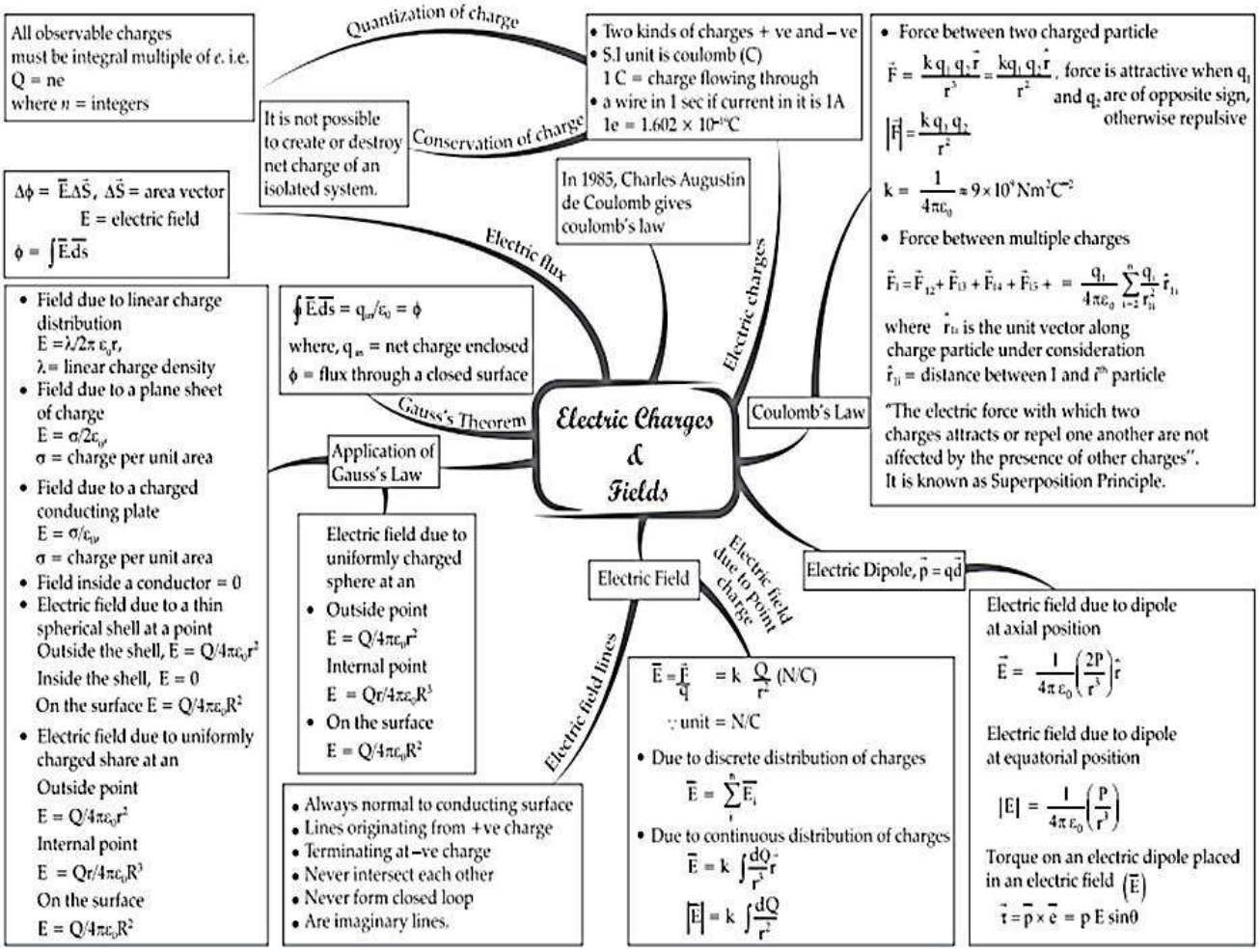
CHAPTER 1 - ELECTRIC CHARGES AND FIELD

MIND MAP



MULTIPLE CHOICE QUESTIONS

1. A charge q is placed at the centre of the line joining two exactly equal positive charges Q. The system of these charges will be in equilibrium, if q is equal to

   A. $-\frac{Q}{4}$ B. $-\frac{Q}{2}$ C. $+\frac{Q}{4}$ D. $+\frac{Q}{2}$

2. Electric charges of 1μC, -1 μC and 2μC are placed in air at the corners A,B and C respectively of an equilateral triangle ABC having length of each side 10 cm. The resultant force on the charge at C is

   A. 0.9 N B 1.8 N C 2.7 N D. 3.6 N

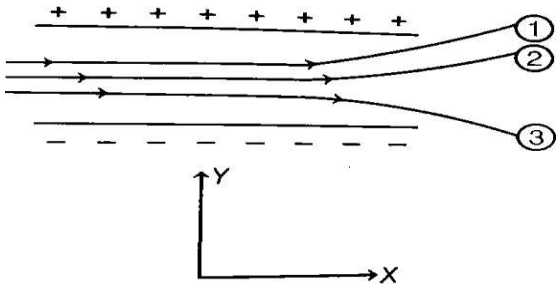
3. When the charge of a body becomes half, the electric field becomes

   A. Half B. Twice C. Thrice D. No change

4. An electron enters uniform electric field maintained by parallel plates and of value 'E' V m^{-1} with a velocity ' v ' ms^{-1}. The plates are separated by a distance 'd' metre. What is the acceleration of the electron in the field

A. $\frac{eE}{m}$ B. $-\frac{eE}{m}$ C. $\frac{Ed}{m}$ D. $\frac{Ed^2}{m}$

5. The given figure shows tracks of three charged particles n a unform electrostatic field. Which particle has the highest charge to mass ratio?



A. 1 B. 2 C. 3 D. All are equal

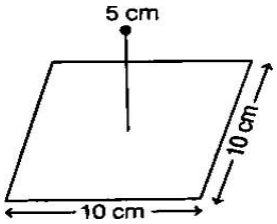
6. What is the nature of gaussian surface involved in Gauss's law of electrostatics?

A. Scalar B Electrical C Magnetic D Vector

7. An electrical dipole is placed in an unform electric field with the dipole axis asking an angle θ with the direction of electrical field. The orientation of the dipole for stable equilibrium is

A. π/6 B. π/3 C. 0 D. π/2

8. A point charge + 10 μC is at a distance 5 cm directly above the centre of a square of side 10 cm, as shown in figure. What is the magnitude of the electric flux through the square?



A. Zero B. 8 x 10^2 Nm^2C^{-1}

C. 1.8 x 10^4 Nm^2 C^{-1} D1.8 x 10^5 Nm C^{-1}

9. Which of the following statements is / are incorrect regarding the point charge?

A. The charge Q on a body is always given by q=ne, where n is any integer, positive or negative.

B. By convention, the charge on an electron is taken to be negative.

C. The fact that electric charge is always an integral multiple of *e* is termed as quantisation of charge

D. The quantisation of charge was experimentally demonstrated by Newton in 1912.

10. Electric field at a point varies as r° for

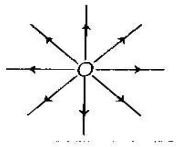
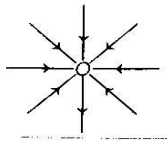
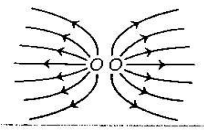
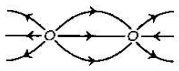
A. Point charge B. Dipole

C. Line charge D. Infinite plane sheet of charge

11. Two spheres have their surface charge densities in the ratio of 2 :3 and their radii 3 :2. The ratio of the charges on them is:

A. 3:2 B. 4:2 C. 2:3 D. 2:4

12. Match the column 1(electrical lines of force) with column 2(type of charge) and select the correct answer from the given codes below

Column I		Column II
A. 	p.	A pair of equal and opposite charges
B. 	q.	A pair of positive charges
C. 	r.	A single positive charge
D. 	s.	A single negative charge

Codes

	A	B	C	D
A.	p	q	r	s
C	r	s	p	q

	A	B	C	D
B.	r	q	p	s
D.	r	s	q	p

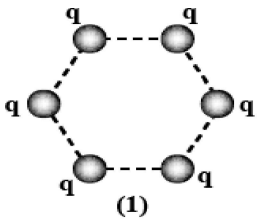
13. Charge on a body is Q_1 and it is used to charge another body by induction. Charge on second body is found to be Q_2 after charging, then

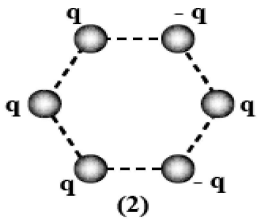
A. $q_1 / q_2 = 1$ B. $q_1 / q_2 < 1$ C. $q_1 / q_2 \leq 1$ D. $q_1 / q_2 \geq 1$

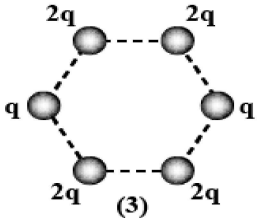
14. The force between 2 charges 0.0 6m apart is 5 N. If each charge is moved towards each other by 0.04 m then the force between them will become

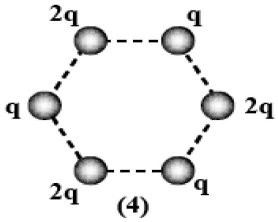
A. 7.20 N B. 11.25 N C. 22.50 N D. 45.00 N

15. Figure below show regular hexagons with charges at the vertices In which case the electric field at the centre zero?









A. 1 B.2 C.3 D.4

ASSERTION AND REASONING QUESTIONS

These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following four responses.

(a) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.

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(c) If the Assertion is correct but Reason is incorrect.

(d) If both the Assertion and Reason are incorrect.

1. Assertion When we produce charge q_1 on a body by rubbing it against another body which gets a charge q_2 in the process then $q_1 + q_2 = 0$

   Reason Charge on an isolated system remains constant.

2. Assertion Electric line of force cross each other

   Reason Electric field at a point does not superimposes to give one resultant electric field.

3. Assertion On going away from a small electric dipole electric field decrease

   Reason electric field is inversely proportional to square of distance from an electric dipole.

4. Assertion The electric flux of the electric field $\oint \mathbf{E}.d\mathbf{A}$ is zero. The electric field is zero everywhere on the surface.

   Reason: The charge inside the surface is zero.

5. Assertion If a point charge be rotated in a circle around a charge, the work will be zero

   Reason Work done is equal to dot product of force and distance.

6. Assertion If a conducting medium is placed between two charges, then electric force between them becomes zero

   Reason Reduction in a force due to introduce material is inversely proportional to dielectric constant.

7. Assertion Charge is quantized

   Reason Charge which is less than 1C is not possible

8. Assertion Excess charge on a conductor resides entirely on the outer surface.

   Reason Like charges repel one another.

9. Assertion When a neutral body is charged negatively, its mass increases slightly.

   Reason When a body is charged negatively, it gains some electrons and electron has finite mass; though quite small

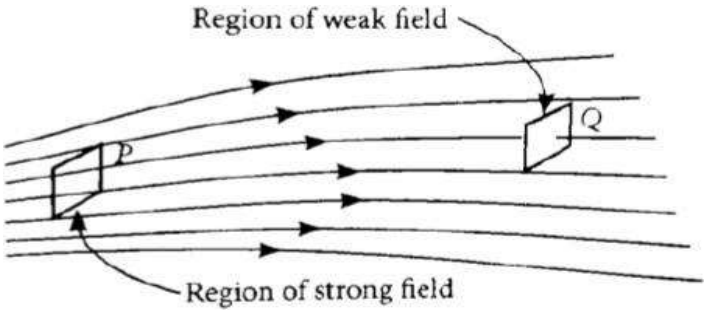
10. Assertion As force is a vector quantity, hence electric field intensity is also a vector quantity.

    Reason The unit of electric field intensity is Newton per coulomb.

CASE STUDY BASED QUESTIONS

RELATIONSHIP BETWEEN STRENGTH OF ELECTRIC FIELD AND DENSITY OF LINE OF FORCES.

Electric field strength is proportional to the density of lines of force i.e., electric field strength at a point is proportional to the number of lines of force cutting a unit area element placed normal to the field at that point. As illustrated in given figure, the electric field at P is stronger than at Q.



