PHYSICS

1) Two objects are rubbed against each other, the nature of electric force, when they are placed at some distance is :

(1) Attractive
(2) Repulsive
(3) Both (1) and (2)
(4) Either (1) or (2)

2) Select the correct alternative :-

(1) The charge gained by the uncharged body from a charged body due to conduction is equal to charge initialy present.
(2) The magnitude of charge increase with the velocity of charge.
(3) Charge cannot exist without matter although matter can exist without charge.
(4) Attraction is the true test of electrification

3) If one faraday positive charge is given to a body, then it means that :-

(1) One electron is taken out from it
(2) N_A electrons is given to it
(3) N_A electrons are taken out from it
(4) 6.25×10^{18} electrons are given to it

4) When an isolated body is earthed, electrons from the body flow into the earth. This means the body is initially :

(1) Uncharged
(2) Charged negatively
(3) Charged positively
(4) an insulator

5)

Match the facts given in column I with column II:

Column-I		Column-II	
I.	Charge cannot exist	a.	without charge
II.	Mass can exist	b.	without mass

III.	Charge is	c.	not conserved
IV.	Mass is	d.	conserved

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

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

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

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

6) **Assertion :** Total charge of an isolated system remains conserved.
Reason : Charge is a scalar quantity.

(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.

7) ***Assertion (A) :-*** Coulombic force follows the principle of superposition.
Reason (R) :- Coulombic force is a two charge particle interaction.

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

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

(3) **(A)** is incorrect but **(R)** is correct.

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

8) Two parallel infinite long straight wire having linear charge densities +λc/m and –2λc/m linear are placed at a distance 2R in free space. What is the electric field mid way between the two line charges

(1) $\frac{3\lambda}{2\pi\varepsilon_0 R}$

(2) $\frac{\lambda}{2\pi\varepsilon_0 R}$

(3) $\frac{\lambda}{4\pi\varepsilon_0 R}$

(4) $\frac{3\lambda}{4\pi\varepsilon_0 R}$

9) Match the Column-I with Column-II :-

Column-I		Column-II	
I.	ε_0	a.	$M^{\circ}L^{\circ}T^{\circ}A^{\circ}$
II.	ε_r	b.	$\left[M^1L^1T^{-2}\right]$
III.	E	c.	$\left[M^{-1}L^{-3}T^4A^2\right]$
IV.	F	d.	$\left[M^1L^1T^{-3}A^{-1}\right]$

(Where :-
F $\rightarrow$ force
E $\rightarrow$ electric field
$\varepsilon_0 \rightarrow$ Permittivity of free space
$\varepsilon_r \rightarrow$ Relative permittivity of medium.)

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

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

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

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

10) Two conducting spheres A & B having radius 2 cm and 3 cm has charge 4μC and 5μC respectively. If they are touched with each other find final charge on 'A' :-

(1) $\frac{27}{5}\mu C$

(2) $\frac{5}{18}\mu C$

(3) $\frac{5}{27}\mu C$

(4) $\frac{18}{5}\mu C$

11) A charge Q is divided into two parts Q_1 and Q_2 and these charges are placed of a distance R. There will be a maximum repulsion between them when :

(1) $\frac{Q_1}{Q_2} = \frac{1}{2}$

(2) $\frac{Q}{Q_1} = \frac{1}{2}$

(3) $\frac{Q_1}{Q_2} = \frac{1}{1}$

(4) $\frac{Q_2}{Q} = \frac{2}{1}$

12) Two particle of equal mass m and charge q are placed at a distance of 16 cm. They do not experience any net force. The value of $\frac{q}{m}$ is:

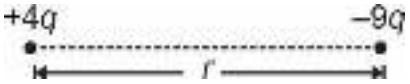
(1) $\sqrt{16\pi\epsilon_0 G}$

(2) $\sqrt{\frac{\pi\varepsilon_0}{G}}$

(3) $\sqrt{\frac{G}{4\pi\varepsilon_0}}$

(4) $\sqrt{4\pi\varepsilon_0 G}$

13) Two charges +4q and –9q are placed at separation ‘r’ as shown in the figure.



Net electric field due to these charges will be zero

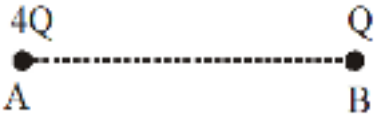
(1) At a distance 2r from –9q

(2) At a distance r from +4q

(3) At a distance 3r from +4q

(4) At a distance 3r from –9q

14) Force between A and B is F. If 75% charge of A is transferred to B then force between A and B is :



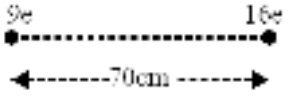
(1) $\frac{F}{4}$

(2) 4F

(3) F

(4) None

15) Two charges are placed as shown in figure. Where should a third charge be placed along the line joining of two point charges so that it remains in equilibrium



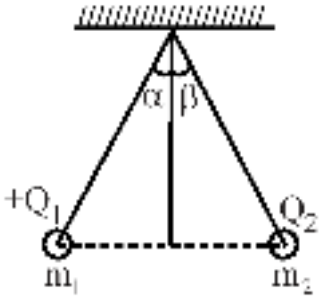
(1) 280 cm from 16e

(2) 40 cm from 16e

(3) 30 cm from 9e

(4) Both (1) and (2)

16) Consider the following charged suspended ball system. If α < β then the statements which can be true at equillibrium out of followings



(a) $Q_1 > Q_2$ $m_1 < m_2$
(b) $Q_1 > Q_2$ $m_1 > m_2$
(c) $Q_1 < Q_2$ $m_1 = m_2$
(d) $Q_1 < Q_2$ $m_1 > m_2$

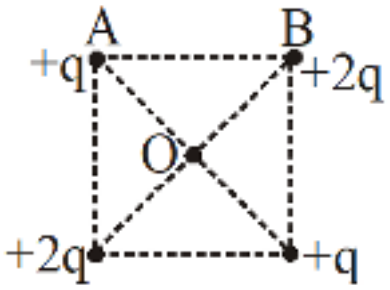
(1) Only d

(2) Only c

(3) (c,d)

(4) (b,d)

17) Four charges are arranged at the corners of a square ABCD as shown in Fig. The force on a charge kept at the centre O is :



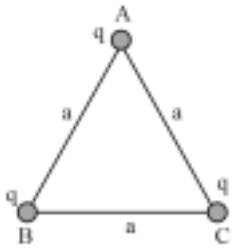
(1) Zero

(2) along diagonal AC

(3) along diagonal BD

(4) Perpendicular to the side AB

18) In the figure net electrostatic force on charge at A



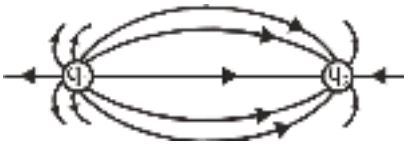
(1) $-\frac{kq}{a^2}$

(2) $-\frac{kq^2}{2a^2}$

(3) $\frac{kq^2}{2a^2}$

(4) $\frac{\sqrt{3}kq^2}{a^2}$

19) Electric field lines due to charge q_1 and q_2 are shown below then :-



(1) $|q_1| < |q_2|$

(2) $|q_1| > |q_2|$

(3) $\frac{|q_1|}{|q_2|} = \frac{4}{5}$

(4) $|q_1| = |q_2|$

20) An α-particle is situated in an electric field of strength 15×10^4 NC^{-1}. The force acting on it is :-

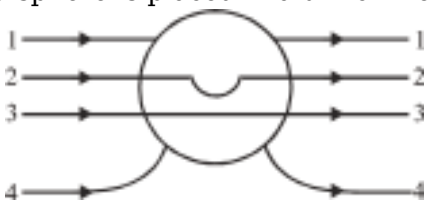
(1) 4.8×10^{-12} N

(2) 4.8×10^{-14} N

(3) 48×10^{-14} N

(4) None of these

21) A metallic solid sphere is placed in a uniform electric field. The lines of force follow the path(s) shown in figure as



(1) 1

(2) 2

(3) 3

(4) 4

22) Electric field is maximum due to a charged ring of radius R at a distance from circumference of the ring :

(1) $\frac{R}{\sqrt{2}}$

(2) $\sqrt{\frac{3}{2}}R$

(3) $\frac{\sqrt{3}}{2}R$

(4) $\sqrt{\frac{3}{2}R}$

23) The spatial distribution of the electric field lines due to charges (A, B) is shown in figure. Which one of the following statements is correct ?

(1) A is +ve and B is –ve and |A| < |B|

(2) A is –ve and B is +ve; |A| = |B|

(3) Both are +ve but |A| > |B|

(4) A is +ve and B is –ve and |A| > |B|

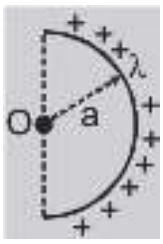
24) Electric lines of force about negative point charge are

(1) Circular, anticlockwise

(2) Circular, clockwise

(3) Radial, inward

(4) Radial, outward

25) Electric field at the centre 'O' of a semicircle of radius 'a' having linear charge density λ is given as :- 

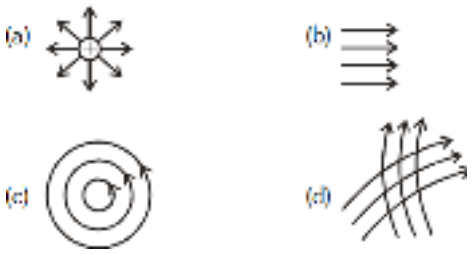
(1) $\frac{2\pi}{\epsilon_0 a}$

(2) $\frac{\lambda\pi}{\epsilon_0 a}$

(3) $\frac{\lambda}{2\pi\epsilon_0 a}$

(4) $\frac{\lambda}{\pi\epsilon_0 a}$

26) The figures shows electrostatic lines of force for a conservative electric field, which pattern is incorrect :-



(1) a,c

(2) b,c

(3) only d

(4) c,d

27) At a 10 meter distance from a point charge the electric field is 800V/m at that point the potential is :

(1) 80000 V

(2) 8000 V

(3) 800 V

(4) 80 V

28) A proton and an electron are placed in uniform electric field :-

(1) The electric forces acting on them will be equal

(2) The magnitudes of the force will be equal

(3) Their accelerations will be equal

(4) The magnitudes of their accelerations will be equal

29) -1×10^{-6} C charge is on a drop of water having mass 10^{-6} kg. What electric field should be applied

on the drop so that it is in the balanced condition with its weight ?

(1) 10 V/m upward
(2) 10 V/m downward
(3) 0.1 V/m downward
(4) 0.1 V/m upward

30) A sphere of radius R and charge Q is placed inside a concentric imaginary sphere of radius 2R. The flux associated with the imaginary sphere is _____.

