+]$.

C. Order with respect to $[CH_3COCH_3]$:

Comparing experiments 1 and 4, we need to consider the changes in both $[CH_3COCH_3]$ and $[H^+]$.Let the order with respect to $[CH_3COCH_3]$ be z.(Rate4 / Rate1) = $([CH_3COCH_3]4 / [CH_3COCH_3]1)^z$ * $([H^+]_4 / [H^+]1)^1$ $(3 \times 10^{-4} / 6 \times 10^{-5}) = (0.40 / 0.30)$ z × (0.20 / 0.05) 1 5 = (4/3) z × 4 5/4 = (4/3) z 1.25 = (1.33) z z ≈ 1The reaction is approximately first order with respect to $[CH_3COCH_3]$.Therefore, the rate equation is: Rate = $k[CH_3COCH_3][H^+]$E. Final Answer The correct rate equation is Rate = $k[CH_3COCH_3][H^+]$, which corresponds to option 4.
F. Question Level-TOUGH

82)

A. Question Explanation

An elementary reaction's molecularity is defined as the total number of reactant species (molecules or atoms) that collide simultaneously in that single step.
B. Given Data

A. The elementary step is:

$$2X + Y \longrightarrow Z + W$$

C. Concept

A. Molecularity = the sum of stoichiometric coefficients of reactants in the elementary step.
D. Mathematical Calculation

Molecularity = 2(from X) + 1(from Y) = 3

E. Final Answer Option (1)
F. Question Level

Medium

83) **Question Explanation:**
You are given experimental data for a reaction:
A + B → C, along with concentrations of [A], [B] and the rate of reaction for different experiments.
We are to determine the correct rate law from the data by comparing how the rate changes when [A] and [B] are varied.

Given Data:

Exp.	[A]	[B]	Rate
1	0.012	0.035	0.10
2	0.024	0.070	0.80
3	0.024	0.035	0.10
4	0.012	0.070	0.80

Concept: Rate Law

Solution:
The rate law for a reaction is generally of the form:

$$\text{Rate} = k[A]^x[B]^y$$

To find x and y (orders with respect to A and B), we analyze the change in rate as we vary [A] and [B], one at a time.

Mathematical Calculation:
Step 1: Find order with respect to A
Compare Exp 1 and Exp 3:

A. [A] doubles: 0.012 → 0.024
B. [B] is constant: 0.035
C. Rate is constant: 0.10 → 0.10

$$\frac{\text{Rate}_3}{\text{Rate}_1} = \left(\frac{[A]_3}{[A]_1}\right)^x = \left(\frac{0.024}{0.012}\right)^x = 2^x = 1 \Rightarrow x = 0$$

So, rate is independent of [A]
⇒ x = 0

Step 2: Find order with respect to B
Compare Exp 1 and Exp 4:

A. [A] is constant: 0.012
B. [B] doubles: 0.035 → 0.070
C. Rate: 0.10 → 0.80

$$\frac{\text{Rate}_4}{\text{Rate}_1} = \left(\frac{[B]_4}{[B]_1}\right)^y = \left(\frac{0.070}{0.035}\right)^y = 2^y = \frac{0.80}{0.10} = 8 \Rightarrow 2^y = 8 \Rightarrow y = 3$$

So, rate ∝ $[B]^3$

Final Answer: Option (1)

84) 36 g $O_2 = \frac{36}{32} = 1.125$ $molL^{-1}min^{-1}$

$-\frac{1}{2}\frac{[H_2O_2]}{dt} = \frac{d[O_2]}{dt}$

$-\frac{d[H_2O_2]}{dt} = 2 \times \frac{d[O_2]}{dt} = 2 \times 1.125$

$= 2.25$ $molL^{-1}min^{-1}$

85)

Asking :- Rate low expression
Concept :- rate law
Solution :- given relation

$$\frac{1}{2}\frac{d[c]}{dt} = -\frac{1}{3}\frac{d[A]}{dt} = \frac{1}{4}\frac{d[A]}{dt} = \frac{-d[B]}{dt}$$

where –ve espression show reactant & +ve expression show product & penominator inter ger show. stoichiomeri coefficient
so that reaction will be
3D + B → 2c + 4A
Correct ans. → option 2

86) Rate $= \frac{-1}{2}\frac{d[NO]}{dt} = \frac{-1}{2}\frac{d[H_2]}{dt}$

$= \frac{d[N_2]}{dt} = \frac{1}{2}\frac{d[H_2O]}{dt}$

$\Rightarrow \frac{1}{2}k_1'[NO][H_2] - \frac{1}{2}k_1''[NO][H_2]$

$= k_1[NO][H_2] = \frac{1}{2}k[NO][H_2]$

$\rightarrow \frac{k_1'}{2} = \frac{k_1''}{2} = k_1 = \frac{k}{2}$

$\Rightarrow k - 2k_1 = k_1' - k_1''$

87) $ROR = \frac{-d[A]}{\frac{dt}{2}} = \frac{-[0.3-0.8]}{5 \times 2}$

$\frac{0.5}{5 \times 2} = \frac{0.1}{2} = 5 \times 10^{-2}$ $M.min^{-1}$

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88) $\frac{R_A}{4} = \frac{R_B}{1} = \frac{R_C}{2} = \frac{R_D}{2}$

89) For 1st order : $t_{1/2} = \frac{0.693}{k}$

90) $\frac{R_2}{R_1} = \left(\frac{B_2}{B_1}\right)^y$

$2 = (2)^1 \Rightarrow y = 1$

$\frac{R_2}{R_1} = \left(\frac{A_2}{A_1}\right)^x \left(\frac{B_2}{B_1}\right)^y$

$8 = (2)^x (2)^1$

$\Rightarrow x = 2$

BIOLOGY

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