1) Electric lines of force about a positive point charge are

   (a) radially outwards (b) circular clockwise

   (c) radially inwards (d) parallel straight lines

2) Which of the following is false for electric lines of force?

   (a) They always start from positive charge and terminate on negative charges.

   (b) They are always perpendicular to the surface of a charged conductor.

   (c) They always form closed loops.

   (d) They are parallel and equally spaced in a region of uniform electric field.

3) Which one of the following patterns of electric line of force is not possible in field due to stationary charges?

4) Electric field lines are curved

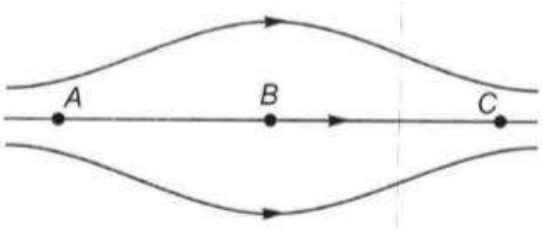
(a) in the field of a single positive or negative charge

(b) in the field of two equal and opposite charges.

(c) in the field of two like charges.

(d) both (b) and (c)

5) The figure below shows the electric field lines due to two positive charges. The magnitudes E_A, E_B and E_C of the electric fields at point A, B and C respectively are related as



(a) $E_A > E_B > E_C$ (b) $E_B > E_A > E_C$ (c) $E_A = E_C > E_B$ (d) $E_A > E_B = E_C$

ANSWERS

S NO	ANS MCQs.	S NO	ANS Assertion / Reasoning
1	A	1	A
2	B	2	D
3	A	3	C
4	B	4	D
5	C	5	A
6	D	6	A
7	C	7	C
8	D	8	B
9	D	9	A
10	D	10	B
11	A	S NO	ANS CASE STUDY
12	D	1	A
13	D	2	C
14	B	3	C
15	B	4	D
		5	C

TEST PAPER

1. When a glass rod is rubbed with silk, it

   (a) gains electrons from silk. (b) gives electrons to silk.

   (c) gains protons from silk. (d) gives protons to silk.

2. The force between two charges is 120N. If the distance between the two charges is doubled, the force will be

   (a) 30N (b) 60N (c) 15N (d) 40N

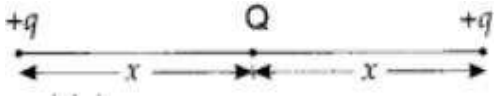
3. Two large metal sheets having surface charge density $+\sigma$ and $-\sigma$ are kept parallel to each other at a small separation distance d. The electric field at any point in the region between the plates is

   (a) σ/ε_0 (b) $\sigma/2\varepsilon_0$ (c) $2\sigma/\varepsilon_0$ (d) $\sigma/4\varepsilon_0$

4. SI unit of permittivity of free space is

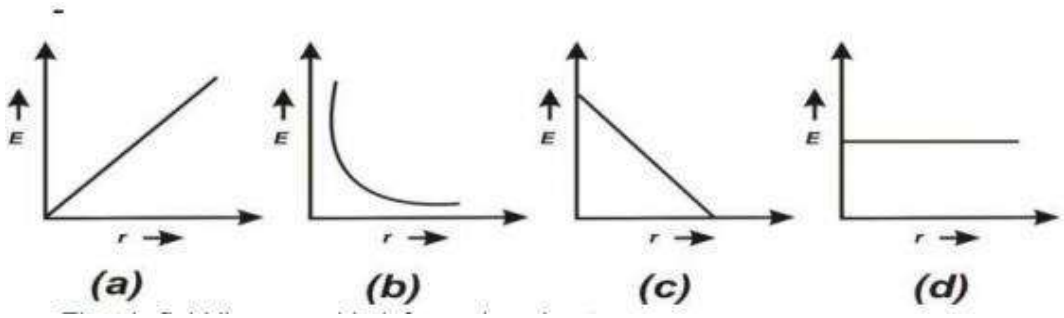
   (a) Farad (b) Weber (c) $C^2N^{-1}\ m^{-2}$ (d) $C^2N\ m^{-2}$

5. A charge Q is placed at the centre of the line joining two-point charges +q and +q as shown in the figure. The ratio of charges Q and q is



   (a) 4 (b) 1/4 (c) -4 (d) -1/4

6. For a point charge, the graph between electric field versus distance is given by:



7. When an electric dipole is placed in a uniform electric field, it experiences

   a) Force as well as torque b) Torque but no net force

   c) Force but no torque d) Neither any force nor any torque

8. The angle between area of equipotential surface and electric field is-

   (a) 0^0 (b) 90^0

   (c) Between 0^0 and 90^0 (d) Between 90^0 and 180^0

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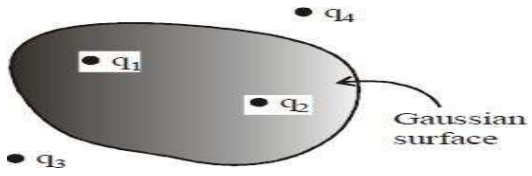
(c) If the Assertion is correct but Reason is incorrect.

(d) If both the Assertion and Reason are incorrect

9. Assertion When a charged body is brought near to an uncharged conducting body equal and opposite charge is induced on the nearer surface of the conducting body.

   Reason Net electric field inside the conductor is zero.

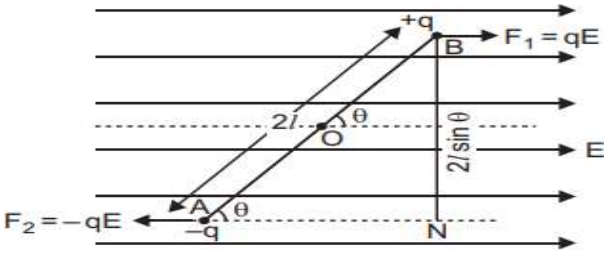
10. Assertion: Four-point charges q1, q2, q3 and q4 are as shown in figure. The flux over the shown Gaussian surface depends only on charges q1 and q2.



Reason In coulombic attraction two bodies are oppositely charged.

CASE STUDY BASED MCQs

11. When electric dipole is placed in uniform electric field, its two charges experience equal and opposite forces, which cancel each other and hence net force on electric dipole in uniform electric field is zero. However these forces are not collinear, so they give rise to some torque on the dipole. Since net force on electric dipole in uniform electric field is zero, so no work is done in moving the electric dipole in uniform electric field. However, some work is done in rotating the dipole against the torque acting on it.



1. The dipole moment of a dipole in a uniform external field $\bar{E}$ is P. Then the torque τ acting on the dipole is

(a) $\tau = P \times E$ (b) $\tau = P.\bar{E}$

(c) $\tau = 2(P + \bar{E})$ (d) $\tau = (P + E)$

2. An electric dipole consists of two opposite charges, each of magnitude 1.0 μC separated by a distance of 2.0 cm. The dipole is placed in an external field of 10^5 NC^{-1}. The maximum torque on the dipole is

(a) 0.2×10^{-3} Nm (b) 1×10^{-3} Nm

(c) 2×10^{-3} Nm (d) 4×10^{-3} Nm

3. Torque on a dipole in uniform electric field is minimum when θ is equal to

(a) 0° (b) 90° (c) 180° (d) Both (a) and (c)

4. When an electric dipole is held at an angle in a uniform electric field, the net force F and torque τ on the dipole are

(a) $F = 0, \tau = 0$ (b) $F \neq 0, \tau \neq 0$

(c) $F = 0, \tau \neq 0$ (d) $F \neq 0, \tau = 0$

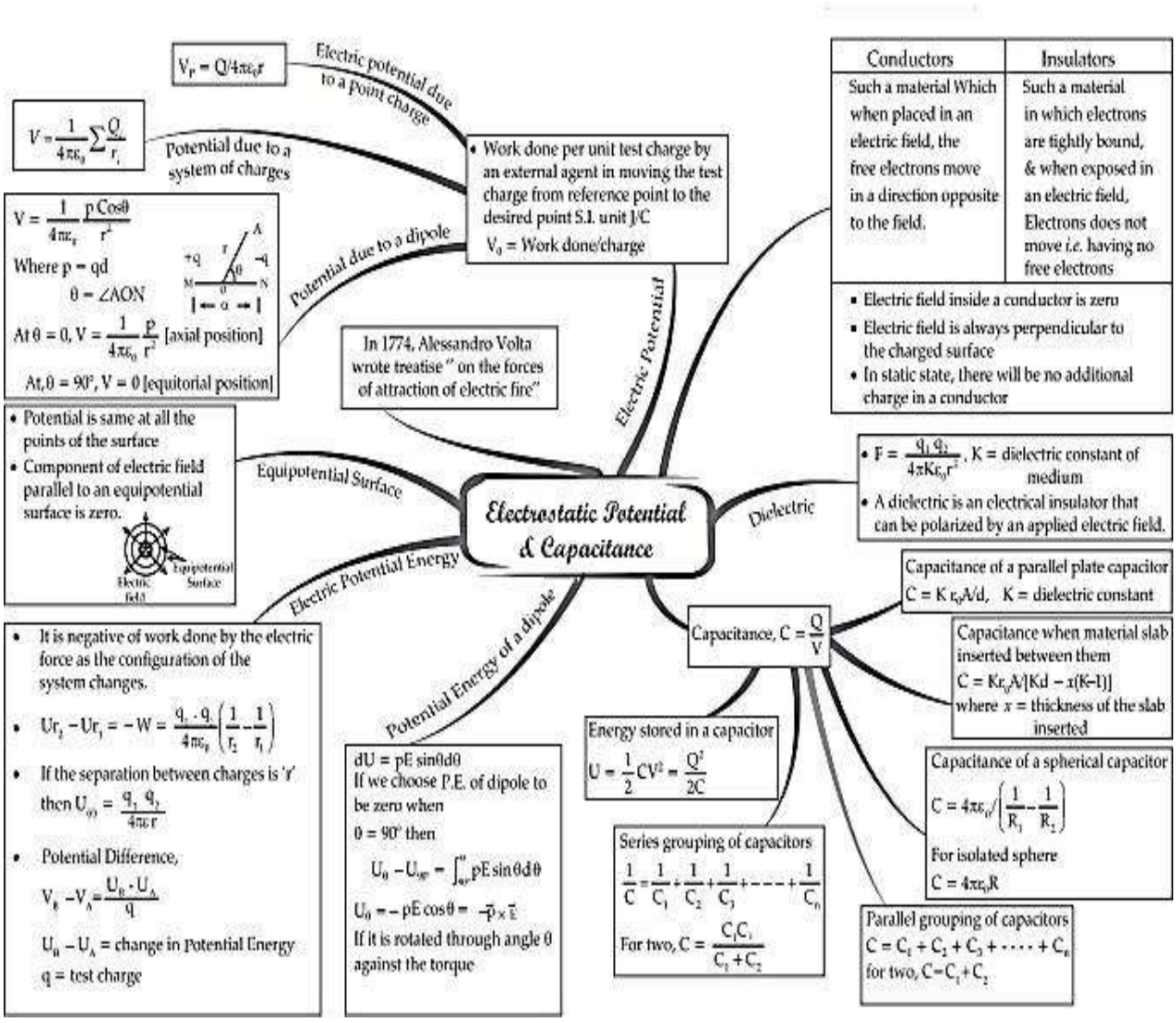
5. An electric dipole of moment p is placed in an electric field of intensity E. The dipole acquires a position such that the axis of the dipole makes an angle with the direction of the field. Assuming that potential energy of the dipole to be zero when $\theta = 90°$, the torque and the potential energy of the dipole will respectively be

(a) $pE\sin\theta, -pE\cos\theta$ (b) $pE\sin\theta, -2pE\cos\theta$

(c) $pE\sin\theta, 2pE\cos\theta$ (d) $pE\cos\theta, -pE\sin\theta$

CHAPTER 2 - ELECTROSTATIC POTENTIAL AND CAPACITANCE

MIND MAP

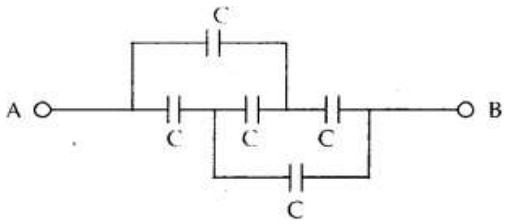


MULTIPLE CHOICE QUESTIONS

1 Three capacitors of capacitances 3μF, 9μF and 18 μF are connected once in series and then in parallel. The ratio of equivalent capacitances C_s/C_p will be:

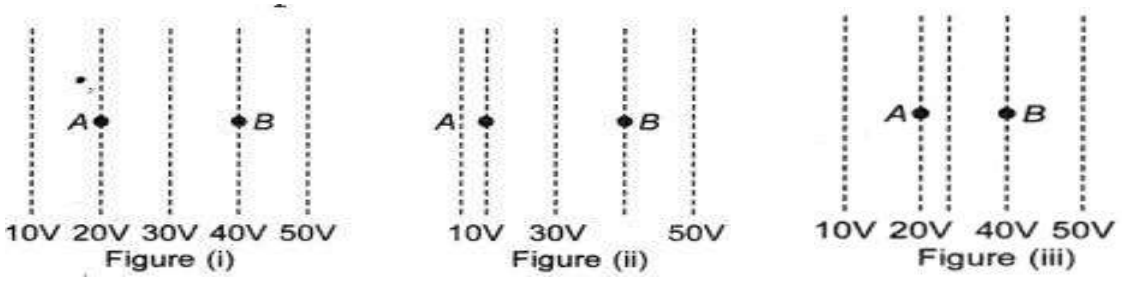
(a)1:15 (b)15:1 (c)1:1 (d) 1: 3

2 Five equal capacitors, each with capacitance C are connected as shown. The equivalent capacitance between A and B is.



(a)5 C (b) C (c) C/5 (d) 3C.