(1) $\frac{Q}{\epsilon_0}$
(2) $\frac{Q}{2\epsilon_0}$
(3) $\frac{4Q}{\epsilon_0}$
(4) $\frac{2Q}{\epsilon_0}$

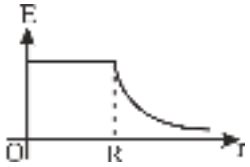
31) Two conducting spheres of radii r_1 and r_2 have equal surface charge density. The ratio of their charges is :-

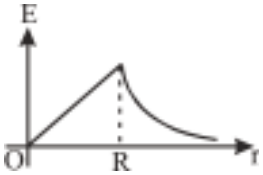
(1) $\left(\frac{r_1^2}{r_2^2}\right)$
(2) $\left(\frac{r_2^2}{r_1^2}\right)$
(3) $\left(\frac{r_1}{r_2}\right)$
(4) $\left(\frac{r_2}{r_1}\right)$

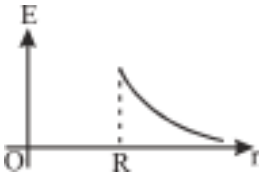
32) A charge Q is placed at the corner of a cube. The net out going electric flux through all the six faces of the cube is :-

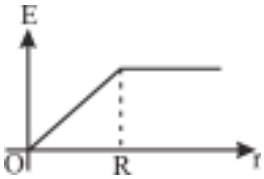
(1) $\frac{Q}{3\varepsilon_0}$
(2) $\frac{Q}{6\varepsilon_0}$
(3) $\frac{Q}{8\varepsilon_0}$
(4) $\frac{Q}{\varepsilon_0}$

33) The electric field due to a uniformaly charged non metallic sphere of radius R as a function of the distance from its centre is represented graphically by :-

(1) 

(2) 

(3) 

(4) 

34)

The given figure shows two parallel plates A and B of charge densities +σ and –σ respectively. Electric intensity will be zero in the :

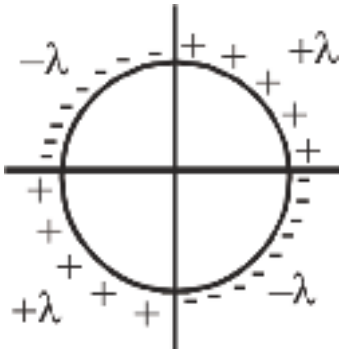
(1) region I

(2) region II

(3) region III

(4) region I and III

35) An arc of radius R is shown in the diagram with linear charge density. Find electric field at the centre :-

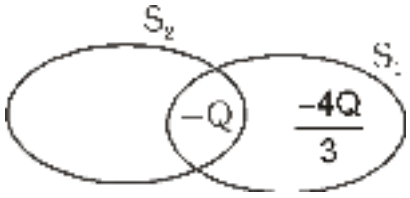


(1) $4\sqrt{2}\,\frac{k\lambda}{R}$

(2) $\sqrt{2}\,\frac{k\lambda}{R}$

(3) $\frac{k\lambda}{R}$

(4) Zero



36) The ratio of electric flux through surfaces S_1 and S_2 is:

(1) 1 : 1

(2) –3 : 1

(3) 3 : 1

(4) –1 : 3

37) The electric field at a distance $\frac{3R}{2}$ from the centre of a charged conducting spherical shell (hollow) of radius R is E. The electric field at a distance $\frac{R}{2}$ from the centre of the spherical shell is :-

(1) E

(2) E/2

(3) E/3

(4) Zero

38) Four particles each of mass m are placed at the vertices of a square of side □. The gravitational field at the centre of square :-

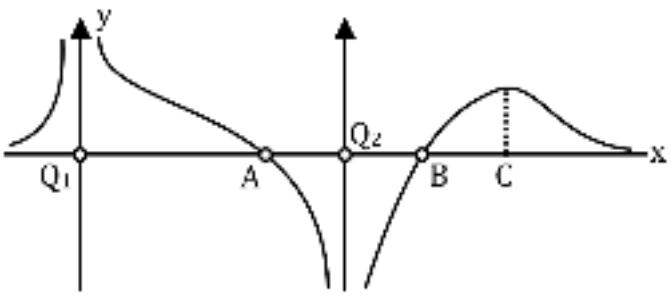
(1) $-2\frac{Gm}{\ell}$

(2) $-3\sqrt{2}\frac{Gm}{\ell}$

(3) $-2\sqrt{2}\frac{Gm}{\ell}$

(4) zero

39) The curve shown in figures represents the distribution of potential along the straight line joining the two charges Q1 and Q2 separated by a distance r then which of the following statements are correct ?



1. $|Q_1| > |Q_2|$
2. Q_1 is positive in nature
3. A and B are equilibrium points
4. C is a point of unstable equilibrium

(1) a and 2

(2) 1,2 and 3

(3) a2,2 and 4

(4) 1,2,3 and 4

40) In bringing an electron toward another electron, the electrostatic potential energy of the system :

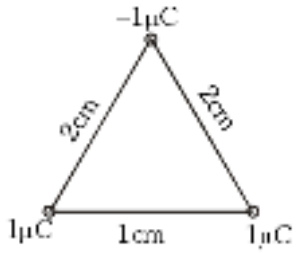
(1) Becomes zero

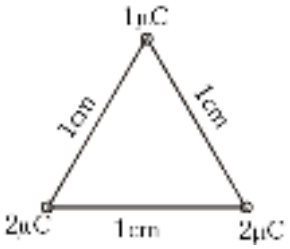
(2) Increases

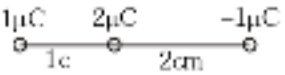
(3) Decreases

(4) Remains same

41) Which of the following systems of charges have zero electrostatic potential energy ?

(1) 

(2) 

(3) 

(4) None of these

42) Find gravitational potential energy of the system. 

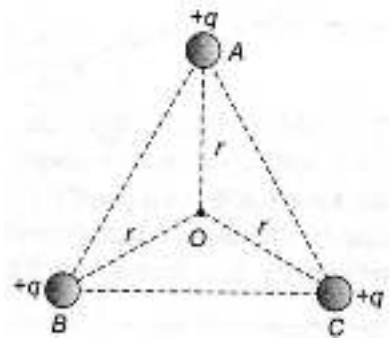
(1) $-\frac{5}{4}G$

(2) $-\frac{4}{5}G$

(3) $-\frac{3}{4}G$

(4) $-\frac{4}{25}G$

43) ABC is an equilateral triangle. Charges +q are placed at each corner. The electric intensity at O will be



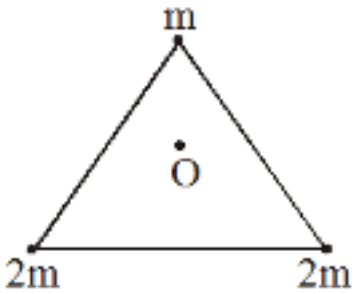
(1) $\frac{1}{4\pi\varepsilon_0}\frac{q}{r^2}$

(2) $\frac{1}{4\pi\varepsilon_0}\frac{q}{r}$

(3) zero

(4) $\frac{1}{4\pi\varepsilon_0}\frac{3q}{r^2}$

44) Gravitation field intensity at centre "O" due to following system of particles placed at vertices of an equilateral triangle of side length "a" :-



(1) $\frac{3Gm}{a^2}$

(2) $\frac{6Gm}{a^2}$

(3) $\frac{2\sqrt{3}Gm}{a^2}$

(4) $\frac{3\sqrt{3}Gm}{2a^2}$

45) Infinite number of bodies, each of mass 2 kg are situated on x-axis at distances 1m, 2m, 4m, 8m, ... respectively, from the origin. The resulting gravitational field due to this system at the origin will be :

(1) $\frac{8}{3}G$

(2) $\frac{4}{3}G$

(3) 4G

(4) G

CHEMISTRY

1) If four gases A, B, C and D have Henry's constant (K_H) values 1.9×10^{1}, 6.5×10^{-4}, 7.8×10^{-4} and 6.0×10^{3} bar respectively then which of the following gas has maximum solubility at same partial pressure?

(1) A

(2) B

(3) C

(4) D

2) 2 moles each of liquids A and B are dissolved to form an ideal solution. What will be the mole fraction of B in the vapour phase :- p_A^0 = 120 torr; p_B^0 = 80 torr.

(1) 1/4

(2) 1/2

(3) 2/5

(4) 3/5

3) One mole of non-volatile solute is dissolved in two mole of water. The vapour pressure of the solution relative to that of water is :-

(1) 2/3

(2) 1/3

(3) 1/2

(4) 3/2

4) Which of the following is correct for an non-ideal solution ?

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

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

(3) $P_A = P_A^0 X_A$

(4) $\Delta S_{mix} > 0$

5) 1 mole of heptane (v. p = 92 mm of Hg) was mixed with 4 moles of octane (v. p = 31 mm of Hg) The vapour pressure of resulting ideal solution will be:

(1) 93

(2) 43.2

(3) 30

(4) 28

6) Which of the following will form an ideal solution?

(1) C_2H_5OH and water
(2) HNO_3 and water
(3) $CHCl_3$ and CH_3COCH_3
(4) C_6H_6 and $C_6H_5CH_3$

7) Which of the following is a colligative property?

(1) Surface tension
(2) Viscosity
(3) Refractive index
(4) Osmotic pressure

8) Maximum osmotic pressure will be shown by which of the following solution :-

(1) 0.1 M $AlCl_3$
(2) 0.1 M $BaCl_2$
(3) 0.1 M NaCl
(4) 0.1 M sugar

9) What is the molarity of 0.4 N Na_2CO_3 solution:-

(1) 0.2 M
(2) 0.1 M
(3) 0.8 M
(4) 0.6 M

10) Which of the following is dependent on temperature.

(1) Mole fraction
(2) Molarity
(3) % by wt
(4) Molality

11) What will be normality of "20V H_2O_2" solution ?

(1) 1.78 N
(2) 3.56 N
(3) 10 N
(4) 0.28 N

12) The van't Hoff factor for 0.1 M $Ba(NO_3)_2$ solution is 2.74. The degree of dissociation is:

(1) 91.4%

(2) 87%

(3) 100%

(4) 75%

13) If 12 g of urea is dissolved in 500 g water then the freezing point of the solution will be (K_f of water = 1.86 K kg mol^{-1})

(1) –1.74°C

(2) –0.22°C

(3) –0.74°C

(4) –1.21°C

14) The boiling points of C_6H_6, CH_3OH, $C_6H_5NH_2$ and $C_6H_5NO_2$ are 80°C, 65°C, 184°C and 212°C respectively. Which of the following will have highest vapour pressure at room temperature?

(1) C_6H_6

(2) CH_3OH

(3) $C_6H_5NH_2$

(4) $C_6H_5NO_2$

15) The osmotic pressure of 0.1 M sodium chloride solution at 27°C is

(1) 4.0 atm

(2) 2.46 atm

(3) 4.92 atm

(4) 1.23 atm

16) If van't Hoff factor, i = 1, then

(1) It is dissociation

(2) It is association

(3) Both (1) & (2)

(4) Neither dissociation nor association

17) Which of the following gas does not obey Henry’s law?

(1) NH_3

(2) H_2

(3) O_2

(4) He

18) What will be the molarity of a solution containing 5g of sodium hydroxide in 250 mL solution ?

(1) 0.5

(2) 1.0
(3) 2.0
(4) 0.1

19) Which property is shown by an ideal solution ?

(1) It follows Raoult's law
(2) $\Delta H_{mix} = 0$
(3) $\Delta V_{mix} = 0$
(4) All of these

20) Which of the following solutions will have highest boiling point ?

(1) 1% Glucose in water
(2) 1% Sucrose in water
(3) 1% NaCl in water
(4) 1% Urea in water

21) The molal elevation constant of water is 0.51 K kg/mol. The boiling point of 0.1 molal aqueous NaCl solution is nearly :

(1) 100.05°C
(2) 100.1°C
(3) 100.2° C
(4) 101.0° C

22) Osmotic pressure of 0.585% w/v NaCl solution at 27°C is.

(1) 2.49 atm
(2) 5 atm
(3) 1.2 atm
(4) 3.8 atm

23) What volume of 0.1 N HNO_3 solution can be prepared from 6.3 g of HNO_3 ?

(1) 1 litre
(2) 2 litre
(3) 0.5 litre
(4) 5 litre

24)

The correct order of acidic strength is :-

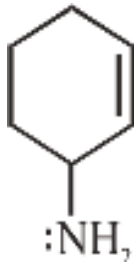
(1) Chloroacetic acid > Acetic acid > Fluoroacetic acid
(2) Chloroacetic acid > Fluoroacetic acid > Acetic acid

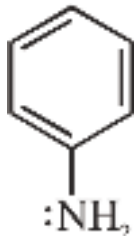
(3) Fluoroacetic acid > Chloroacetic acid > Acetic acid

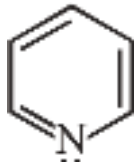
(4) Acetic acid > Fluoroacetic acid > Chloroacetic acid

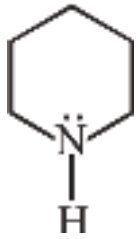
25)

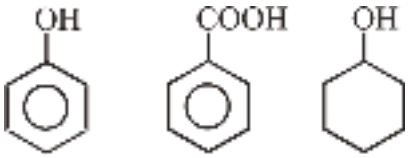
In which of following is minimum basic :-

(1) 

(2) 

(3) 

(4) 

26) Compare acidic strength :- 

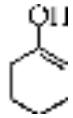
(1) a > b > c

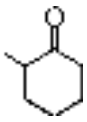
(2) b > a > c

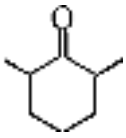
(3) c > b > a

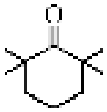
(4) None of these

27) Which of the following compound will not undergo tautomerism?

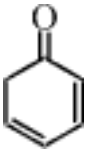
(1) 

(2) 

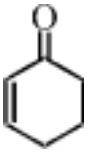
(3) 

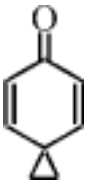
(4) 

28) Which of the following on enolisation give aromatic compound?

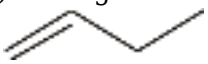
(1) 

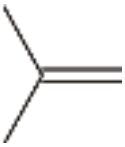
(2) 

(3) 

(4) 

29) Arrange stability order of following alkenes

(I)  (II) 

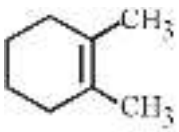
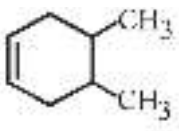
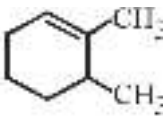
(III) 

(1) I > II > III

(2) III > II > I

(3) II > III > I

(4) III > I > II

 (I)  (II)  (III)

30) Which of following orders is correct for heat of hydrogenation of these compounds ?

(1) I > II > III

(2) III > II > I

(3) II > III > I

(4) III > I > II

31) Hyperconjugation essentially involves delocalisation of :-

(1) π e^-

(2) Lone pair e^-

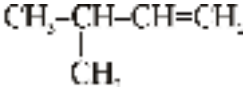
(3) σ e^-

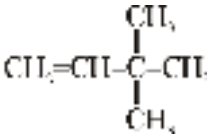
(4) Unpaired e^-

32) Hyperconjugation is shown by :-

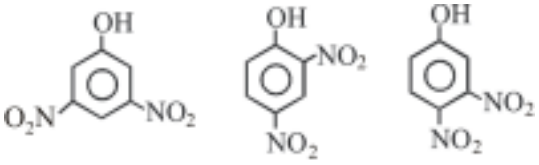
(1) $CH_3–CH_2–CH_3$

(2) $CH_2 = CH_2$

(3) 

(4) 

33) What is the correct order of pK_a for the following compounds ?



I II III

(1) II < III < I

(2) I < III < II

(3) III < I < II

(4) III < II < I

34) Electromeric effect is not observed in :-

(1) $CH_3–CN$

(2) $CH_2=CH_2$

(3) $CH_3–CH=O$

(4) $CH_3–OH$

35) Arrange the following in decreasing order of their basic strength

$C_6H_5NH_2$ $C_2H_5NH_2$ $(C_2H_5)_2NH$ NH_3

(i) (ii) (iii) (iv)

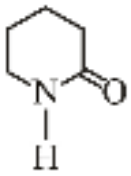
(1) (iii) > (ii) > (iv) > (i)

(2) (iv) > (i) > (iii) > (ii)

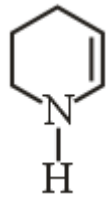
(3) (i) > (iii) > (ii) > (iv)

(4) (ii) > (iii) > (iv) > (i)

36) In which of the following compounds lone pair of nitrogen is not involved in resonance ?

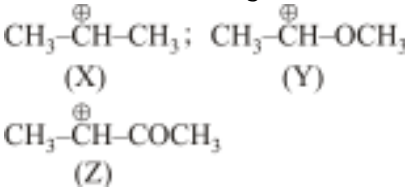
(1) 

(2) 

(3) 

(4) 

37) The decreasing order of the stability of the cations are :-



(1) X > Y > Z

(2) Y > X > Z

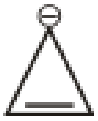
(3) Y > Z > X

(4) Z > Y > X

38) Aromatic species among the following is :-

(1) 

(2) 

(3) 

(4) 

39) Which of the following compound can produce aromatic species after deprotonation ?

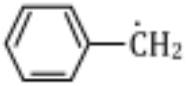
(1) 

(2) 

(3) 

(4) 

40) The correct order of stability of following carbon free radical is

(1) $(CH_3)_3\dot{C}$ (2)  (3) $CH_3\dot{C}H_2$ (4) $\dot{C}H_3$

(1) 1 > 2 > 3 > 4

(2) 4 > 3 > 2 > 1

(3) 2 > 3 > 1 > 4

(4) 2 > 1 > 3 > 4

41) The **correct** order of the basic strength of methyl substituted amines in aqueous solution is

(1) $(CH_3)_2NH > CH_3NH_2 > (CH_3)_3N$

(2) $(CH_3)_3N > CH_3NH_2 > (CH_3)_2NH$

(3) $(CH_3)_3N > (CH_3)_2NH > CH_3NH_2$

(4) $CH_3NH_2 > (CH_3)_2NH > (CH_3)_3N$

42) ***Assertion :-*** Phenol is more acidic than benzyl alcohol.

Reason :- $C_6H_5-O^{\ominus}$ is more stable than $C_6H_5-CH_2-O^{\ominus}$ due to resonance

(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

43) Match the column :-

	Column-I (Electronic effect)		**Column-II (Electron displacement)**

(I)	Inductive effect	(a)	Temporary effect
(II)	Mesomeric effect	(b)	π electron pair delocalise
(III)	Hyper conjugation effect	(c)	σ-electron pair displace
(IV)	Electromeric effect	(d)	σ and π electron pair delocalise

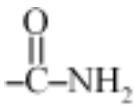
(1) I-c, II-d, III-b, IV-a

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

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

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

44) Match the columns and select appropriate code.

Column-I Functional group		**Column-II Effect**	
a.	$-NH_2$	p.	+M and +I
b.		q.	+M and –I
c.		r.	–M and –I

	a	**b**	**c**
1.	q	r	p
2.	p	q	r
3.	r	q	p
4.	p	r	q

(1) 1

(2) 2

(3) 3

(4) 4

45) **Statement-I :** Electron donating groups decrease the acidity of carboxylic acid.
Statement-II : Electron donating groups stabilise the conjugate base of corresponding carboxylic acid.

(1) Both Statement I and Statement II are incorrect

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

(3) Statement I and II are correct, and Statement II is the correct explanation of Statement I

(4) Statement I and Statement II are correct, but Statement II is not correct explanation of Statement I

BIOLOGY

1) The book, "An introduction to embryology of Angiosperms" was written by :-

(1) P.Maheshwari

(2) Yuho

(3) Stanley

(4) Nageli

2) Microsporophyll Represents :-

(1) Stamen

(2) Carpel

(3) Androecium

(4) Gynoeciun

3)

How many of the following statements are **incorrect:**
(A) Flowers are morphological and embryological marvels and the sites of sexual reproduction.
(B) Much before the actual flower is seen on a plant, the decision that the plant is going to flower has taken place.
(C) Flowers have always been used as symbols for conveying important human feeling.
(D) Human beings have had a intimate relationship with flowers since time immemorial.
(E) Many hormonal and structural changes are initiated which lead to the differentiation and further development of floral primordium.

(F) Flower are objects of aesthatic, ornamental, social, religious and cultural value.

(1) 0

(2) 1

(3) 2

(4) 3

4) If one flower of chinarose have 25 stamens then how many microsporangia are found in this flower ?

(1) 200

(2) 400

(3) 50

(4) 100

5) Perisperm is found in which plant :-

(1) Litchi

(2) Mango

(3) Black pepper

(4) Lemon

6) In a transverse section a typical microsporangium appear :-

(1) Circular in outline

(2) Tetrahedral in outline

(3) Biconvex in outline

(4) Tetragonal in outline

7) Read the following statements carefully :-
(A) All flowering plants show double fertilization.
(B) The number and length of stamens are variable in flowers of different species.
(C) The distal end of the filament is attached to the anther.
How many above statement/s are **correct**?

(1) One

(2) Two

(3) Three

(4) Four

8) Outer integument in seed is known as :-

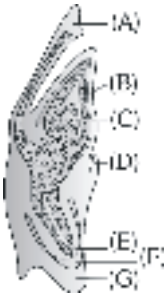
(1) Testa

(2) Tegmen

(3) Coleoptile

(4) Main embryonal axis

9) Consider the following diagram and choose the **incorrect** option –



(1) D is the remnant of second cotyledons found in some monocots

(2) A is the single cotyledon of grass embryo

(3) G is responsible for formation of shoot

(4) B encloses the shoot apex and few leaf primordia and called coleoptile

10) How many haploid nuclei are involved in double fertilisation.

(1) Three

(2) Four
(3) Five
(4) Two

11)

Pollen tube enters in embryosac through :-

(1) Chalaza
(2) Egg apparatus
(3) Antipodals
(4) All of the above

12) Cleistogamous flowers are present in:

(1) *Commelina*
(2) Mustard
(3) *Mango*
(4) *Catharanthus*

13) Multicarpellary, syncarpous gynoecium is found in:-

(1) Rose, lotus
(2) Hibiscus, Papaver
(3) Michelia, lotus
(4) Hibiscus, rose

14) Which of the following statements are **correct**?

(1) The body of ovule fuses with funicle in the region called chalaza
(2) The central cell contains one polar nuclei
(3) Cleistogamous flowers are invariably autogamous
(4) Pollen tube releases the two male gametes in to the cytoplasm of egg cell

15) The versatile anthers are helpful for :-

(1) Anemophily
(2) Entomophily
(3) Cheiropterophily
(4) Malacophily

16)

Which of the following is/are not **correct** with respect to Angiosperms.
A. A typical anther is bilobed, dithecous and tetrasporangiate.
B. Pollen grains may have two cells or three cells at the time of shedding.
C. Individial microspores mature into pollen grains.