3 Figures show some equipotential lines distributed in space. A charged object is moved from point A to point B.



(a) The work done in Fig. (i) is the greatest.

(b) The work done in Fig. (ii) is least.

(c) The work done is the same in Fig. (i), Fig.(ii) and Fig. (iii).

(d) The work done in Fig. (iii) is greater than Fig. (ii) but equal to that in Fig. (i).

4 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 (1 m, 0, 2 m) in volt/metre is

(a) 8 along negative x-axis (b) 8 along positive x-axis

(c) 16 along negative x-axis (d) 16 along positive z-axis

5 Which of the following options is correct? In a region of constant potential

(a) the electric field is uniform.

(b) The electric field is zero.

(c) There can be charge inside the region.

(d) The electric field shall necessarily change if a charge is placed outside the region.

6 In a parallel plate capacitor, the capacity increases if

(a) area of the plate is decreased.

(b) Distance between the plates increases.

(c) Area of the plate is increased.

(d) Dielectric constantly decreases.

7 If a unit positive charge is taken from one point to another over an equipotential surface, then

(a) work is done on the charge. (b) work is done by the charge.

(c) work done is constant. (d) no work is done.

8 Twenty-seven drops of mercury are charged simultaneously to the same potential of 10 volts. What will be potential if all the charged drops are made to combine to form one large drop ?

(a)180 V (b) 90 V (c) 120 V (d) 45 V

9 A capacitor has some dielectric between its plates, and the capacitor is connected to a dc source. The battery is now disconnected and then the dielectric is removed, then

(a) capacitance will increase. (b) energy stored will decrease.

(c) electric field will increase. (d) voltage will decrease.

10 Which of the following is blocked by a capacitor?

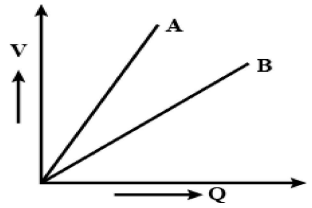
(a) A.C. (b) D.C. (c) Both A.C. and D.C. (d) Neither A.C. nor D. C

11 A dielectric is placed in between the two parallel plates of a capacitor as shown in the figure. The dielectric constant of the dielectric being K. If the initial capacity is C, then the new capacity will be:

(a)(K + l).C (b) K.C (c) ((K+1)/2) . C (d) (k – l) C

12 The graph shows the variation of voltage 'V' across the plates of two capacitors A and B versus increase of charge 'Q' stored on them. which of the two capacitors has higher capacitance?

(a) A (b) B (c) both have same (d) none



13 Two spherical conductors each of capacity C are charged to potential V and -V. These are then connected by means of a fine wire. The loss of energy is

(a) zero (b) $1/2CV^2$ (c) CV^2 (d) $2\ CV^2$

14. A positively charged particle is released from rest in a uniform electric field. The electric potential energy of the charge

(a) remains constant because the electric field is uniform.

(b)increases because charge moves along the electric field.

(c)decreases because charge moves along the electric field.

(d)decreases because charge moves opposite to the electric field.

15. Electric potential of earth is taken to be zero because earth is a good

(a) Insulator (b). Conductor (c). Semiconductor (d). Dielectric

ASSERTION REASONING QUESTIONS

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(c) If the Assertion is correct but Reason is incorrect.

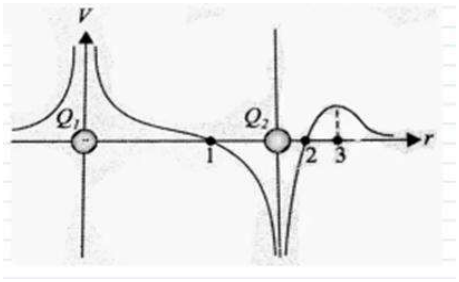
(d) If both the Assertion and Reason are incorrect.

1. Assertion: If the distance between parallel plates of a capacitor is halved and dielectric constant is three times, then the capacitance becomes 6 times.
   Reason : Capacity of the capacitor does not depend upon the nature of the material.
2. Assertion : Two concentric charged shells are given. The potential difference between the shells depends on charge of inner shell.
   Reason : Potential due to charge of outer shell remains same at every point inside the sphere.
3. Assertion : Electric field inside a conductor is zero.
   Reason: The potential at all the points inside a conductor is same.
4. Assertion : Work done in moving a charge between any two points in an electric field is independent of the path followed by the charge, between these points.
   Reason: Electrostatic force is a non-conservative force.
5. Assertion : Polar molecules do not have permanent dipole moment.
   Reason : In polar molecules, the centres of positive and negative charges coincide even when there is no external field.
6. Assertion: A capacitor can be given only a limited quantity of charge.
   Reason: Charge stored by a capacitor depends on the shape and size of plates of capacitor and the surrounding medium.
7. Assertion: Electron move away from a region of lower potential to a region of higher potential.
   Reason: An electron has a negative charge.
8. Assertion: A charged capacitor is disconnected from a battery. Now, if its plate are separated further, the potential energy will fall.
   Reason Energy stored in a capacitor is equal to the work done in charging it.
9. Assertion: Due to two-point charges electric field and electric potential can't be zero at some point simultaneously
   Reason Field is a vector quantity and potential a scalar quantity.

10. Assertion: A parallel plate capacitor is connected across battery through a key. A dielectric slab of dielectric constant k is introduced between the plates. The energy stored becomes k times.
Reason The surface density of charge on the plate remains constant.

CASE STUDY BASED QUESTIONS

1. The potential at any observation point P of a static electric field is defined as the work done by the external agent (or negative of work done by electrostatic field) in slowly bringing a unit positive point charge from infinity to the observation point. Figure shows the potential variation along the line of charges. Two-point charges Q_1 and Q_2 lie along a line at a distance from each other.



(i) At which of the points 1, 2 and 3 is the electric field is zero?

(a) 1 (b)2 (c) 3 (d) Both (a) and (b)

(ii) The signs of charges Q_1 and Q_2 respectively are

(a) positive and negative

(b) negative and positive

(a) positive and positive

(b) negative and negative

(iii) Which of the two charges Q_1 and Q_2 is greater in magnitude?

(a) Q_1 (b)Q_2 (c)cannot determine (d) same

(iv) Which of the following statement is not true?

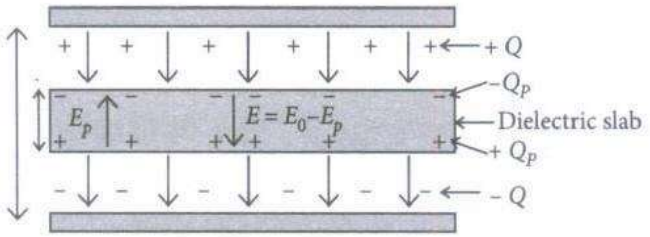
(a)Electrostatic force is a conservative force.

(b) Potential at a point is the work done per unit charge in bringing a charge from infinity to that point in an electric field.

(c) Electrostatic force is non-conservative.

(d)Potential is the ratio of work to charge.

2. A dielectric slab is a substance which does not allow the flow of charges through it but permits them to exert electrostatic forces on one another.
When a dielectric slab is placed between the plates, the field E_o polarises the dielectric. This induces charge $-Q_p$ on the upper surface and $+ Q_p$ on the lower surface of the dielectric. These induced charges set up a field E_p inside the dielectric in the opposite direction of E_0 as shown.



(i) In a parallel plate capacitor, the capacitance increases from 4μF to 80μF on introducing a dielectric medium between the plates. What is the dielectric constant of the medium?

(a)10 (b) 20 (c)50 (d) 100

(ii) A parallel plate capacitor with air between the plates has a capacitance of 8 pF. The separation between the plates is now reduced half and the space between them is filled with a medium of dielectric constant 5. Calculate the value of capacitance of the capacitor in second case.

(a) 8pF (b) 10pF (c) 80pF (d) 100pF

(iii) A dielectric introduced between the plates of a parallel plate condenser

(a) decreases the electric field between the plates

(b) increases the capacity of the condenser

(c) increases the charge stored in the condenser

(d) increases the capacity of the condense

(iv) A parallel plate capacitor of capacitance 1 pF has separation between the plates is d. When the distance of separation becomes 2d and wax of dielectric constant x is inserted in it the capacitance becomes 2 pF. What is the value of x

(a) 2 (b) 4 (c) 6 (d) 8

ANSWERS
MULTIPLE CHOICE QUESTIONS

SNO	ANS MCQs	SNO	ANS A&R
1	(a)	1	(c)
2	(b)	2	(a)
3	(c)	3	(a)
4	(a)	4	(c)
5	(b)	5	(c)
6	(c)	6	(a)
7	(d)	7	(a)
8	(b)	8	(d)
9	(c)	9.	(b)
10	(b)	10.	(c)
11	(c)		**ANS CSB**
12	(a)	1 (i)	(c)
13	(c)	(ii)	(a)
14	(c)	(iii)	(a)
15	(b)	(iv)	(c)

		2. (i)	(b)
		(ii)	(c)
		(iii)	(d)
		(iv)	(b)

TEST PAPER
MULTIPLE CHOICE QUESTIONS

1. Two small spheres each carrying a charge q are placed r meter apart. If one of the spheres is taken around the other one in a circular path of radius r, the work done will be equal to

   (a) force between them × r (b) force between them × 2πr

   (c) force between them/2πr (d) zero

2. The electric potential V at any point O (x, y, z all in meters) in space is given by $V = 4x^2$ volt. The electric field at the point (1 m, 0, 2 m) in volt/meter is

   (a) 8 along negative x-axis (b) 8 along positive x-axis

   (c) 16 along negative x-axis (d) 16 along positive z-axis

3. If a unit positive charge is taken from one point to another over an equipotential surface, then

   (a) work is done on the charge. (b) work is done by the charge.

   (c) work done is constant. (d) No work is done

4. A hollow metal sphere of radius 5 cm is charged so that the potential on its surface is 10 V. The potential at the centre of the sphere is

   (a) 0 V (b) 10 V

   (c) Same as at point 5 cm away from the surface

   (d) Same as at point 25 cm away from the surface

5. The electrostatic force between the metal plates of an isolated parallel plate capacitor C having a charge Q and area A, is

   (a) proportional to the square root of the distance between the plates.

   (b) Linearly proportional to the distance between the plates.

   (c) Independent of the distance between the plates.

   (d) Inversely proportional to the distance between the plates.

6. A capacitor is charged by a battery. The battery is removed and another identical uncharged capacitor is connected in parallel. The total electrostatic energy of resulting system

   (a) increases by a factor of 4. (b) Decreases by a factor of 2.

   (c) Remains the same. (d) Increases by a factor of 2

7. Assertion (A): Sensitive instruments can protect from outside electrical influence by enclosing them in a hollow conductor.

   Reason (R): Potential inside the cavity is zero.