D. Microspore mother cells represent the male gametophytic generation.

E. Cells of the sporogenous tissue lying in the centre of the microsporangium undergo microsporogenesis to form tetrads of microspores.

(1) A and C

(2) B and E

(3) D

(4) E

17) The two cells at which pollen grains are discharged are :-

(1) Larger generative cell and smaller vegetative cell

(2) Larger vegetative cell and smaller body cell

(3) Smaller vegetative cell and larger body cell

(4) Smaller generative cell and larger vegetative cell

18) The cells of tapetum become polyploid due to :-

(1) Free nuclear division

(2) Endomitosis

(3) Amitosis

(4) Meiosis

19) Polar nuclei are situated in the central cell :-

(1) Below the egg apparatus

(2) Above the egg apparatus

(3) Below the antipodals

(4) Both (2) and (3)

20)

Match the **column-I** with **column-II** and select the right option:-

Column-I		**Column-II**	
A	Male gametophyte	(i)	Embryosac
B	Megasporangium	(ii)	Pollen grain
C	Megasporophyll	(iii)	Ovule
D	Female gametophyte	(iv)	Pistil/carpel

A B C D (1) i ii iii iv

(2) ii iv i iii

(3) ii iii iv i (4) ii iii i iv

(1) 1

(2) 2

(3) 3

(4) 4

21) **Assertion :** A Typical angiosperm anther is bilobed with each lobe having two theca.
Reason : Often a longitudinal groove runs lengthwise separating the theca.

(1) Both assertion and reason are false.

(2) Assertion is true but reason is false.

(3) Both assertion and reason are true and reason is correct explanation of assertion.

(4) Both assertion and reason are true but reason is not correct explanation of assertion.

22) How many of the following statements are **correct** ?
(a) Scutellum is found in both dicot and monocot embryos.
(b) Pollination and fertilisation are fully dependent on water in angiosperms.
(c) Nucellus cells protrude into embryo sac and develop into the embryos in citrus and mango.
(d) If hybrid are made into apomicts, there is no segregation of characters in the hybrid progeny.

(1) Four

(2) Three

(3) One

(4) Two

23) Self incompatibility refers to

(1) Inhibition of pollen germination on the stigma of flower of another species

(2) Maturation of anther & stigma at different times

(3) Germination of pollen within the anther

(4) Inhibition of pollen germination on the stigma of same flower

24) **Assertion (A) :** Majority of flowering plants show pollination by animals.
Reason (R) : Large and attractive flowers are present in sunflower.

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

(2) A and R both are true and R does not explain A

(3) A is true while R is false

(4) A and R both are false

25) A single shield shape cotyledon of monocot embryo is commonly known as:

(1) Scutellum

(2) Epiblast

(3) Coleoptile

(4) Tigellum

26) What will be the ploidy of seed coat and endosperm cell respectively if a tetraploid plant is used to pollinate a hexaploid plant?

(1) 4n and 5n

(2) 6n and 8n

(3) 4n and 8n

(4) 6n and 7n

27) How many meiotic divisions are required to form 500 seeds in wheat plant?

(1) 1000

(2) 750

(3) 625

(4) 500

28) Adventive embryos in citrus are developed from:

(1) Sporophytic tissue of ovule

(2) Gametophytic tissues of ovule

(3) Antipodal cell of embryosac

(4) Synergieds and antipodal cells of embryosac

29) **Assertion (A) :** In dioecious plants only geitonogamy is possible
Reason (R) : In geitonogamy pollen is transferred from one flower to the stigma of other flower of different plant

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

(2) A and R both are true and R does not explain A

(3) A is true while R is false

(4) A and R both are false

30) Match the column I with column II and select the **correct** option from options given below :

Column I		**Column II**	
P.	Egg	A.	Seed coat
Q.	Ovule integument	B	Seed
R.	Ovary wall	C.	Embryo
S.	Ovule	D.	Pericarp

(1) P: A; Q: B; R: C; S: D

(2) P: C; Q: A; R: B; S: D

(3) P: C; Q: A; R: D; S: B

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

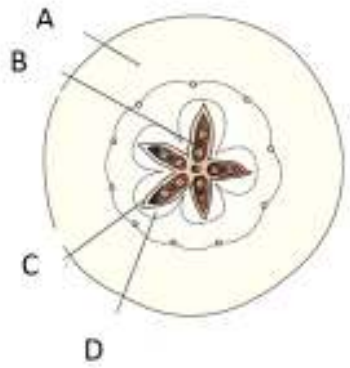
31) **Assertion (A) :** Double fertilization is unique feature of angiosperm plants.
Reason (R) : Two male gametes are released in persisted synergied in all seeded plants.

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

(2) A and R both are true and R does not explain A
(3) A is true while R is false
(4) A and R both are false

32) Large number of small seeds are present in fruit of:

(1) *Orobanche and Striga*
(2) Watermelon and Mango
(3) *Ficus* and *Phoenix dectylifera*
(4) Orchids and Mango



33) What is A, B, C and D in given figure?

(1) A : Thalamus; B : Seed; C : Endocarp; D : Mesocarp
(2) A : Epicarp; B : Seed; C : Endocarp; D : Mesocarp
(3) A : Thalamus; B : Seed; C : Mesocarp; D : Endocarp
(4) A : Thalamus; B : Epicarp; C : Endocarp; D : Mesocarp

34) Pollen grains lose their viability within 30 minutes of their release in :-

(1) Rose
(2) Potato
(3) Pea
(4) Wheat

35) How many nuclei in the female gametophyte in angiosperms are surrounded by new wall?

(1) 5
(2) 8
(3) 6
(4) 7

36) The portion of the embryonal axis above the level of attachment of scutellum is

(1) Plumule or stem tip
(2) Epicotyl
(3) Hypocotyl

(4) radicle or root tip

37) Edible part in Apple is-

(1) Test
(2) Thalamus
(3) Ovar
(4) Endosperm

38) Pollen pistil interaction is a dynamic process involving _____A_____ followed by _____B_____of the pollen. The knowledge gained in this area would help the plant breeder in manipulating pollen pistil interaction, even in _____C_____, to get desired hybrids.

(1) A incompatible pollinations, B pollen recognition, C promotion or inhibition.
(2) A compatible pollinations, B pollen recognition, C promotion.
(3) A pollen recognition, B promotion or inhibition, C incompatible pollinations.
(4) A pollen recognition, B promotion, C compatible pollinations

39) **Assertion (A) :-** Pollen grains are rich in nutrients.
Reason (R) :- Pollen grains are well preserved as fossils.

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

40) How many of the following structures can be found in a dicot seed?
(A) Cotyledon
(B) Coleorhiza
(C) Coleoptile
(D) Epiblast
Choose **correct** option-

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

41) In most of the water- pollinated species, pollen grains are protected from wetting by a

(1) Sporopollenin
(2) Mucilaginous covering
(3) Covering of thalamus
(4) α-cellulose fibre

42) Out breeding devices that can prevent autogamy but not Geitenogamy

(1) Heterogamy
(2) Heterostyly
(3) Self-incompatibility
(4) (1) and (2) both

43) Growth of pollen tube towards embryo sac is

(1) Chemotactic
(2) Chemotropic
(3) Chemotaxis
(4) Thigmonastic

44) Repeated self pollination over the generation produces

(1) New species
(2) Better progenies
(3) Inbreeding depression
(4) Elimination of weak traits

45) Filiform apparatus is characteristic feature of

(1) Synergids
(2) Generative cell
(3) Nucellar embryo
(4) Aleurone cell

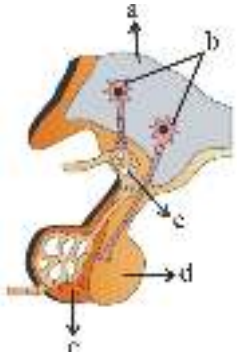
46) Thyroid and liver :-

(1) Both are organised endocrine glands.
(2) Both are non organised endocrine glands.
(3) Liver is organised where thyroid is non organised gland.
(4) Only thyroid is organised endocrine gland.

47) A hormone that helps in increase in blood pressure by vasoconstriction ?

(1) Atrial natriuretic factor
(2) Anti diuretic hormone
(3) Thyroxine
(4) Cortisol

48) Recognise the figure and find out the correct matching.



(1) a–pituitary, b–portal circulation, c–pars intermedia, d–hypothalamus, e–sella tursica

(2) a–hypothalamus, b–hypothalamic neurons, c–portal circulation, e–posterior pituitary

(3) a–hypothalamus, b–portal circulation, c–hypothalamic neurons, d–posterior pituitary

(4) a–hypothalamus, b–hypothalamic neurons, c–portal circulation, d–posterior pituitary, e–anterior pituitary

49) A pregnant lady delivers a baby who suffers from stunted growth, mental retardation, low intelligence quotient and abnormal skin. This is the result of :-

(1) Atrophy of thyrofollicular cells

(2) Atrophy of thyroparafollicular cells

(3) Atrophy of adrenal medulla

(4) Atrophy of adrenal cortex

50) The blood calcium level is increases by the deficiency of ?

(1) TCT

(2) PTH

(3) Both TCT and PTH

(4) Thyroxine

51) Luteinising hormone (LH) in female

(1) Helps in the appearance of secondary sexual characters

(2) Stimulates ovary to secrete oestradiol

(3) Helps in release of the secondary oocyte from the ovary

(4) Controls the blood pressure

52) Which of the following hormones is responsible for gigantism?

(1) Growth hormone

(2) Somatostatin

(3) Adrenaline

(4) GnRH

53)

Calcium homeostasis is maintained by a group of hormones. Which hormone increases Calcium in bones?

(1) T_3

(2) Calcitonin

(3) Thyroxine

(4) PTH

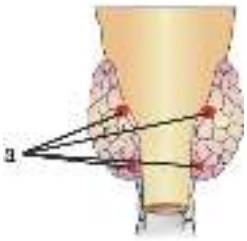
54) Hormones are :-

(1) Intra cellular, nutritive substance

(2) Intercellular, Non nutritive substance

(3) Maximum secreted always

(4) Species specific, Non nutritive substance



55) The following figure is taken from :

(1) Ventral side showing thyroid gland (a)

(2) Ventral side showing parathyroid glands (a)

(3) Dorsal side showing thyroid gland (a)

(4) Dorsal side showing parathyroid glands (a)

56) After some time of ejaculation, semen liquifies due to presence of an enzyme which is found in secretion of:-

(1) Vagina

(2) Seminal vesicle

(3) Prostate

(4) Cowpers gland

57) Match the Column-A with Column-B :-

Column -A		**Column-B**	
(A)	Mons pubis	(i)	Fleshy folds of tissue
(B)	Labia majora	(ii)	Paired folds of tissue
(C)	Labia minora	(iii)	Membrane covering the vaginal opening
(D)	Hymen	(iv)	Cushion of fatty tissue

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

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

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

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

58) Secondary follicle in ovary has-

(1) Primary oocyte

(2) Secondary oocyte

(3) Ootid

(4) Antrum

59) Consider the following four statements (a-d) and select the option which includes all the incorrect ones only.
(a) Each testicular lobule contains 750 highly coiled seminiferous tubules, in which sperms are produced.
(b) Sertoli cells undergo meiotic divisions finally leading to sperm formation.
(c) The regions outside the seminiferous tubules called interstitial spaces, contain blood vessels, Leydig cells, and some immunologically competent cells.
(d) The scrotum helps in maintaining the low temperature of the testes, necessary for spermatogenesis.