8. Assertion (A): Electrostatic forces are conservative in nature.

Reason (R): Work done by electrostatic force is path dependent.

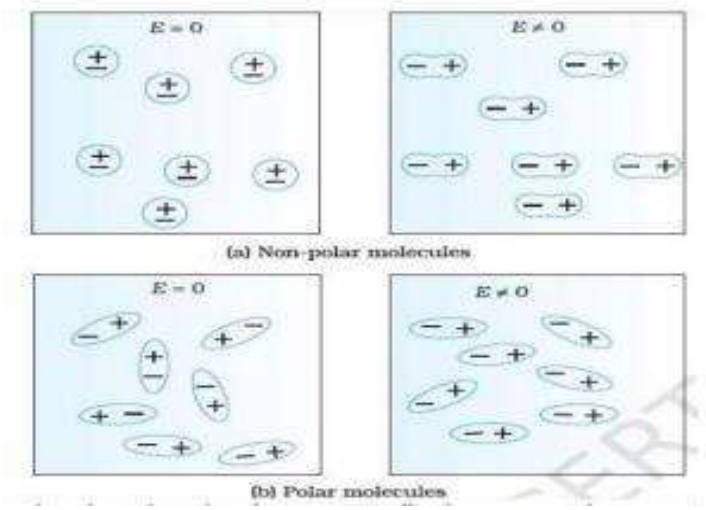
9. CASE STUDY BASE

Attempt any 4 sub parts out of 5 of question.

Dielectric with polar molecules also develops a net dipole moment in an external field, but for a different reason. In the absence of any external field, the different permanent dipoles are oriented randomly due to thermal agitation; so, the total dipole moment is zero. When an external field is applied, the individual dipole moments tend to align with the field. When summed overall the molecules, there is then a net dipole moment in the direction of the external field, i.e., the dielectric is polarized. The extent of polarisation depends on the relative strength of two factors: the dipole

potential energy in the external field tending to align the dipoles mutually opposite with the field and thermal energy tending to disrupt the alignment. There may be, in addition, the 'induced dipole moment' effect as for non-polar molecules, but generally the alignment effect is more important for polar molecules. Thus, in either case, whether polar or non-polar, a dielectric develops a net dipole moment in the presence of an external field. The dipole moment per unit volume is called polarization.

(i) The best definition of polarisation is



(a) Orientation of dipoles in random direction (b) Electric dipole moment per unit volume

(c) Orientation of dipole moments (d)Change in polarity of every dipole

(ii) Calculate the polarisation vector of the material which has 100 dipoles per unit volume in a volume of 2 units.

(a) 200 (b) 50 (c) 0.02 (d) 100

(iii) The total polarisation of a material is the

(a) Product of all types of polarisation (b) Sum of all types of polarisation

(c)Orientation directions of the dipoles (d)Total dipole moments in the material

(iv) Dipoles are created when dielectric is placed in _____

(a) Magnetic Field (b) Electric field

(c) Vacuum (d) Inert Environment

(v) Identify which type of polarisation depends on temperature.

(a)Electronic (b)Ionic (c) Orientational (d) Interfacial

CHAPTER 3 - CURRENT ELECTRICITY

MIND MAP

Important formula

$I=\Delta Q/\Delta t I=nqAvd$ $\rho=\rho 0\,(1+\alpha\Delta T)$ $R=R0\,(1+\alpha\Delta T)$

$P=IV=V^2/R=I^2R$ Current density: j = i/A = σE

Drift speed: vd = eE m/ τ = i Resistance of a wire: R = ρl/A, where ρ = 1/σ

Temp. dependence of resistance: R = R0(1 + αΔT) Ohm's law: V = iR

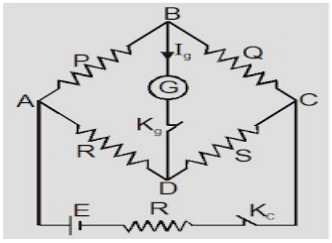
Kirchhoff 's Laws: (i) The Junction Law: The algebraic sum of all the currents directed towards a node is zero i.e., Σnode I = 0.

(ii)The Loop Law: The algebraic sum of all the potential differences along a closed loop in a circuit is zero i.e., Σloop Δ Vi = 0.

Resistors in parallel: 1 Req = R1 R2 /R1+R2 R1 Resistors in series: Req = R1 + R2

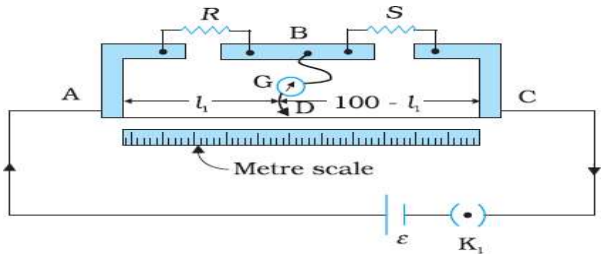
B Wheatstone bridge P/Q=R/S if bridge is in Balance condition

:

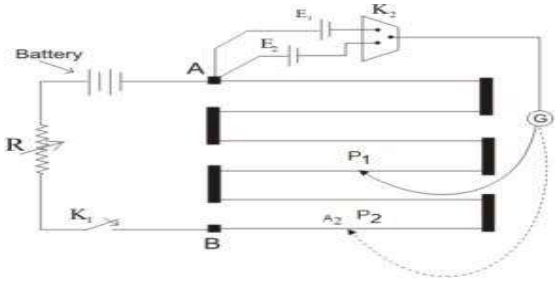


R /S= l/ 100-l if bridge is in balance condition

Circuit diagram for meter bridge



Potentiometer



To compare EMF of primary cells E1/E2=l1/ll2

MULTIPLE CHOICE QUESTIONS

1. The filament of 60W and 100 W bulbs are of same length. Then:

   (a) 60W filament is thicker (b) 100W filament is thicker

   (b)both are of same thickness (d)both cannot have same length

2. Kirchhoff's first law (∑i=o) and second law(∑iR=∑E),where the symbols have their usual meanings, are respectively based on:

   (a)Conservation of charge, conservation of momentum

   (b)Conservation of energy, conservation of charge

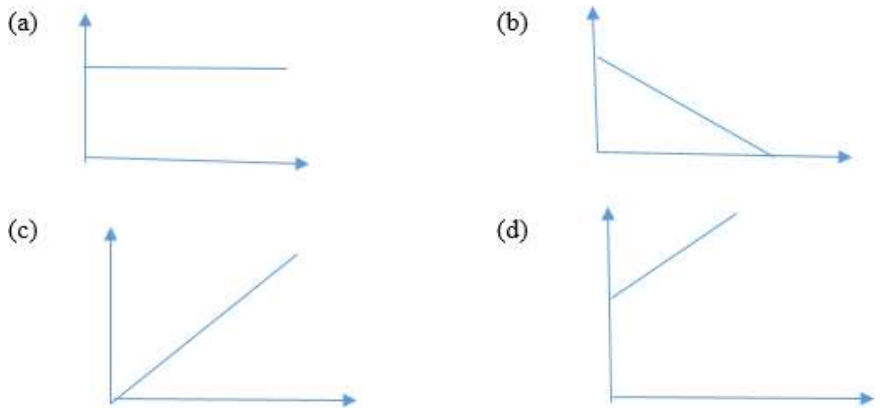
   (c) Conservation of momentum, conservation of charge

   (d)Conservation of charge, conservation of energy

3. Drift velocity of the free electrons in a conducting wire carrying a current i is v. If in a wire of the same metal, but of double the radius, the current be 2i then the drift velocity of the electrons will be

   (a) v/4 (b) v/2 (c) v (d) 4v

4. Following are the graphs between the current I drawn from a cell and the terminal voltage V of the cell. Which one is correct in(In Y axis V and in x axis I)



5. If a wire is stretched to make it double longer, its resistance will

   (a)Increase by 4 times (b)increase by 2

   (c)decrease by 4 times (d) decrease by 2times

6. In a meter bridge experiment the ratio of left gap resistance to right gap resistance is 1:3.The balance point from left is:

   (a)20cm (b)25cm (c)30cm (d)35cm

7. When a metal conductor connect to left gap of a meter bridge is heated the balancing point

   (a) shifts towards right (b) shifts towards left

   (c) remains unchanged (d)remains to zero

8. The specific resistance of a conductor increase with

(a) increase in temperature (b)increase in cross-sectional area

(c) decrease in length (d)decrease in cross-sectional area

9. In a current carrying conductor the net charge is

(a) $1.6X10^{-19}C$ (b) $6.25X10^{-18}C$ (c)zero (d)infinite

10 Nichrome or Manganin is widely used in wire bound resistors because of their

(a)temperature independent resistivity

(b)very weak temperature dependent resistivity

(c)strong dependence of resistivity with temperature

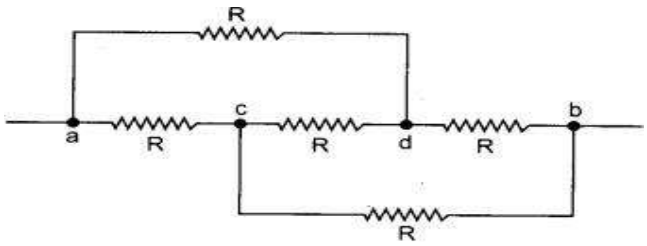
(d)mechanical strength

11. A current pass through a wire of nonuniform cross section. Which of the following quantities are independent of cross section

(a) the charge crossing (b)Drift velocity

(c)current density (d)free electron density

12. In below circuit if the value of each resistance is 10 Ω then equivalent resistance between a and b is



(a)10 Ω (b)20 Ω (c)30 Ω (a)40 Ω

13. The resistance of silver wire at 0^0 is 1.25 Ω. Up to what temperature it must be heated so that its resistance is doubled? (givenα for silver=0.0041^0C^{-1})

(a)350^0C (b)200^0C (c)244^0C (d)300^0C

14. A cell having emf of 1.5V, when connected across a resistance of 14 Ω, produces a voltage of only 1.4V across the resistance. The internal resistance of the cell must be

(a)1Ω (b)14Ω (c)15Ω (d)21Ω

15. Two conducting wires X and Y of same diameter but different materials are joined in series across a battery. If the number density of electron in X is twice that in Y, find the ratio of drift velocity of electrons in two wires is

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

For question 1 to 10 two statements are given –one labelled Assertion(A) and the other labelled Reason (R).Select the correct answer to these question from the codes (a),(b),(c)and (d) as given below.

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

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

(c)A is true but R is false

(d)A is false and R is also false

1. Assertion. Though large number of free electrons are present in the metal. Yet there is no current in the absence of electric field.
   Reason: In the absence of electric field electrons move randomly in all direction.
2. Assertion. An electrical bulb starts glowing instantly as it is switched on.
   Reason: Drift speed of electrons in a metallic wire is very large
3. Assertion: The emf of driver cell in potentiometer experiment should be greater than emf of cell to be determined.
   Reason: The fall of potential across the potentiometer wire should not be less than emf of cell to be determined.
4. Assertion: In meter bridge experiment, a high resistance is always connected in series with galvanometer.
   Reason: As resistance increase current more accurately than ammeter.
5. Assertion-Two electric bulb of 50W and 100 Ware given. When connected in series 50 W bulb glows more but when connected parallel100W bulb glows more.
   Reason-In series combination power is directly proportional to the resistance of the resistance of circuit. But in parallel combination power is inversely proportional to the resistance of the circuit.
6. Assertion- The average time of collision decreases with increasing temperature.
   Reason-At increased temperature average speed of the electrons, which act as the carrier of current increases resulting in more frequent collision.
7. Assertion-Two bulbs of same wattage, one having a carbon filament and the other having a metallic filament are connected in series. Mettalic bulbs will glow more brightly than carbon filament bulb
   Reason-Carbon is a semiconductor.
8. Assertion-Practically a voltmeter will measure the voltage across the battery not its emf.
   Reason-EMF of cell is measured with the help of potentiometer.
9. Assertion -Ohm's law is universally applicable for all conducting elements
   Reason-All conducting elements show straight line graphic variation on (I-V)plot.
10. Assertion-The potentiometer wire should have uniform cross sectional area.
    Reason-on potentiometer wire the jockey is gently touched, not pressed hard

CASE STUDY QUESTION

1. Electron move more easily through some conductors than others when potential difference is applied. The opposition of a conductor to current is is called its resistance. Collisions are the basic cause of opposition. When potential difference is applied across the ends of a conductor, its free electrons get accelerated. On their way, they frequently collide with positive metal ions, i.e., their motion is opposed and this opposition to the flow of electron is called resistance. The number of collisions that the electrons make with atoms/ions depends on the arrangement of atoms or ions in the conductor. A long wire offers more resistance than short wire because there will be more collisions. A thick wire offers less resistance than a thin wire because in a thick wire more area of cross section is available for the flow of electrons. The resistance of metal increases when their temperature increases. Certain alloys such as constantan and manganin show very small changes of resistance with temperature and are used to make standard resistors. The resistance of semiconductor and insulator decreases as their temperature increases.

Questions

(i). The resistance of a conductor is

(a) inversely proportional to the length

(b) directly proportional to the square of the radius

(c) inversely proportional to the square of the radius

(d) directly proportional to the square root of the length.

(ii). The dimensions of a block are $1cm \times 1cm \times 100cm$. If the specific resistance of the material is $3X10^{-7}\Omega$ then the resistance between two opposite rectangular base is

(a) $3X10^{-9}\Omega m$ (b) $3X10^{-7}\Omega$ (c) $3X10^{-5}\Omega$ (d) $3X10^{-1}\Omega$

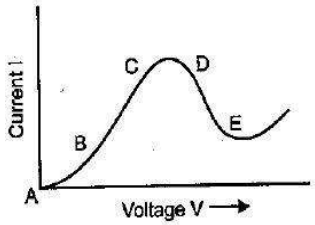
(iii). Two wire of the same material have lengths I and 2l and areas of cross section 4A and A respectively. The ratio of their specific resistance would be

(a)1:2 (b)8:1 (c)1:8 (d) 1:1

(iv). A wire of resistance R is stretched to twice of its original length.Its new resistance will be

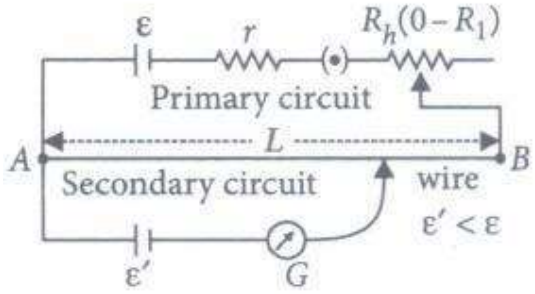
(a)4R (b)R/9 (c)3R (d)R/3

(v). From the graph between current I and V identify the portion corresponding to the negative resistance



(a) AB (b)BC (c)CD (d)DE

2. Potentiometer is an apparatus used for measuring the emf of a cell or potential difference between two points in an electrical circuit accurately. It is also used to determine the internal resistance of a primary cell. The potentiometer is based on the principle that, if V is the potential difference across any portion of the wire of length l and resistance R, then $V \propto l$ or $V=kl$ where k is the potential gradient. Thus, potential difference across any portion of potentiometer wire



is directly proportional to length of the wire of that portion. The potentiometer wire must be uniform. The resistance of potentiometer wire should be high.

Questions

(i) Which one of the following is true about potentiometer?

(a) Its sensitivity is low

(b) It measures the emf of a cell very accurately

(c) It is based on deflection method

(d) None of the above

(ii) A current of 1.0 mA is flowing through a potentiometer wire of length 4 m and of resistance 4Ω .The potential gradient of the potentiometer wire is

(a) 10^{-3}V/m **(b)** 10^{-4}V/m (c) 10^{-2}V/m (d) 10^{-1}V/m

(iii) Sensitivity of a potentiometer can be increased by

(a) decreasing potential gradient along the wire (b) increasing potential gradient along the wire

(c) decreasing current through the wire (d) increasing current through the wire

(iv) A potentiometer is an accurate and versatile device to make electrical measurements of EMF because the method involves

(a) potential gradients

(b) a condition of no current flow through the galvanometer

(c) a combination of cells, galvanometer and resistances

(d) cells

(v) In a potentiometer experiment, the balancing length is 8 m, when the two cells E_1 and E_2 are joined in series. When the two cells are connected in opposition the balancing length is 4 m. The ratio of the e. m. f. of two cells (E_1/E_2) is

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

ANSWERS

MULTIPLE CHOICE QUESTIONS

1. $P=V^2/R$ for more power less resistance hence 100W bulb has low resistance and resistance is inversely proportion to cross section are so 100 W bulb is more thicker.

2 (d)

3(b)$I = neAV_d$ as per question $I=ne\pi r^2V$ than for $2I= ne\pi(2r)^2 V_2$ by solving V2=V/2

4(b) V=E-Ir

5(a)For stretching volume remain constant hence l1A1=l2A2 therefore A1/A2=l2/l1

As per the question l2=2l1 hence A1/A2=2/1

R2/R1=(l2/l1)X(A1/A2)=2X2 =4

6 (b)for meter bridge P/Q=R/S i.e. 1/3 =l/100-l by solving l=25

7 (a) When conductor heated its resistance increases hence length from left hand side also increases.

8 (a)specific resistance depends on temperature and independent by length and cross section area

9 (c)

10 (b)

11(d)

12(a) another form of wheat stone bridge

13(c) $\Delta R=\alpha R \Delta T$ in this case $\Delta R=R$

Thererfore $\Delta T=1/\alpha$ by solving $\Delta T=244$

Final temperature $T=T+\Delta T=0+244=244$

14.(a) r=R(E/V -1) R=14 E=1.5 V=1.4 by putting values r=1

15(a) In series current remains same $I_x=I_y$

$en_xAv_d(x)= en_yAv_d(y)$ as per the question ny/nx=1/2 by solving $v_d(x)/v_d(y)=1/2$

ASSERTION AND REASONING QUESTIONS

1.(a) 2(c) drift speed of electron is very small.

3(a) 4(c)resistance is connected for the protection of galvanometer.

5(a) 6(a) 7(d) 8(b) 9(d) 10(b)

CASE STUDY-BASED QUESTIONS

Case study 1.

(i) (c) $R=\rho l/A= \rho l/\pi r^2$

(ii) (b) $R=\rho l/A=(3.7X10^{-7}X10^{-2})/1X10^{-2}=3.7X10^{-7}$

(iii) (d) The specific resistance does not depend upon l and A depends upon nature of material

(iv) (a) R2/R1=l2XA1/l1XA2 when stretch volume remains constant hence l1A1=2l1XA2

A1/A2=2/1

henceR2/R1=(l2/l1)XA1/A2=2X2=4

(v)(c)In portion CD current decrease with increase in voltage

Case Study 2.

(i)(b)

(ii) (a)$V=IR=10^{-3}X4$

$K=V/l=10^{-3}X4/4=10^{-3}V/m$

(iii) (a)

(iv) (b)

(v). (d)(E1+E2)/(E1-E2)=8/4 by solving E1/E2=3/1

CHAPTER 4 - MOVING CHARGES AND MAGNETISM

MULTIPLE CHOICE QUESTIONS

1. Biot-Savart law indicates that the moving electrons (velocity v) produce a magnetic field B such that

(a) B Perpendicular to **v**

(b) B || v

(c) It obeys inverse cube law.

ARMY PUBLIC SCHOOL, DAGSHAI

CLASS-12TH (SCIENCES)

HOMEWORK

SECTION-BIOLOGY

1.Test cross involves

(a) crossing between two genotypes with dominant trait

(b) crossing between two genotypes with recessive trait

© crossing between two F1 hybrids

(d) crossing the F1 hybrid with a double recessive genotype.

2.In Mendel's experiments with garden pea, round seed shape (RR) was dominant over wrinkled seeds (rr), yellow cotyledon (YY) was dominant over green cotyledon (yy). What are the expected phenotypes in the F2 generation of the cross RRYY × rryy?

(a) Round seeds with yellow cotyledons, and wrinkled seeds with yellow cotyledons.

(b) Only round seeds with green cotyledons.

© Only wrinkled seeds with yellow cotyledons.

(d) Only wrinkled seeds with green cotyledons.

3.If a colour blind woman marries a normal visioned man, their sons will be

(a) all colour blind

(b) all normal visioned

© one-half colour blind and one-half normal

(d) three-fourths colour blind and one-fourth normal

4.Which one of the following is an example of polygenic inheritance?

(a) Skin colour in humans.

(b) Flower colour in Mirabilis jalapa.

© Production of male honey bee.

(d) Pod shape in garden pea.

5.All genes located on the same chromosome

(a) form different groups depending upon their relative distance

(b) form one linkage group

© will not from any linkage groups

(d) form interactive groups that affect the phenotype

6.Distance between the genes and percentage of recombination shows

(a) a direct relationship

(b) an inverse relationship

© a parallel relationship

(d) no relationship

7.If a genetic disease is transferred from a phenotypically normal but carrier female to only Some of the male progeny, the disease is

(a) autosomal dominant

(b) autosomal recessive

© sex-linked dominant

(d) sex-linked recessive

8. If a plant heterozygous for tallness is selfed, the F2 generation has both tall and dwarf plants. It proves the principle of

(a) dominance

(b) segregation

© independent assortment

(d) incomplete dominance

9.In sickle cell anaemia glutamic acid is replaced by valine. Which one of the following triplets codes for valine?

(a) G G G

(b) A A G

© G A A

(d) G U G

10.Conditions of a karyotype 2n + 1, 2n – 1 and 2n + 2, 2n – 2 are called

(a) aneuploidy

(b) polyploidy

© allopolyploidy

(d) monosomy

11.A cross between two tall plants resulted in offspring having few dwarf plants. What would be the genotypes of both the parents?

(a) TT and Tt

(b) Tt and Tt

© TT and TT

(d) Tt and tt

12.In a dihybrid cross, if you get 9:3:3:1 ratio it denotes that

(a) the alleles of two genes are interacting with each other

(b) it is a multigenic inheritance

© it is a case of multiple allelism

(d) the alleles of two genes are segregating independently.

13.ZZ/ZW type of sex determination is seen in

(a) platypus

(b) snails

© cockroach

(d) peacock

14.Which of the following will not result in variations among siblings?

(a) Independent assortment of genes

(b) Crossing over

© Linkage

(d) Mutation

15.Mendel's Law of independent assortment holds good for genes situated on the

(a) non-homologous chromosomes

(b) homologous chromosomes

© extra nuclear genetic element

(d) same chromosome

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

(a) multiple allelism

(b) mosaicism

© pleiotropy

(d) polygeny

17.The inheritance pattern of a gene over generations among humans is studied by the pedigree analysis. Character studied in the pedigree analysis is equivalent to

(a) quantitative trait

(b) Mendelian trait

(c) polygenic trait

(d) maternal trait

18.It is said that Mendel proposed that the factor controlling any character is discrete and

Independent. His proposition was based on the

(a) results of F3 generation of a cross.

(b) observations that the offspring of a cross made between the plants having two contrasting

Characters shows only one character without any blending.

© self pollination of F1 offsprings.

(d) cross pollination of F1 generation with recessive parent.

19.In the F2 generation of a Mendelian dihybrid cross the number of phenotypes and genotypes are

(a) phenotypes – 4; genotypes – 16

(b) phenotypes – 9; genotypes – 4

© phenotypes – 4; genotypes – 8

(d) phenotypes – 4; genotypes – 9

20.Two genes ‘A’ and ‘B’ are linked. In a dihybrid cross involving these two genes, the F1

Heterozygote is crossed with homozygous recessive parental type (aa bb). What would be the

Ratio of offspring in the next generation?

(a) 1 : 1 : 1: 1

(b) 9 : 3 : 3 : 1

© 3 : 1

(d) 1 : 1

21.What is the nature of the strands of the DNA duplex?