(1) Statements (b), (c) and (d).

(2) Statements (a), (b).

(3) Statements (a), (b) and (c).

(4) Statements (a), (c) and (d).

60) How many sperms and ova are formed from 50 primary spermatocyte and 50 primary oocyte ?

(1) 200 sperm and 50 ovum

(2) 200 ovum and 50 sperm

(3) 50 sperm and 50 ovum

(4) 100 sperm and 200 ovum

61) Which sequence is correct for male genital tract?

(1) Seminiferous tubules → Rete testis → Vasa efferentia → Epididymis → Vas deferens → Urethra

(2) Rete testis → Vas deferens → Vasa efferentia → Epididymis → Urethra

(3) Seminiferous tubules → Rete testis → Vasa efferentia → Vas deferens → Epididymis → Urethra

(4) Seminiferous tubules → Rete testis → Vas deferens → Vasa efferentia → Seminal vesicle → Urethra

62) Birth canal is formed by :-

(1) Cervix and uterus.

(2) Cervix and fallopian tube.

(3) Cervical canal and vagina

(4) Uterus and follopian tube

63) Human male ejaculates about __A__ million sperms during a coitus, of which for normal fertility, at least __B__% sperm must have normal shape and size and at least __C__% of them must show vigorous motility. Choose correct values for A, B and C from the given options :- (1) A-400-500 B-60 C-40
(2) A-200-300 B-60 C-40
(3) A-200-300 B-40 C-60
(4) A-80-100 B-40 C-60

(1) 1

(2) 2

(3) 3

(4) 4

64) Tiny finger like structure which lies at the upper junction of the two labia minora is :

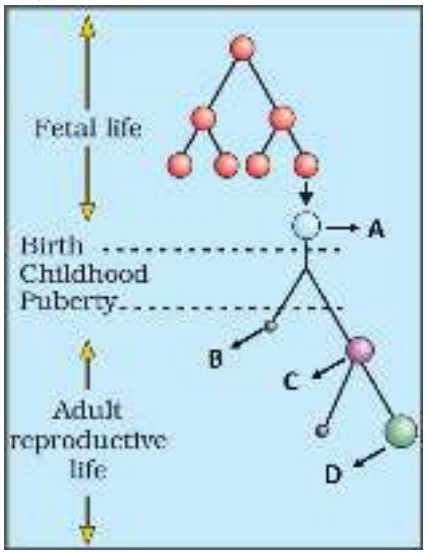
(1) Mons pubis

(2) Clitoris

(3) Hymen

(4) Fimbriae

65) Given below is schematic representation of oogenesis. identify A, B, C and D :-



	A	B	C	D
(1)	Primary oocyte	Polar body	Secondary oocyte	Ovum
(2)	Polar body	Primary oocyte	Ovum	Secondary oocyte
(3)	Ovum	Polar body	Primary oocyte	Secondary oocyte
(4)	Primary oocyte	Secondary oocyte	Polar body	Ovum

(1) 1

(2) 2

(3) 3

(4) 4

66) Read the following statements about the female reproductive system and choose the set of correct statements :-
(a) Perimetrium of uterus is outermost thin membranous layer.
(b) Myometrium of uterus is a middle thick layer of skeletal muscle
(c) Endometrium is inner nonglandular layer of uterus.
(d) Endometrium of uterus undergoes cyclical changes during menstrual cycle.
Choose the correct answer from the options given below :-

(1) (a), (c) and (d) only

(2) (a) and (d) only

(3) (b) and (c) only

(4) (c) and (d) only

67) Each ovary is connected to the pelvic wall and uterus by the _____ .

(1) Bone

(2) Cartilage

(3) Ligament

(4) Tendon

68) Which hormone acts on sertoli cells and stimulates secretion of some factors which help in the process of spermatogenesis ?

(1) FSH

(2) LH

(3) Estrogen

(4) Testosterone

69) In which part of sperm possesses numerous mitochondria ?

(1) Head

(2) Neck

(3) Middle piece

(4) Tail

70) When released from ovary, human egg contains:-

(1) 1 Y chromosome

(2) 2 X chromosome

(3) 1 X chromosome

(4) XY chromosome

71)

How many structures in the list given below have only (22 + x) chromosome ?

Polar Body, Oogonia, Primary Oocyte, Ovum, Secondary oocyte :-

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

72) Liberation of sperms from sertoli cells is called :-

(1) Semination
(2) Spermiation
(3) Ejaculation
(4) Insemination

73) Lateral end of fallopian tube, closer to the ovary is Funnel shaped and called :-

(1) Intramural part
(2) Ampulla
(3) Isthmus
(4) Infundibulum

74) For humans which statement is incorrect among following statements :-

(1) Uterus is single
(2) Uterus is also known as womb
(3) Mons pubis is cushion of fatty tissue
(4) The shape of uterus is like bean

75)

Which one of the following structure of sperm is mismatched?

(1) Acrosome - Contain spermlysins that help in fertilisation
(2) Nucleus - Contain haploid DNA
(3) Proximal centriole - Promote cleavage in zygote
(4) Tail - Contain numerous mitochondria, which produce energy for movement of tail

76)

Vas deferens originates from :-

(1) Caput part of epididymis
(2) Corpus part of epididymis
(3) Vasa efferentia
(4) Cauda part of epididymis

77) Which of the following release inhibin to control spermatogenesis ?

(1) Leydig cells
(2) Interstitial cells
(3) Subtentacular cells
(4) Theca interna

78) The edges of the infundibulum posses finger like projections called fimbriae which helps in:

(1) Collection of sperms
(2) Collection of secondary oocyte after ovulation
(3) To facilitate implantation
(4) To pass nutrition towards ovum

79) The _____are the first haploid cells during the process of spermatogenesis.

(1) spermatogonia
(2) primary spermatocytes
(3) secondary spermatocytes
(4) spermatids

80) Ampulla of mammary gland connects :-

(1) Mammary tubule to lactiferous duct
(2) Mammary alveoli to mammary duct
(3) Mammary duct to lactiferous duct
(4) Mammary alveoli to lactiferous duct

81) A man is facing with sterility problems when his hormonal analysis was done. FSH was normal but level of testosterone was disturbed. Which of the part must be dysfunctional ?

(1) Anterior pituitary gland
(2) Epididymis
(3) Sertoli cells of testis
(4) Leydig cell

82)

Seminal plasma is rich in which sugar?

(1) Sucrose
(2) Glucose
(3) Fructose
(4) Maltose

83)

Cluster of cells in mammary lobes is known as

(1) Mammary duct
(2) Alveoli
(3) Ampulla
(4) Lactiferous duct

84)

Which is the primary female sex organ?

(1) Uterus
(2) Ovaries
(3) Oviducts
(4) Vagina

85)

Spermatogonium undergoes ____.

(1) Reduction division
(2) Meiotic division
(3) Mitotic division
(4) None of these

86)

The mature tertiary follicle is also known as

(1) Ovum
(2) Oogonia
(3) Graafian follicle
(4) Polar body

87) Scrotum communicates with abdominal cavity through

(1) urethra
(2) inguinal canal
(3) vas deferens
(4) epididymis

88) The male accessory glands include :-

(1) Prostate gland
(2) Bulbourethral gland
(3) Seminal vesicles
(4) All of above

89) Polar body is produced during the formation of :

(1) Sperm
(2) Secondary oocyte
(3) Oogonium
(4) Spermatocytes

90) Secondary sex organ in human male is :-

(1) Testis
(2) Ovary
(3) Beard
(4) Vas deferens

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.	1	3	3	2	1	2	1	1	4	4	3	4	4	3	1	4	1	4	2	2
Q.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
A.	4	2	4	3	3	4	2	2	2	1	1	3	2	4	4	4	4	4	4	2
Q.	41	42	43	44	45															
A.	1	2	3	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.	2	3	1	4	2	4	4	1	1	2	2	2	3	2	3	4	1	1	4	3
Q.	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85
A.	2	2	1	3	2	2	4	1	2	3	3	3	1	4	1	2	2	4	2	4
Q.	86	87	88	89	90															
A.	1	1	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.	1	1	1	3	3	1	3	1	3	3	2	1	2	3	1	3	4	2	1	3
Q.	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130
A.	4	4	4	3	1	2	3	1	4	3	3	1	1	4	3	2	2	3	4	1
Q.	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
A.	2	4	2	3	1	4	2	4	1	1	3	1	2	2	4	3	3	1	2	1
Q.	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170
A.	1	3	2	2	1	2	3	1	3	3	2	2	4	4	4	4	3	2	3	3
Q.	171	172	173	174	175	176	177	178	179	180										
A.	4	3	2	2	3	3	2	4	2	4										

SOLUTIONS

PHYSICS

1)

When two objects are rubbed against each other, they undergo triboelectric charging, where :
One object **gains electrons – becomes negatively charged (– q)**
The other object **loses electrons – becomes positively charged (+ q)**
Since they acquire **opposite charges**, they will experience an **attractive force** due to electrostatic interaction.
Correct Answer is 1

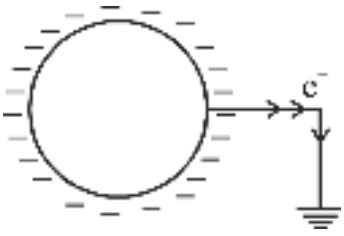
2)

1. When a charged body conducts charge to an uncharged body, the charge is distributed, not entirely transferred. So, option 1 is incorrect.
2. The magnitude of charge is invariant with velocity (relativity deals with mass increase, not charge). So, option 2 is incorrect.
3. Charge is always associated with matter (like electrons and protons). Matter can exist without a net charge (neutral atoms). So, option 3 is correct.
4. Attraction can occur between a charged and a neutral body (by induction), so it's not a true test of electrification (repulsion is). So option (4) is incorrect.
Final answer: Charge cannot exist without matter although matter can exist without charge.
Correct option (3)

3)

1 Faraday = 1 mole of electrons = $N_A e$

4)



When body is negatively charged then electron flows from body to earth.

5) Charge can't exist without mass, but mass can exist without change. Charge is conserved but mass is not conserved.

6) Law of conservation of charge doesn't comment on charge being scalar.

7) **Asking About:**

We asses if Coulomb's law follows the superposition principle and whether this is explained by it being a two-charge interaction force.

Concept:
Superposition is arises from vector nature of force.

Solution:
Formula:

$$\vec{F}_{net} = \sum \vec{F}_i$$

$$\vec{F}_{net} = \frac{kq_1q_2}{r^2}\hat{r}$$

Calculation:
Assertion is true- Coulomb's force obeys superposition. Reason is true. Coulomb force acts between two charges. But two-charge nature doesn't explain superposition. Superposition arises from linearity of vector addition.

Final Answer:
Both (A) and (R) are correct but (R) is not the correct explanation of (A).