(a) Anti-parallel and complementary

(b) Identical and complementary

© Anti=parallel and non-complementary

(d) Dissimilar and non-complementary

22.Hershey and Chase's experiment was based on the principle

(a) Transformation

(b) Translation

© Transduction

(d) Transcription

23.AUG stands for

(a) Alanine

(b) Methionine

© N-formyl methionine

(d) Glycine

24.The reason behind the anti-parallel strand of DNA is

(a) Hydrogen bond

(b) Ionic bond

© Phosphodiester bond

(d) Disulphide bond

25.In a transcription unit, the promoter is located towards

(a) 5'end of the structural gene

(b) 3'end of the structural gene

© 5'end of the template strand

(d) 3'end of the coding strand

26.Genetic information is transferred from nucleus to cytoplasm through

(a) RNA

(b) Anticodon

© DNA

(d) Lysosomes

27.The enzyme involved in transcription

(a) DNA Polymerase I

(b) DNA Polymerase III

© RNA Polymerase

(d) DNA Polymerase II

28.Non-sense codons participate in

(a) Releasing t-RNA from polynucleotide chain

(b) Formation of unspecified amino acids

© Terminating message of gene-controlled protein synthesis

(d) Conversion of sense DNA into non-sense DNA

29.The proofreading enzyme in DNA replication is

(a) Primase

(b) DNA Polymerase I

© Ligase

(d) DNA PolyInitiation

30.Which step does not occur in translation?

(a) Replication

(b) Termination

© Elongation

(d) Initiation

31.Select the incorrectly matched pairs

(a) Purines – Nitrogenous bases cytosine, thymine and uracil

(b) Recombinant DNA – DNA formed by joining the DNA segments from two different sources

© rRNA – RNA found in ribosomes

(d) ATP – The energy-carrying compound in the cell

32.The energy source for the elongation process is

(a) Creatine-PO4

(b) GTP

© ATP

(d) All of the above

33.In lac-operon, which protein is not regulated by the repressor?

(a) Galactosidase

(b) Lactose Permease

© Tryptophan

(d) Transacetylase

34.Spliceosomes are absent in the cells of

(a) Plants

(b) Animals

© Bacteria

(d) Fungi

35.The primary control of gene expression takes place at the level of

(a) Translation

(b) Replication

© Transcription

(d) None

36.Human Genome Project led to the development of

(a) Biotechnology

(b) Bioinformatics

© Biosystematics

(d) Bioengineering

37.Which non-radioactive isotope was used by Messelson and Stahl in their experiment?

(a) P32

(b) S35

© N15

(d) None

38.Histones are

(a) Positively charged and basic amino acids

(b) Positively charged and acidic proteins

© Negatively charged and basic proteins

(d) Absent in bacteria

39.For terminating process of translation release factor binds to

1. Ribosome subunit
2. Stop codon
3. UTR at downstream
4. tRNA

40.Vectors used in human genome project include

1. BAC
2. YAC
3. Ti plasmid
4. Both 1 and 2

PRACTICE QUESTIONS

1. **Suppose P and Q are two different matrices of order $3 \times n$ and $n \times p$, then the order of the matrix $P \times Q$ is** *[CBSE 2019-20]*

   (a) $3 \times p$ (b) $p \times 3$ (c) $n \times n$ (d) 3×3

2. **If $\begin{bmatrix} x-y & z \\ 2x-y & w \end{bmatrix} = \begin{bmatrix} -1 & 4 \\ 0 & 5 \end{bmatrix}$, the value of $x + y$ is**

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

3. **If P and Q are two different matrices of order 3×4 and 4×3 respectively, then the order of matrix QP is**

   (a) 3×3 (b) 4×4 (c) 3×4 (d) 4×3

4. **If P and Q are two different matrices such that P is of order 3×4 and PQ is of order 3×3, then the order of matrix Q is**

   (a) 3×3 (b) 4×4 (c) 3×4 (d) 4×3

5. **If a matrix has 5 elements, write all possible orders it can have are**

   (a) 1×5 only. (b) 5×1 only.

   (c) 1×5 and 5×1 both. (d) None of these.

6. The order of the product matrix is

$$\begin{bmatrix}1\\2\\3\end{bmatrix}\begin{bmatrix}2 & 3 & 4\end{bmatrix}$$

(a) 1×1 (b) 1×3 (c) 3×1 (d) 3×3

7. If $\begin{bmatrix}2 & 3\\5 & 7\end{bmatrix}\begin{bmatrix}1 & -3\\-2 & 4\end{bmatrix}=\begin{bmatrix}-4 & 6\\-9 & x\end{bmatrix}$, the value of x is

(a) 9 (b) 11 (c) 13 (d) None of these.

8. If the matrix $\begin{bmatrix}2k+3 & 4 & 5\\-4 & 0 & -6\\-5 & 6 & -2k-3\end{bmatrix}$ is skew-symmetric, then the value of k is

(a) $\frac{3}{2}$ (b) $-\frac{3}{2}$ (c) $\frac{1}{2}$ (d) None of these.

9. If A is a matrix of order 3×3 such that $A^2 = 4A - 3I$, then A^{-1} is

(a) $\frac{1}{3}(4I - A)$ (b) $3(4I - A)$ (c) $\frac{1}{4}(4I - A)$ (d) $\frac{1}{2}(4I - A)$

10. For a square matrix A, $A + A^T$ is

(a) Symmetric matrix. (b) Skew-symmetric matrix.
(c) Identity matrix. (d) Void matrix.

11. If A is a matrix of order 3×2, then the order of the matrix A' is [CBSE 202

(a) 2×3 (b) 2×2 (c) 3×3 (d) None of these

12. A square matrix A is said to be skew-symmetric, if [CBSE 202

(a) $A^T = A$ (b) $A^T = O$ (c) $AA^T = I$ (d) $A^T = -A$

13. Given a skew-symmetric matrix $A = \begin{bmatrix}0 & a & 1\\-1 & b & 1\\-1 & c & 0\end{bmatrix}$, the value of $(a + b + c)^2$ is [CBSE 2020

(a) 0 (b) 1 (c) 2 (d) 3

14. Construct a 2×2 matrix $A = [a_{ij}]$ whose elements are given by $a_{ij} = |(i)^2 - j|$ is [CBSE 2020]

(a) $\begin{bmatrix}0 & 1\\3 & 2\end{bmatrix}$ (b) $\begin{bmatrix}0 & 1\\3 & 2\end{bmatrix}$ (c) $\begin{bmatrix}0 & 1\\-3 & 2\end{bmatrix}$ (d) $\begin{bmatrix}1 & 1\\3 & 2\end{bmatrix}$

15. If $A = [2 \quad -3 \quad 4]$, $B = \begin{bmatrix}3\\2\\2\end{bmatrix}$, $X = [1 \quad 2 \quad 3]$ and $Y = \begin{bmatrix}2\\3\\4\end{bmatrix}$, then $AB + XY$ equals [CBSE 2020]

(a) [28] (b) [24] (c) 28 (d) 24

16. If $\begin{bmatrix}x+y & 7\\9 & x-y\end{bmatrix}=\begin{bmatrix}2 & 7\\9 & 4\end{bmatrix}$, then $xy =$ _____. [CBSE 2020]

(a) 3 (b) 5 (c) -3 (d) None of these

17. If $A+B=\begin{bmatrix}1 & 0\\ 1 & 1\end{bmatrix}$ and $A-2B=\begin{bmatrix}-1 & 1\\ 0 & -1\end{bmatrix}$, then $A=$ _____. [CBSE 2020]

(a) $\frac{1}{4}\begin{bmatrix}1 & 1\\ 2 & 1\end{bmatrix}$ (b) $\frac{1}{3}\begin{bmatrix}1 & 1\\ 2 & 1\end{bmatrix}$ (c) $\begin{bmatrix}1 & 1\\ 2 & 1\end{bmatrix}$ (d) $\begin{bmatrix}1 & 1\\ 3 & 2\end{bmatrix}$

18. If matrix $A=\begin{bmatrix}0 & 2b & -2\\ 3 & 1 & 3\\ 3a & 3 & -1\end{bmatrix}$ is a symmetric matrix, then the value of a is

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

19. If A is a null matrix, then

(a) A is a square matrix.
(b) A is not a square matrix.
(c) Both (a) and (b).
(d) All entries are zero.

20. If A is a scalar matrix, then

(a) $A=[a_{ij}]_{m\times m}$ where $a_{ij}=\begin{cases}0 \text{ if } i\neq j\\ k \text{ if } i=j \text{ for } k\in R\end{cases}$ (b) $A=[a_{ij}]_{m\times m}$ where $a_{ij}=\begin{cases}k \text{ if } i\neq j\\ 0 \text{ if } i=j \text{ for } k\in R\end{cases}$

(c) $A=[a_{ij}]_{m\times m}$ where $a_{ij}=k\ \forall\ i,j$ (d) None of these

21. Let I be an identity matrix, then

(a) $A=[a_{ij}]_{m\times m}$ where $a_{ij}=\begin{cases}0 \text{ if } i\neq j\\ 1 \text{ if } i=j\end{cases}$ (b) $A=[a_{ij}]_{m\times m}$ where $a_{ij}=\begin{cases}1 \text{ if } i\neq j\\ 0 \text{ if } i=j \text{ for } k\in R\end{cases}$

(c) $A=[a_{ij}]_{m\times m}$ where $a_{ij}=k\ \forall\ i,j$ (d) None of these

22. Which is true about matrix multiplication ?

(a) It is commutative. (b) It is associative. (c) Both (a) and (b). (d) None of these.

23. If $\begin{bmatrix}m & n\end{bmatrix}\begin{bmatrix}m\\ n\end{bmatrix}=[25]$ and $m<n$, then (m, n) is equal to

(a) (2, 3) (b) (3, 4) (c) (4, 3) (d) None of these

24. For any matrix A, AA^T is a

(a) Unit matrix
(b) Symmetric matrix
(c) Skew-symmetric matrix
(d) Diagonal matrix

25. If $\begin{bmatrix}1 & 2\\ 2 & 1\end{bmatrix}\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}5\\ 4\end{bmatrix}$, then value of y is [CBSE 2019-20]

(a) 1 (b) 2 (c) 3 (d) None of these

26. If $2\begin{bmatrix}3 & 4\\ 5 & x\end{bmatrix}+\begin{bmatrix}1 & y\\ 0 & 1\end{bmatrix}=\begin{bmatrix}7 & 0\\ 10 & 5\end{bmatrix}$, the value of $(x-y)$ is

(a) 3 (b) 1 (c) 10 (d) 8

27. The value of x for the following matrix equation $\begin{bmatrix}x & 1\end{bmatrix}\begin{bmatrix}1 & 0\\ -2 & 0\end{bmatrix}=O$ is

(a) 1 (b) 2 (c) 3 (d) None of these

28. If matrix $A=\begin{bmatrix}1 & -1\\ -1 & 1\end{bmatrix}$ and $A^2=kA$, then the value of k is

(a) 1 (b) 2 (c) 3 (d) 5

29. For a 2×2 matrix, $A = [a_{ij}]$, whose elements are given by $a_{ij} = \frac{i}{j}$, the value of a_{12} is

(a) $\frac{1}{2}$ (b) $-\frac{1}{2}$ (c) $\frac{1}{3}$ (d) $\frac{1}{5}$

30. The values of $x - y + z$ from the following equation $\begin{bmatrix} x+y+z \\ x+z \\ y+z \end{bmatrix} = \begin{bmatrix} 9 \\ 5 \\ 7 \end{bmatrix}$ is

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

31. If A is a matrix of order 2×3 and B is a matrix of order 3×5, then the order of matrix $(AB)^T$ is

(a) 2×2 (b) 5×2 (c) 2×5 (d) 5×5

32. If $A = \begin{bmatrix} 2 & 4 \\ 3 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & 5 \\ 3 & 4 \end{bmatrix}$, then $(3A - B)$ is

(a) $\begin{bmatrix} 8 & 7 \\ 6 & 2 \end{bmatrix}$ (b) $\begin{bmatrix} 8 & 7 \\ -6 & 2 \end{bmatrix}$ (c) $\begin{bmatrix} 8 & 7 \\ 6 & -2 \end{bmatrix}$ (d) $\begin{bmatrix} -8 & 7 \\ 6 & 2 \end{bmatrix}$

33. If $[2 \quad 1 \quad 3]\begin{bmatrix} -1 & 0 & -1 \\ -1 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix}\begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix} = A$, then the order of matrix A is

(a) 2×2 (b) 1×1 (c) 3×3 (d) 5×5

34. If A and B are symmetric matrices, such that AB and BA are both defined, then $AB - BA$ is

(a) symmetric matrix (b) skew-symmetric matrix
(c) scalar matrix (d) diagonal matrix

35. If $A = [a_{ij}]_{m \times n}$ is a square matrix, then

(a) $m < n$ (b) $m > n$ (c) $m = n$ (d) None of these

36. The square matrix $[a_{ij}]$ in which $a_{ij} = 0$ for $i \neq j$ and $a_{ij} = k$ for $i = j$ is called a

(a) unit matrix (b) null matrix (c) scalar matrix (d) diagonal matrix

37. If $U = [2 \quad -3 \quad 4]$, $V = \begin{bmatrix} 3 \\ 2 \\ 1 \end{bmatrix}$, $X = [0 \quad 2 \quad 3]$ and $Y = \begin{bmatrix} 2 \\ 2 \\ 4 \end{bmatrix}$, then $UV + XY$ equals

(a) 20 (b) -20 (c) [20] (d) [-20]

38. If $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$, then $A^3 + 2A^2 + 4A$ equals

(a) $7A$ (b) $5A$ (c) A (d) $3A$

39. The matrix $A = \begin{bmatrix} 0 & -5 & 9 \\ 5 & 0 & -3 \\ -9 & 3 & 0 \end{bmatrix}$ is a

(a) symmetric matrix (b) diagonal matrix
(c) scalar matrix (d) skew-symmetric matrix

40. If $A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$, then A^3 is equal to

(a) A (b) $2A$ (c) $4A$ (d)

41. If $A=\begin{bmatrix} 2 & 5 & 9 \\ 6 & 2 & 8 \\ -5 & 1 & 3 \end{bmatrix}$, then sum of values on the main diagonal of A is equal to

(a) 6 (b) 7 (c) 16 (d) 3

42. If a matrix has 18 elements, then number of possible orders are

(a) 6 (b) 4 (c) 8 (d) 7

43. If $A=\begin{bmatrix} 1 & -2 \\ 5 & 3 \end{bmatrix}$, $A+A^T$ equals

(a) $\begin{bmatrix} 2 & 3 \\ 3 & 6 \end{bmatrix}$ (b) $\begin{bmatrix} 2 & -4 \\ 10 & 6 \end{bmatrix}$ (c) $\begin{bmatrix} 2 & 4 \\ -10 & 6 \end{bmatrix}$ (d) None of these

44. Matrices A and B will be inverse of each other only if

(a) $AB = BA$ (b) $AB = BA = O$ (c) $AB = O, BA = I$ (d) $AB = BA = I$

45. The matrix $\begin{bmatrix} 0 & 7 & 5 \\ -7 & 0 & -3 \\ -5 & 3 & 0 \end{bmatrix}$ is a

(a) diagonal matrix. (b) symmetric matrix.
(c) skew symmetric matrix. (d) scalar matrix.

46. The matrix $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 4 \end{bmatrix}$ is a

(a) identity matrix. (b) symmetric matrix.
(c) skew-symmetric matrix. (d) None of these.

47. If $A=\begin{bmatrix} \cos q & \sin q \\ -\sin q & \cos q \end{bmatrix}$, then $A^2 = ?$

(a) $\begin{bmatrix} \cos 2q & \sin 2q \\ -\sin 2q & \cos 2q \end{bmatrix}$ (b) $\begin{bmatrix} \sin 2q & \cos 2q \\ \cos 2q & \sin 2q \end{bmatrix}$

(c) $\begin{bmatrix} \cos 2q & \sin 2q \\ -\sin 2q & \cos 2q \end{bmatrix}$ (d) $\begin{bmatrix} \sin 2q & 0 \\ 0 & 0 \end{bmatrix}$

48. $A=\begin{bmatrix} 3 & 2 \\ -1 & 2 \end{bmatrix}$ is a square matrix, then

(a) $O(A^2) = 2 \times 2$ (b) $O(A^2) = 4 \times 4$ (c) $O(A^2) = 9 \times 9$ (d) None of these

49. Let $A=\begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$, then

(a) $A^2 = A$ (b) $A^2 = O$ (c) $A^2 = I$ (d) None of these

50. Let $A=\begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$, then

(a) $A^2 = A$ (b) $A^2 = O$ (c) $A^2 = I$ (d) None of these

51. Let $A=\begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix}$, then

(a) $A^2 = A$ (b) $A^2 = O$ (c) $A^2 = I$ (d) None of these

52. **Assuming that the sums and products given below are defined, which of the following is not true for matrices ?**

(*a*) $A + B = B + A$

(*b*) $AB = AC$ does not imply $B = C$

(*c*) $AB = O$ implies $A \neq O$ or $B \neq O$

(*d*) $(AB)' = B'A'$

53. **Let** $A = \begin{bmatrix} a & h & g \\ h & b & f \\ g & f & c \end{bmatrix}$, **then**

(*a*) $A^T = A$

(*b*) $A^T = -A$

(*c*) $A^T = I$

(*d*) None of these

MULTIPLE CHOICE QUESTIONS

1. If A is a square matrix of order 3 and $|A| = 5$, then the value of $|2A'|$ is [CBSE 2020]

   (a) -10 (b) 10 (c) -40 (d) 40

2. If $A = \begin{bmatrix} 2 & 0 & 0 \\ -1 & 2 & 3 \\ 3 & 3 & 5 \end{bmatrix}$, then $A(\text{adj } A)$ is [CBSE 2020]

   (a) $\begin{bmatrix} 3 & 3 & 3 \\ 3 & 3 & 3 \\ 3 & 3 & 3 \end{bmatrix}$ (b) $\begin{bmatrix} 3 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix}$ (c) $\begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

3. If A is a non-singular square matrix of order 3 such that $A^2 = 3A$, then value of $|A|$ is [CBSE 2020]

   (a) -3 (b) 3 (c) 9 (d) 27

4. If $A = \begin{bmatrix} -2 & 0 & 0 \\ 0 & -2 & 0 \\ 0 & 0 & -2 \end{bmatrix}$, then the value of $|\text{adj } A|$ is [CBSE 2020]

   (a) 64 (b) 16 (c) 0 (d) -8

5. If $A = \begin{bmatrix} 2 & -1 \\ 4 & 3 \end{bmatrix}$, then adj. A is

   (a) $\begin{bmatrix} 3 & -1 \\ -4 & 2 \end{bmatrix}$ (b) $\begin{bmatrix} 3 & 1 \\ 4 & 2 \end{bmatrix}$ (c) $\begin{bmatrix} -3 & 1 \\ -4 & 2 \end{bmatrix}$ (d) $\begin{bmatrix} 3 & 1 \\ -4 & 2 \end{bmatrix}$

6. If A is a square matrix of order 3, such that $A(\text{adj } A) = 10\,I$, then $|\text{adj } A|$ is equal to [CBSE 2020]

   (a) 1 (b) 10 (c) 100 (d) 101

7. If A is a 3×3 matrix such that $|A| = 8$, then $|3A|$ equals [CBSE 2020]

   (a) 8 (b) 24 (c) 72 (d) 216

8. If $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$, then A^{-1} equal to

(a) $\begin{bmatrix} 1 & 4 \\ 1 & 3 \end{bmatrix}$ (b) $\begin{bmatrix} -1 & 4 \\ -1 & -3 \end{bmatrix}$ (c) $\begin{bmatrix} -1 & 4 \\ -1 & 3 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 1 \\ 4 & 3 \end{bmatrix}$

9. If $\begin{vmatrix} 5x & 6 \\ 2 & 4 \end{vmatrix} = 12$, then x is

(a) $\frac{6}{5}$ (b) $\frac{5}{6}$ (c) $\frac{4}{6}$ (d) $-\frac{5}{6}$

10. The value of the determinant $\begin{vmatrix} 0 & 5 & -7 \\ -5 & 0 & -3 \\ 7 & 3 & 0 \end{vmatrix}$ is [CBSE 2019]

(a) 0 (b) 1 (c) 4 (d) 6

11. If A is a 3×3 matrix and $|3A| = k|A|$, then k is equal to

(a) 3 (b) 9 (c) 27 (d) None of these

12. If the points $(2, -5)$, $(-4, 5)$ and $(x, 15)$ are collinear then value of x is

(a) 10 (b) -10 (c) 0 (d) 1

13. If, adj $A = \begin{bmatrix} 5 & -6 \\ -7 & 4 \end{bmatrix}$, then A^{-1} is

(a) $\begin{bmatrix} 5 & -6 \\ -7 & 4 \end{bmatrix}$ (b) $\begin{bmatrix} 4 & 6 \\ 7 & 5 \end{bmatrix}$ (c) $-\frac{1}{22}\begin{bmatrix} 5 & -6 \\ -7 & 4 \end{bmatrix}$ (d) $-\frac{1}{22}\begin{bmatrix} 4 & 6 \\ 7 & 5 \end{bmatrix}$

14. If $\begin{vmatrix} \sin\alpha & \cos\beta \\ \cos\alpha & \sin\beta \end{vmatrix} = \frac{1}{2}$, where α, β are acute angles, then the value of $\alpha + \beta$ is

(a) $\frac{2\pi}{3}$ (b) $\frac{\pi}{3}$ (c) $\frac{4\pi}{3}$ (d) $-\frac{\pi}{3}$

15. If A is any square matrix of order 3×3 such that $|A| = -4$, then the value of $|A.\text{adj } A|$ is

(a) 16 (b) 64 (c) -16 (d) -64

16. Which of the following is correct ? [NCERT]

(a) Determinant is a square matrix.

(b) Determinant is a number associated to a square matrix.

(c) Determinant is a number associated to a matrix.

(d) None of these.

17. If A is any square matrix of order 3×3 such that $|A| = 3$, then the value of $|\text{adj } A|$ is

(a) 3 (b) $\frac{1}{3}$ (c) 9 (d) 27

18. If A is any square matrix of order 3×3 such that $|A| = -7$, then the value of $|\text{adj } A|$ is

(a) 49 (b) 343 (c) -49 (d) -343

19. If A is a square matrix such that $|A| = 5$, the value of $|AA^T|$ is

(a) 5 (b) 25 (c) 125 (d) 1

20. If A is any square matrix of order 3×3 such that $|\text{adj } A| = 25$ and $|A|$ is non-positive, then the value of $|A|$ is

(a) 5 (b) -5 (c) ± 5 (d) None of these

21. If A is any square matrix of order 2×2 such that $|A| = -7$, then the value of $|\text{adj } A|$ is

(a) 7 (b) 49 (c) -7 (d) -49

22. The value of $|3I_3|$, where I_3 is the identity matrix of order 3 is

(a) 3 (b) 9 (c) 27 (d) None of these

23. If $\begin{vmatrix} x & x \\ 1 & x \end{vmatrix} = \begin{vmatrix} 3 & 4 \\ 1 & 2 \end{vmatrix}$, write the positive value of x is

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

24. If A is a square matrix of order 3 and $|2A| = k|A|$, then the value of k is

(a) 2 (b) 4 (c) 8 (d) None of these

25. If A is any square matrix of order 3×3 such that $|A| = 4$, then the value of $|A^{-1}|$ is

(a) 4 (b) 16 (c) 2 (d) $\frac{1}{4}$

26. If A is any square matrix of order 3×3 such that $|\text{adj } A| = 169$ and $|A|$ is non-negative, then the value of $|A|$ is

(a) 13 (b) -13 (c) ± 13 (d) None of these

27. If A is any square matrix of order 3×3 such that $|\text{adj}\, A| = 4$, then the value of $|A|$ is

(a) 2 (b) -2 (c) ± 2 (d) None of these

28. The value of $\begin{vmatrix} \cos 15^\circ & \sin 15^\circ \\ \sin 75^\circ & \cos 75^\circ \end{vmatrix}$ is

(a) 0 (b) 1 (c) 2 (d) None of these

29. If $f(x) = \begin{vmatrix} 0 & x-a & x-b \\ x+a & 0 & x-c \\ x+b & x+c & 0 \end{vmatrix}$, then [NCERT Exemplar]

(a) $f(a) = 0$ (b) $f(b) = 0$ (c) $f(0) = 0$ (d) $f(1) = 0$

30. Value of $\begin{vmatrix} 1 & a & b+c \\ 1 & b & c+a \\ 1 & c & a+b \end{vmatrix}$ is

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

31. The value of $\begin{vmatrix} 0 & 5 & 3 \\ -5 & 0 & -11 \\ -3 & 11 & 0 \end{vmatrix}$ is

(a) 0 (b) -1 (c) 2 (d) 3

32. The minimum value of $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+\sin\theta & 1 \\ 1 & 1 & 1+\cos\theta \end{vmatrix}$ is

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

33. The maximum value of $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+\sin\theta & 1 \\ 1+\cos\theta & 1 & 1 \end{vmatrix}$ is (θ is real number)

(a) $\frac{1}{2}$ (b) $\frac{\sqrt{3}}{2}$ (c) $\sqrt{2}$ (d) $\frac{2\sqrt{3}}{4}$

34. If $\Delta = \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$, and $A_1, B_1, C_1, \ldots$ denote cofactors of $a_1, b_1, c_1, \ldots$, then $\begin{vmatrix} A_1 & B_1 & C_1 \\ A_2 & B_2 & C_2 \\ A_3 & B_3 & C_3 \end{vmatrix} =$

(a) Δ (b) Δ^2 (c) Δ^3 (d) 0

35. If $A=\begin{bmatrix}\cos\alpha & \sin\alpha\\ -\sin\alpha & \cos\alpha\end{bmatrix}$, then $A(\text{adj } A)=\begin{bmatrix}k & 0\\ 0 & k\end{bmatrix}$, then k is equal to

(a) 0 (b) 1 (c) $\sin\alpha\cos\alpha$ (d) $\cos 2\alpha$

36. If A is a singular matrix, then adj A is

(a) singular. (b) non-singular. (c) symmetric. (d) not defined.