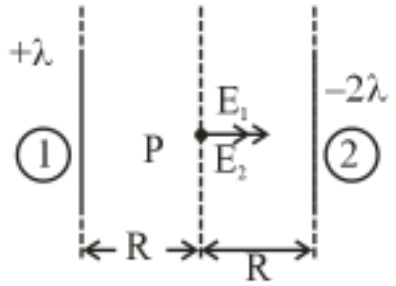
correct option- (1)

8)

At mid point P

$$E = E_1 + E_2 = \frac{\lambda}{2\pi\lambda_0 R} + \frac{2\lambda}{2\pi\varepsilon_0 R}$$

$$E = \frac{3\lambda}{2\pi\varepsilon_0 R}$$



$[F] = [MLT^{-2}]$

$\because \quad F = \frac{E}{q}$

$\therefore \quad E = \frac{MLT^{-2}}{AT} \Rightarrow E = [MLT^{-3}A^{-1}]$

ε_r is dimensionless

$F = \frac{1}{4\pi\varepsilon_0}\frac{q_1 q_2}{r^2} \Rightarrow \varepsilon_0 = \frac{[A^2T^2]}{[MLT^{-2}][L^2]}$

$= [M^{-1}L^{-3}A^2T^4]$

9)

10)

$q^1 \propto r$

$qA = \frac{r_A(q_1 + q_2)}{r_A + r_B} = \frac{(2)(9)}{5}$

$= \frac{18}{5}$ μc

11) **Concept:**
Maxima - minima

Formula:
If given function is 'F'
then for maximum value of F
$\frac{dF}{dx} = 0$
and calculate 'x'. [Here 'x' is variable]

Calculation:
$Q = Q_1 + Q_2$
$Q_1 = Q - Q_2$

$F = \frac{KQ_1Q_2}{r^2}$

$\Rightarrow F = \frac{K(Q - Q_2)Q_2}{r^2}$

Here variable is 'Q_2'

so, $\frac{dF}{dQ_2} = \frac{K}{r^2}\frac{d}{dQ_2}[QQ_2 - Q_2^2]$

$= \frac{K}{r^2}[Q - 2Q_2]$

$\frac{dF}{dQ_2} = 0$

$\Rightarrow Q - 2Q_2 = 0$

$Q_2 = \frac{Q}{2}$

So, $Q_1 = \frac{Q}{2}$

$\frac{Q_1}{Q_2} = \frac{1}{1}$

12) They will not experience any force if $\left|\vec{F}_G\right| = \left|\vec{F}_e\right|$

$G = \frac{m^2}{\left(16 \times 10^{-2}\right)^2} = \frac{1}{4\pi\varepsilon_0} \cdot \frac{q^2}{\left(16 \times 10^{-2}\right)^2}$

$\frac{q}{m} = \sqrt{4\pi\varepsilon_0 G}$

13)

$\frac{K(4q)}{x^2} = \frac{K(9q)}{(r+x)^2}$

$\frac{2}{x} = \frac{3}{r+x}$

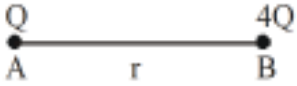
$2r + 2x = 3x$

x = 2r from 4q

distance 3r from –9q

14) 

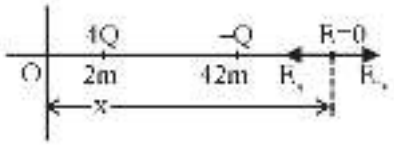
$\Rightarrow F = \frac{k(4Q)(Q)}{r^2} = \frac{4kQ^2}{r^2}$



$\Rightarrow F^1 = \frac{k(4Q)(Q)}{r^2} = F$

15)

For F = 0, E = 0 at given point.



$\Rightarrow \frac{K(9e)}{x^2} = \frac{K(16e)}{(70+x)^2}$

$\Rightarrow \frac{3}{x} = \frac{4}{70+x}$

x = 210 cm from 9e

and x^1 = 280 cm from 16e.

16)

At equilibrium - $\tan\theta = \frac{F_E}{mg}$

Here, F_E same for Q_1 and Q_2.

Hence $\tan\theta \propto \frac{1}{m}$.
If $\alpha < \beta \Rightarrow m_1 > m_2$, for any combination of Q_1 and Q_2.

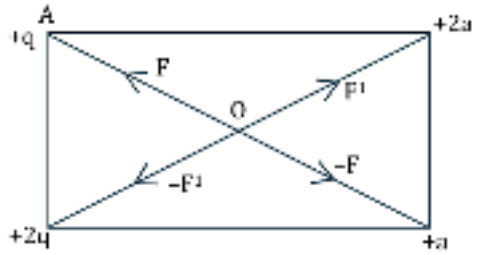
17) **Solution/Explanation :** to find net force on charge kept at centre of square.

Concept : Silverpoint principle

Formula : $F = \frac{Ka_1a_2}{r^2}$

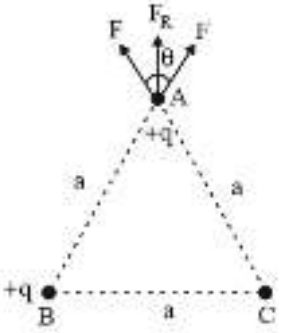
$\vec{F}_{net} = \vec{F}_1 + \vec{F}_2 + \vec{F}_3 + \vec{F}_4$

Visual aid :-



Calculation : due to zymmetery '0' will be pulled. in ruch a way that net force will be zero (gel diagram)
Hence, the correct answer is option (1).

18) $F_R = 2F \cos \theta/2$
Where $\theta = 60°$



$= 2\left(\frac{kq^2}{a^2}\right)\cos 30°$

$= \frac{\sqrt{3}kq^2}{a^2}$

19) No. of field lines $\propto |q|$

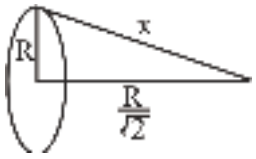
20)

F = qE where q = (+2e) and E = 15×10^4 N/C

$F = 4.8 \times 10^{-14}$ N

21) Electric line of force are perpendicular to the surface of a conductor. Inside the sphere no

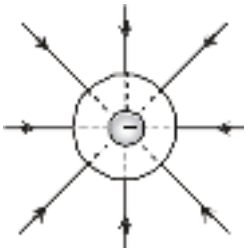
lines are present.

22) 

$x = \sqrt{R^2 + \frac{R^2}{2}} = \sqrt{\frac{3}{2}}R$

23) no. of E.F.L ∝ | q |
| A | > | B |
E.F.L. → Originate from +ve charge
E.F.L. → terminate at –ve charge

24) Electric lines force due to negative charge are radially inward.



25) $E = \frac{2k\lambda}{a}\sin\alpha/2$, where α = 180°

$= \frac{2k\lambda}{a}\sin 90^\circ$

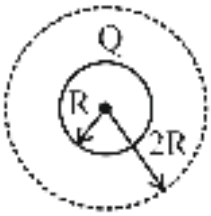
26) C & d are incorrect because electrostatic field lines never form closed loop & never cut each other.

28) Force on any charge in electric field is F = qE as magnitude of charges of proton & electron is equal.

29) For balancing cond
qE = mg

$E = \frac{mg}{q} = \frac{10^6 \times 10}{1 \times 10^{-6}}$

$E = 10\frac{V}{m}$ downward

30) 

$\phi = \frac{q_{en}}{\epsilon_0}$

$\phi = \frac{Q}{\epsilon_0}$

31) $\sigma_1 = \sigma_2 \Rightarrow \frac{Q_1}{4\pi r_1^2} = \frac{Q_2}{4\pi r_2^2} \Rightarrow \frac{Q_1}{Q_2} = \frac{r_1^2}{r_2^2}$

32)

$q_{enc} = \frac{Q}{8}$ (as it is situated at corner of cube)

$\phi = \frac{q_{enc}}{\varepsilon_0} = \frac{Q}{8\varepsilon_0}$

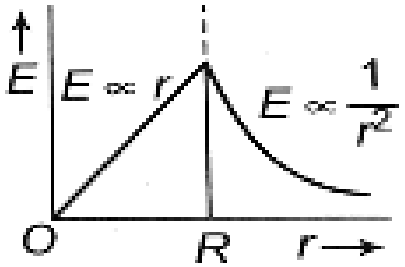
33)

Formula:

Inside the sphere (r < R): $E = \frac{Kqr}{R^3}$

at the surface of sphere (r = R): $E = \frac{Kq}{R^2}$

Outside the sphere (r > R): $E = \frac{Kq}{r^2}$



Correct Answer:

Option 2 is the correct representation of the electric field due to a uniformly charged non-metallic sphere.

34)

Theoretical

35)

Theoretical

36) By Gauss law:

$$\phi_{S_1} = \frac{Q - 4Q/3}{\varepsilon_0} = \frac{-Q}{3\varepsilon_0}$$

$$\phi_{S_2} = \frac{Q}{\varepsilon_0} \Rightarrow \frac{\phi_{S_1}}{\phi_{S_2}} = -\frac{1}{3}$$

37)

Electric field inside a conducting spherical shell is zero.

38)

as the system is symmetric about centre. The net electric field at center of square becomes zero.

40) PE = $\frac{k(-e)(-e)}{r} = \frac{ke^2}{r}$

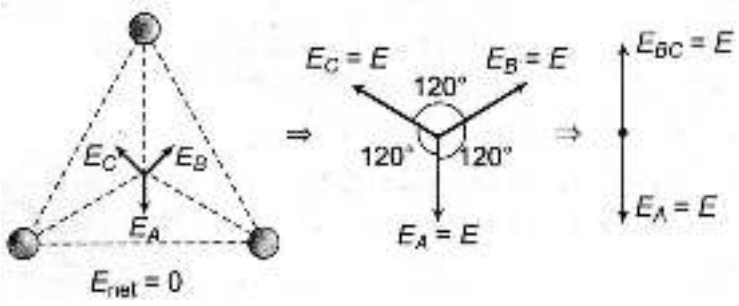
when r decreases PE increases.

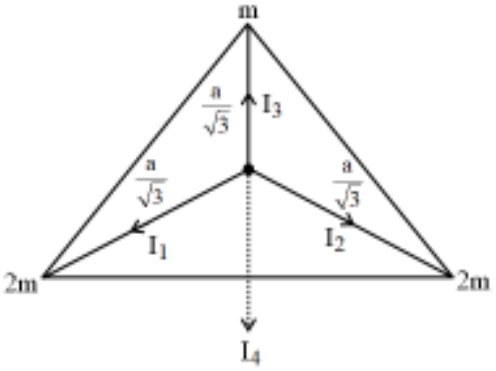
41) U= $\frac{k(1)(-1)}{2} + \frac{k(1)(-1)}{2} + \frac{k(1)(1)}{1} = 0$

42)

U = $\frac{-G(2)(2)}{5} = -\frac{4G}{5}$

43)





44) $I_1 = \frac{3G_{2M}}{a^2} = \frac{6GM}{a^2}$

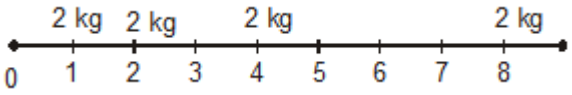
$I_2 = \frac{6GM}{a^2}$. $I_3 = \frac{3GM}{a^2}$

$\vec{I}_4 = \vec{I}_1 + \vec{I}_2$

$I_4 = \frac{6Gm}{a^2}$

$I = I_4 - I_3$

$I = \frac{3Gm}{a^2}$



45) direction of net gravitational field will be towards right.

$I_g = Gm\left(\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{4^2} + \frac{1}{8^2} + \ldots\ldots\ldots\infty\right)$

$I_g = Gm\left(\frac{1}{1-\frac{1}{4}}\right)$

$= \frac{4}{3}Gm = \frac{4}{3}G \times (2) = \frac{8}{3}G$

CHEMISTRY

46) Since solubility of gas decrease with increasing K_H.

47) **Given Data :-** In Ideal solution moles of A (nA) = 2
In Ideal solution moles of B (nB) = 2
Vapour pressure of pure A $\left(P_A^o\right)$ = 120 torr
Vapour pressure of pure B $\left(P_B^o\right)$ = 80 torr
Concept :-Raoult's law and Dalton's law of partial pressures.
Calculation :-

mole fraction of A ⇒ $X_A = \frac{n_A}{n_A + n_B} = \frac{2}{4} = 0.5$

mole fraction of B ⇒ $X_B = \frac{n_B}{n_A + n_B} = \frac{2}{4} = 0.5$

Partial pressure of A ⇒ $P_A = X_B P_B^o = 0.5 \times 120 = 60$ torr

Partial pressure of B ⇒ $P_B = X_B P_B^o = 0.5 \times 80 = 40$ torr

Total vapour pressure ⇒ $P_T = P_A + P_B = 60 + 40 = 100$ torr

$X_B P_B^o = Y_B P_T$ (Y_B = mole fraction of B in vapour)

$$Y_B = \frac{X_B P_B^o}{P_T} = \frac{0.5 \times 80}{100} = \frac{40}{100} = \frac{2}{5}$$

Final answer :- $\frac{2}{5}$

Correct option- (3)

48) **Explanation :-**

Raoult's Law : The relative lowering of vaor pressure is equal to the mole fraction of the solute.

Given Data

Moles of solute =1

Moles of water (solvent) = 2

Concept :-

The vapor pressure of the solution relative to that of pure solvent is equal to the mole fraction of the solvent.

Calculation:-

Total moles = moles of solute + moles of solvent = 1 + 2 = 3

Answer option 1, (2/3)

49)

For non-ideal solution $\Delta S_{mix} > 0$

50) V. P. of solution = $X_{heptane} \times 92 + X_{octane} \times 31$

$= \frac{1}{5} \times 92 + \frac{4}{5} \times 31 = 43.2$ mm of Hg

51) **A. Question Explanation:**

The question asks which pair of liquids will form an ideal solution. An ideal solution follows Raoult's law, meaning that the vapor pressure of the solution is directly proportional to the mole fraction of each component. In simpler terms, the interactions between the molecules of the two liquids are similar to the interactions within each liquid itself.

B. Given Data:

A. Several pairs of liquids are given as options.

C. Concept:

A. **Ideal Solution:** A solution where the intermolecular forces between the components are similar to those in the pure components. This means there's minimal change in enthalpy ($\Delta H \approx 0$) and volume ($\Delta V \approx 0$) upon mixing.
B. **Raoult's Law:** The vapor pressure of each component in an ideal solution is proportional to its mole fraction.

D. Mathematical Calculation:
No calculations are strictly necessary. The key is to understand the nature of intermolecular forces.

A. **Option 1 (C_2H_5OH and water):** Ethanol (C_2H_5OH) and water form hydrogen bonds with each other, which are stronger than the van der Waals forces in pure ethanol. This indicates a significant interaction upon mixing, making it non-ideal.
B. **Option 2 (HNO_3 and water):** Nitric acid (HNO_3) and water react exothermically (strong interaction) to form hydronium ions. This is a clear deviation from ideal behavior.
C. **Option 3 ($CHCI_3$ and CH CH_3COCH_3):** Chloroform ($CHCI_3$) and acetone (CH_3COCH_3) can form weak hydrogen bonds. These weak interactions mean that the solution isn't quite ideal.
D. **Option 4 (C_6H_6 and $C_6H_5CH_3$):** Benzene (C_6H_6) and toluene ($C_6H_5CH_3$) are both nonpolar aromatic hydrocarbons. They interact through weak London dispersion forces. Since the intermolecular forces in the pure liquids and the mixture are very similar, this combination is closest to an ideal solution.

E. Final Answer:
C_6H_6 (benzene) and $C_6H_5CH_3$ (toluene) will form an ideal solution. Option 4 is correct.

52) **Concept:**
Colligative property

Solution:
Osmotic pressure (π) is a colligative property.

53) **B. Given Data:** Four 0.1 M solutions: 0.1 M $AICI_3$, 0.1 M $BaCl_2$, 0.1 M NaCl, and 0.1 M sugar.
C. Concept: Osmotic pressure (π) is a colligative property, meaning it depends on the number of dissolved particles (ions or molecules) in the solution. The formula for osmotic pressure is:
$\pi = i_{CRT}$
Where:

A. π is the osmotic pressure.
B. i is the van't Hoff factor (number of particles the solute dissociates into).
C. C is the molar concentration of the solution.
D. R is the ideal gas constant.
E. T is the temperature.

Since the concentration (C) and temperature (T) are the same for all solutions, the osmotic pressure will be highest for the solution with the largest van't Hoff factor (i).
D. Calculation:

A. **$AICI_3$:** Dissociates into 4 ions (1 Al^+ and 3 Cl^-), so i = 4.
B. **$BaCl_2$:** Dissociates into 3 ions (1 Ba^{2+} and 2 Cl^-), so i = 3.
C. **NaCI:** Dissociates into 2 ions (1 Na^+ and 1 Cl^-), so i = 2.
D. **Sugar (e.g., sucrose, glucose):** Does not dissociate into ions; it remains as a molecule in solution, so i = 1.

E. Final Answer: The 0.1 M AICI, solution will show the maximum osmotic pressure because it has the highest van't Hoff factor (i = 4).

54)

A. Question Explanation:

The question asks to convert the normality of a Na_2CO_3 solution to molarity.

B. Given Data:

A. Normality of Na_2CO_3 solution = 0.4 N

C. Concept: Normality and molarity

D. Solution:

Normality = Molarity × n-factor

Where the n-factor represents the number of reacting units per mole of the compound. For Na_2CO_3, the n-factor is 2 because it has two replaceable Na^+ ions.

E. Mathematical Calculation:

A. **Rearrange the formula to solve for molarity:** Molarity = Normality / n-factor

B. **Plug in the values:** Molarity = 0.4 N / 2

C. **Calculate:** Molarity = 0.2 M

E. Final Answer:

The molarity of the 0.4 N Na_2CO_3 solution is 0.2 M. So, option 1 is correct.

55) **A. Question Explanation:** The question asks which of the given concentration units is dependent on temperature.
B. Given Data:

A. **Options are:** Mole fraction, Molarity, % by weight, Molality

C. Concept:

A. **Temperature dependence:** A quantity is temperature-dependent if its value changes when the temperature changes.
B. **Molarity:** Molarity is defined as moles of solute per *liter* of solution. The volume of a solution changes with temperature due to thermal expansion.
C. **Other concentration units:** Mole fraction, % by weight, and molality are all based on *mass or moles*, which are not affected by temperature changes.

D. Mathematical Calculation:
No calculations are needed. The reasoning is based on the definitions of the concentration units.

Since volume changes with temperature, and molarity involves volume, molarity will also change with temperature.

E. Final Answer:

Molarity is dependent on temperature.

56) $N = \frac{20}{5.6} = 3.56$

57) $Ba(NO_3)_2 \rightleftharpoons Ba^{2+} + 2NO_3^-$

For dissociation,

$i = 1 + (n-1)\alpha$

$2.74 = 1 + (3-1)\alpha$

$\alpha = 0.87$

So, $\alpha\% = 0.87 \times 100 = 87\%$

58) $m = \frac{12 \times 1000}{60 \times 500}$

$\Delta T_f = K_f \times m$

$= 1.86 \times \frac{12 \times 1000}{60 \times 500} = 0.744$ (For urea, i = 1)

$T_f = -0.74°C$

Freezing point of solution = – 0.74°C

59) $B.P. \propto \frac{1}{V.P.}$

If B.P. is low means liquid can easily boil so, liquid forms vapours easily - vapours increases = vapour pressure increases, among all compounds boiling point of CH_3OH is min. B.P. = 65°C so it will have maximum vapour pressure.

60) $\pi = (CST) \times i$ $T = 273 + 21 = 300$

$NaCl \rightarrow Na^+ + Cl^-$ $=(0.1 \times 0.0821 \times 300) \times 2 \Rightarrow 4.92$ atm

61) $i = \frac{\text{number of particles after dissociation association}}{\text{initial moles}}$

i > 1 = Dissociation

i < 1 = Association

i = 1 = neither dissociation nor association

62) Ammonia

63) $M = \frac{w \times 1000}{m \times V(\text{in mL})} = \frac{5 \times 1000}{40 \times 250} = 0.5\ M$

64)

As per theory

65) $\Delta T_b = iK_b m \Rightarrow \Delta T_b \propto im$

for glucose : (i = 1)

$$\Delta T_b = 1 \times K_b \times \left(\frac{1 \times 1000}{180 \times 100}\right)$$

For 1% $\left(\frac{w}{w}\right)$ NaCl (i=2)

$$\Delta T_b = 2 \times K_b \times \left(\frac{1 \times 1000}{55.5 \times 100}\right)$$

For 1% $\left(\frac{w}{w}\right)$ $Ca_3(PO_4)_2$ (i=5)

$$\Delta T_b = 5 \times K_b \times \left(\frac{1}{310}\right) \times 1000 \times 100$$

For 1% $\left(\frac{w}{w}\right)$ urea (i=1)

$$\Delta T_b = \left(\frac{1 \times 1 \times 1000}{60 \times 100}\right) K_b$$

For (NaCl), ΔT_b is maximum & hence maximum boiling point.

66)

$\Delta T_b = iK_b m$

(i = 2 for NaCl)

$\Delta T_b = 2 \times 0.51 \times 0.1$

$= 0.102$

$T_b^1 = 100 + 0.1$

$= 100.1°C$

67)

$\pi = iCRT$

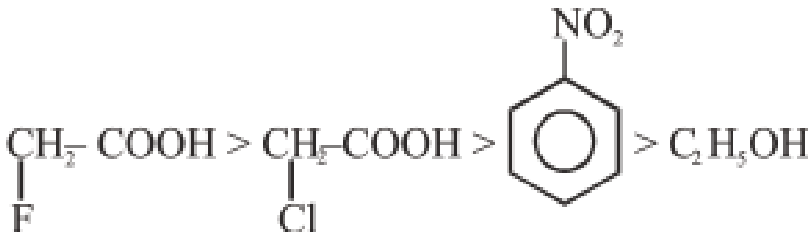
(i = 2 for NaCl)

$$\pi = \left(\frac{2 \times 0.585 \times 1000}{58.5 \times 100}\right) RT = 4.92 \text{ atm}$$

68) $$N = \frac{w \times 1000}{E_w \times V_{(ml)}}$$

$$0.1 = \frac{6.3 \times 1000}{63 \times V_{(ml)}}$$

$V_{(ml)}$ = 1000 ml = 1 L

69) 

70)

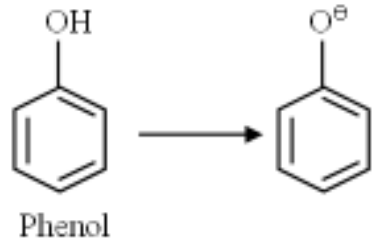
In lone pair is delocalised because involved in resonance.

71) **Solution :-**

Acidic strength [Ka] ∝ – M effect

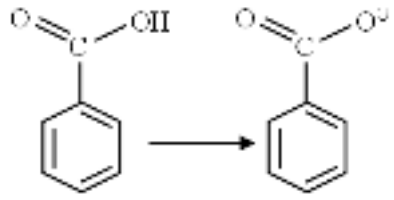
∝ – I effect

Here,



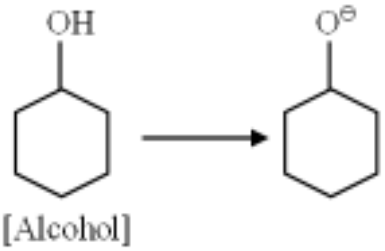
Phenol

(a)



[Benzoic Acid]

(b)



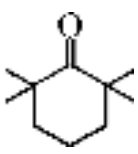
[Alcohol]

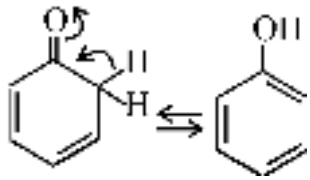
(c)

ORDER of Ka :- Acid > Phenol > Alcohol

Answer -2

 b > a > c

72)  do not show tautomerism due to absence of α-H.

73) 

74) Due to hyper conjugation.

75) Heat of hydrogenation $\propto \frac{1}{\text{stability}}$

76)

Fact

77) It have C_{sp^2} as well as alpha hydrogen.

78) $pKa \propto \frac{1}{\text{Acidic Strength}}$

79)

Electrometric effect is not observed in –OH group.

80) NCERT XII, Pg # 400

81)

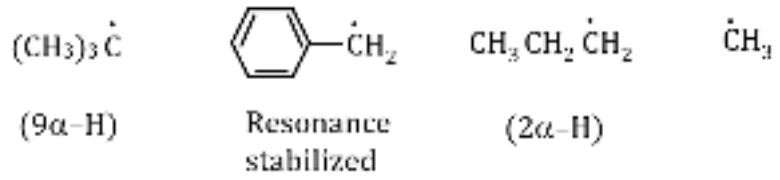
Fact

82)

Y > X > Z according to stability of carbocations

83) Reference NCERT-XI, Pg. # 399

84)  (Aromatic)



85)

Stability of $\dot{C} \propto \frac{+M| + H| + I}{-M| - H| - I}$

 Order will be 2 > 1 > 3 > 4

86) The correct order of the basic strength of methyl substituted amines in aqueous solution is

$(CH_3)_2NH > CH_3NH_2 > (CH_3)_3N$

(2°) (1°) (3°)

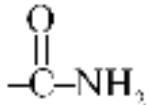
In aqueous solution, electron donating inductive effect, solvation effect (H-bonding) and steric hinderance all together effect the basic strength of substituted amines.

88)

(I)	Inductive effect	(c)	σ-electron pair dispalce
(II)	Mesomeric effect	(b)	π-electron pair delocalise
(III)	Hyper conjugation effect	(d)	σ and π electron pair delocalise
(IV)	Electromeric effect	(a)	Temporary effect

89)

$-NH_2$ +M & –I



–M & –I

+M & +I

BIOLOGY

93)

NCERT Pg .# 19, 20

97) NCERT XII Pg.# 19, 20, 21

98) NCERT (XI) Pg. # 76, last praragraph

99) NCERT XI Pg. # 83

103)

NCERT (XII) Pg. # 25(E), 26(H), fig. 2.7(a)

104) NCERT (XII) Pg. # 28, I para

106) NCERT Pg. # 19,21

107) NCERT-XII, Pg. # 03

108)

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109) NCERT XII pg. 27, I para

111) NCERT - Pg. # 05

112) NCERT XII Pg # 19-23

113)

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114) NCERT XII Page # 14

115) NCERT-XII Page # 19

117) NCERT-XII

118) NCERT-XII Page # 22,23

119) NCERT-XII Page # 15

120) NCERT-XII Page # 20

121) NCERT-XII Page # 18

122) NCERT-XII Page # 21

123) NCERT-XII Page # 21

124) NCERT-XII, Pg # 8

125) NCERT-XII, Pg # 11,

129) NCERT, XII Page # 7,8

130)

(A) Cotyledon, only will be seen in dicot seed.

131) NCERT-XII, Pg. # 29

132)

NCERT XII Pg # 38

133)

NCERT XII Pg # 32

136)

NCERT Pg. No. 240

137) NCERT XI, Pg. # 333

138) NCERT Pg# 332, Fig 22.2

139) NCERT Pg. # 333

140) NCERT Pg. # 334

141) NCERT Pg. No. 240

142) Gigantism : Over secretion of growth hormone before puberty causes gigantism. Gigantism is the extraordinary growth in height caused by abnormal elongation of long bones is the childhood. Somatostatin inhibits the secretion of growth hormone

143)

Ncert page 243.

144)

NCERT Pg. No. # 330

145) NCERT Pg# 334

146)

NCERT XII, Page # 28

The correct answer is (3) Prostate.
The prostate gland secretes an enzyme called fibrinolysin, which helps in the liquefaction of semen after ejaculation. This process allows sperm to become more motile for fertilization.

147)

NCERT, Pg. # 30

148) NCERT (XIIth) Pg. # 52 (E) 57(H) , Fig. (3.11)

149) NCERT XII - Page - 43

150)

A. **Spermatogenesis:**

    A. One primary spermatocyte undergoes meiosis I and meiosis II to produce four haploid spermatids.

    B. Each spermatid matures into a sperm cell.

    C. Therefore, 50 primary spermatocytes will produce 50 x 4 = 200 sperm.

B. **Oogenesis:**

    A. One primary oocyte undergoes meiosis I to produce one secondary oocyte and one polar body.

    B. The secondary oocyte (if fertilized) undergoes meiosis II to produce one mature

ovum (egg) and another polar body.

C. Therefore, 50 primary oocytes will produce 50 ova.

In summary, 50 primary spermatocytes result in 200 sperm, and 50 primary oocytes result in 50 ova.

The correct answer is : 1. 200 sperm and 50 ovum.

151)

The correct sequence for the male genital tract is:

1. Seminiferous tubules → Rete testis → Vasa efferentia → Epididymis → Vas deferens → Urethra

A. **Seminiferous tubules:** This is where sperm production (spermatogenesis) occurs.
B. **Rete testis:** A network of tubules that collects sperm from the seminiferous tubules.
C. **Vasa efferentia:** Tiny tubules that carry sperm from the rete testis to the epididymis.
D. **Epididymis:** A long, coiled tube where sperm mature and are stored.
E. **Vas deferens:** A muscular tube that carries sperm from the epididymis to the ejaculatory ducts.
F. **Urethra:** The final passageway through which sperm and urine are expelled from the body.

152) NCERT (XIIth) Pg. # 46

153)

NCERT-XII, Pg. # 32, para–2.3(E),
Pg. # 35, para–2.3(H)

154) NCERT Page No. # 46

155) NCERT Page No. # 49

156) NCERT Page No.# 46

157) NCERT-XII, Pg # 44

158) NCERT-XII, Pg # 47

159) NCERT-XII, Pg # 43

160)

NCERT-XII, Page # 36

161) NCERT (XIIth) Pg. # 47 (E) 51 (H)

162) NCERT Pg. # 47

163) NCERT (XII) Pg. # 45, Ist para

164) NCERT-12th Pg. No. # (E) 46

165)

NCERT XII, Pg # 48, para-3.3

166)

NCERT XII, Pg # 43, para-3.1

167)

Sertoli cells, also known as sustentacular cells or nurse cells release inhibin.

168)

NCERT XII, Page # 29

169)

The correct answer is **3. secondary spermatocytes**.

A. **Spermatogenesis** is the process of sperm production in males.
B. **Haploid cells** have half the number of chromosomes as diploid cells.
C. **Meiosis** is the process that reduces the chromosome number from diploid to haploid.

170)

NCERT-XII, Pg. # 47, para–1(E),

Pg. # 50, para–2(H)

171)

The correct answer is **4. Leydig cells**

A. **Testosterone production:** Leydig cells are responsible for producing testosterone, the primary male sex hormone.
B. **FSH role:** Follicle-stimulating hormone (FSH) primarily stimulates Sertoli cells, which are important for sperm development.
C. **Sterility and low testosterone:** If testosterone levels are low and FSH levels are normal, it suggests a problem with the cells responsible for testosterone production, which are the Leydig cells.

172)

173)

174)

175)

176)

177)

NCERT Page No 27

178)

The correct answer is **4. All of the above**.

Male accessory glands are structures that contribute fluids to semen. These fluids nourish and protect sperm, and also help in sperm motility. The main male accessory glands include:

A. **Prostate gland:** Secretes a slightly alkaline fluid that helps neutralize the acidity of the vagina, which is important for sperm survival.
B. **Bulbourethral gland:** Secretes a clear, viscous fluid that lubricates the urethra and neutralizes any remaining traces of urine.
C. **Seminal vesicles:** Secrete a fluid rich in fructose (a sugar that provides energy for sperm), prostaglandins (hormones that stimulate uterine contractions), and other substances that help nourish and protect sperm.

179)

Solution:
A polar body is a byproduct of the process of oogenesis (the formation of eggs in females). Here's how it occurs:

A. During meiosis in oogenesis, a primary oocyte undergoes two divisions to produce one secondary oocyte and one polar body.
B. The secondary oocyte is the larger cell that will eventually mature into an egg (ovum) if fertilization occurs.
C. The polar body is a smaller cell that typically does not participate in fertilization and is discarded. It contains a set of chromosomes but little cytoplasm.

Thus, the polar body is produced during the formation of the secondary oocyte.

180)

SOLUTION/EXPLANATION/CALCULATION:

Testis and Ovary:
These are primary sex organs responsible for producing gametes (sperm and eggs).

- Vas deferens: This is a duct that carries sperm from the epididymis to the ejaculatory ducts. It's part of the male reproductive system but not a secondary sex organ. Secondary sex organs are those that develop at puberty and contribute to sexual reproduction but are not directly involved in gamete production. In males, these include:

- Scrotum: A sac of skin that holds the testicles.

- Penis: The male organ for sexual intercourse and urination.

- Seminal vesicles: Glands that produce a fluid that nourishes and protects sperm.

- Prostate gland: A gland that produces a fluid that helps to neutralize the acidity of the vagina.

- Bulbourethral glands: Glands that produce a fluid that lubricates the urethra.
Beard is a secondary sex characteristic that develops in males at puberty due to hormonal changes, specifically the increase in testosterone production. It's a visible sign of male sexual maturity.

Therefore, among the given options, a beard is the only secondary sex organ in human males.