37. If adj $A=\begin{bmatrix}2 & 5\\ 1 & 3\end{bmatrix}$, then inverse of the matrix A is

(a) $\begin{bmatrix}2 & 5\\ 1 & 3\end{bmatrix}$ (b) $\begin{bmatrix}-2 & 5\\ 1 & -3\end{bmatrix}$ (c) $\begin{bmatrix}3 & -5\\ -1 & 2\end{bmatrix}$ (d) $\begin{bmatrix}2 & -5\\ -1 & 3\end{bmatrix}$

38. If the matrix $\begin{bmatrix}5-x & x+1\\ 2 & 4\end{bmatrix}$ is singular, then the value of x is

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

39. If $\begin{vmatrix}3 & 4\\ -5 & 2\end{vmatrix}=\begin{vmatrix}2x & 4\\ -5 & 3\end{vmatrix}$ the value of x is

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

40. If $\Delta=\begin{vmatrix}5 & 3 & 8\\ 2 & 0 & 1\\ 1 & 2 & 3\end{vmatrix}$, then the minor of the element a_{23} is

(a) 1 (b) 7 (c) -7 (d) 4

41. If $\begin{vmatrix}2x & 5\\ 8 & x\end{vmatrix}=\begin{vmatrix}6 & -2\\ 7 & 3\end{vmatrix}$, the value of x is

(a) -6 (b) 6 (c) Both (a) and (b) (d) None of these

42. If for any 2×2 square matrix A, $A(\text{adj}.A)=\begin{bmatrix}8 & 0\\ 0 & 8\end{bmatrix}$, then the value of $|A|$ is

(a) 1 (b) 4 (c) 8 (d) 2

43. If area of a triangle is 35 square units with vertices $(2,-6)$, $(5,4)$ and $(k,4)$ then values of k are _____ and _____.

(a) 2, 12 (b) $-2, 12$ (c) $-2, -12$ (d) $2, -12$

44. If A and B are square matrices of order 3 each, $|A|=2$ and $|B|=3$, then the value of $|3AB|$ is

(a) 18 (b) 54 (c) 162 (d) -162

45. If $A=[a_{ij}]$ is a matrix of order 2×2, such that $|A|=-15$ and C_{ij} represents the cofactor of a_{ij}, then the value of $a_{21}C_{21}+a_{22}C_{22}$ is

(a) 18 (b) 15 (c) 10 (d) -15

46. If A and B are square matrices of the same order 3, such that $|A|=2$ and $AB=2I$, then the value of $|B|$ is

(a) 4 (b) 12 (c) 8 (d) -4

47. If A and B are invertible matrices of order 3, $|A|=2$ and $|(AB)^{-1}|=-\frac{1}{6}$, then $|B|$ is

(a) 6 (b) 2 (c) 3 (d) -3

48. If $A = \begin{bmatrix} 5 & 6 & -3 \\ -4 & 3 & 2 \\ -4 & -7 & 3 \end{bmatrix}$, then the co-factor of the element a_{21} is

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

49. If A_{ij} is the co-factor of the element a_{ij} of the determinant $\begin{vmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{vmatrix}$, then the value of $a_{32}A_{32}$ is

(a) 110 (b) 101 (c) -110 (d) 88

50. Without using the properties of determinants, the value of $\begin{vmatrix} \cos C & \tan A & 0 \\ \sin B & 0 & -\tan A \\ 0 & \sin B & \cos C \end{vmatrix}$ is

(a) 1 (b) 2 (c) 0 (d) None of these

51. Without using the properties of determinants, the value of $\begin{vmatrix} 1 & 1 & 1 \\ p & q & r \\ p^2 - qr & q^2 - rp & r^2 - pq \end{vmatrix}$ is

(a) 0 (b) 1 (c) 2 (d) None of these

52. If A and B are square matrices of order 3 such that $|A| = -1$, $|B| = 3$, then the value of $|2AB|$ is

(a) 24 (b) -24 (c) 20 (d) None of these

53. The value of the determinant $\begin{vmatrix} 0 & a-b & a-c \\ b-a & 0 & b-c \\ c-a & c-b & 0 \end{vmatrix}$ is

(a) a (b) b (c) 0 (d) None of these

54. For any two square matrices A and B, $|A| = 3$, $|B| = 6$, then $|AB|$ is

(a) 3 (b) 6 (c) 18 (d) None of these

55. If $\Delta = \begin{vmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{vmatrix}$ and A_{ij} is a cofactor of a_{ij}, then the value of Δ is given by

(a) $a_{11}A_{31} + a_{12}A_{32} + a_{13}A_{33}$ (b) $a_{11}A_{11} + a_{12}A_{12} + a_{13}A_{13}$
(c) $a_{21}A_{31} + a_{22}A_{32} + a_{23}A_{33}$ (d) $a_{11}A_{31} + a_{21}A_{32} + a_{31}A_{33}$

56. If $A = \begin{bmatrix} 3 & 1 \\ 7 & 5 \end{bmatrix}$, the value of adj. A is

(a) $\begin{bmatrix} 3 & 1 \\ 7 & 5 \end{bmatrix}$ (b) $\begin{bmatrix} 5 & -1 \\ -7 & 3 \end{bmatrix}$ (c) $\begin{bmatrix} 3 & -1 \\ -7 & 5 \end{bmatrix}$ (d) $\begin{bmatrix} 3 & 1 \\ -7 & 5 \end{bmatrix}$

57. If $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$, then for any natural number n, the value of Det(A^n) is

(a) 0 (b) -1 (c) 1 (d) None of these

58. If adj. $A = \begin{bmatrix} 4 & 1 \\ 7 & 5 \end{bmatrix}$, the value of $|A|$ is

(a) 13 (b) -13 (c) 169 (d) None of these

3. The function $f(x) = [x]$, where $[x]$ denotes the greatest integer function, is continuous at

(a) 4 (b) -2 (c) 1 (d) 1.5

4. The number of points at which the function $f(x) = \dfrac{1}{x - [x]}$ is not continuous is [NCERT Exemplar]

(a) 1 (b) 2 (c) 3 (d) none of these

5. The function $f(x) = \begin{cases} \dfrac{\sin x}{x} + \cos x, & \text{if } x \neq 0 \\ k, & \text{if } x = 0 \end{cases}$ is continuous at $x = 0$, then find the value of k is [NCERT Exemplar]

(a) 3 (b) 2 (c) 1 (d) 1.5

6. A function f is said to be continuous for $x \in R$, if it is

(a) continuous at $x = 0$. (b) differentiable at $x = 0$.

(c) continuous at two points. (d) differentiable for $x \in R$.

7. Given functions $f(x) = \dfrac{x^2 - 4}{x - 2}$ and $g(x) = x + 2, x \in R$. Then which of the following is correct ?

(a) f is continuous at $x = 2$, g is continuous at $x = 2$.

(b) f is continuous at $x = 2$, g is not continuous at $x = 2$.

(c) f is not continuous at $x = 2$, g is continuous at $x = 2$.

(d) f is not continuous at $x = 2$, g is not continuous at $x = 2$.

24. If the function f defined as

$$f(x) = \begin{cases} \dfrac{x^2 - 9}{x - 3} & , \quad x \neq 3 \\ k & , \quad x = 3 \end{cases}$$

is continuous at $x = 3$, then the value of k is [CBSE 2020]

(a) 3 (b) -3 (c) 6 (d) None of these

36. If $f(x) = 2x$ and $g(x) = \frac{x^2}{2} + 1$, then which of the following can be a discontinuous function ?

(a) $f(x) + g(x)$ (b) $f(x) - g(x)$ (c) $f(x).g(x)$ (d) $\frac{g(x)}{f(x)}$

37. If the following function

$$f(x) = \begin{cases} \frac{\sqrt{1+kx} - \sqrt{1-kx}}{x}, & \text{for } -1 \le x < 0 \\ 2x^2 + 3x - 2, & \text{for } 0 \le x \le 1 \end{cases}$$

is continuous at $x = 0$, then the value of k is

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

Multiple Choice Questions:

1. Howard Gardner's Theory of intelligence is known as:

a.Theory of Primary Mental Abilities
b.Theory of Multiple Intelligence
c.Triarchic Theory
d.Two-factor Theory

2. Experiential intelligence refers to :

a.None of the above
b.Using past experience creatively
c.Analysis of information
d.Ability to deal with environment

3. Triarchic theory of intelligence was given by which psychologist:

a.Stenberg
b.Louis Thurstone
c.J.P. Guilford
d.Charles Spearman

4. Capacity to use previous experience imaginatively to take care of novel issues is known as:

a.Interpersonal Intelligence
b.Musical Intelligence
c.Experimental Intelligence
d.Contextual Intelligence

5. Which approach considers intelligence as an aggregate of abilities

a.Projective technique
b. Psychometric
c.Behavioural Setting
d.None of the above

6. What is the method of measuring intelligence quotients?

a. IQ = CA / MA x 100
b.IQ = MA / CA x 100
c. IQ = MA x CA x 100
d.IQ = MA + CA x 100

7. What is an individual's preference for engaging in one or more specific activities relative to others?

a.Interest
b.Intelligence
c.Values
d.Aptitude

8. Skills in forming visual images and patterns fall under _____

a.Musical Ability
b.Linguistic Ability
c.Kinesthetic Ability
d.Spatial Ability

9. _____ is an extraordinary general capacity displayed in unrivalled execution in a wide assortment of regions

a.Creativity
b.Giftedness
c.Talent
d.Intelligence

10. Severe intellectually disabled people have IQ range of?

a.15 to 24
b.54 to 65
c.25 to 39
d.40 to 54

11. Which factor influences aptitude formation?

a.Family
b.Intelligence
c.Age
d.Caste

12. In the event that an individual has an expertise of getting the intentions, sentiments, ways of behaving of others, he or she said to have _____

a.Social Intelligence
b.Interpersonal Intelligence
c.Linguistic Intelligence
d.Intrapersonal intelligence

13. Experiential intelligence refers to :

a.Using past experience creatively
b.Ability to deal with environment
c.Analysis of information
d.None of the above

14. What is the range of average IQ?

a.110-120
b.105-115
c.90-110
d.120-140

15. PASS model of intelligence was given by :

a.Jack Naglieri, Binet
b. J.P. Das, Jack Naglieri, and Kirby
c.Binet, Terman and Kirby
d.None of the above

16. The structure of intellect model was given by

a.Charles Spearmen
b.Arthur Jensen
c.Howard Gardner
d.J.P. Guilford

17. Intelligence Quotient was given by which psychologist?

a.Theodore Simon
b.Jack Naglieri
c.Alfred Binet
d.William Stern

18. Riya has a very high aptitude of verbal reasoning and is very much interested in reading is more likely to succeed as a :

a.Agriculturalist
b.Journalist
c.Engineer
d.Athlete

19. Two factors of intelligence were given by:

a.Stemberg
b.Guilford
c.Spearman
d.Gardner

20. Nia is a determined young lady, who shows responsibility, diligence and tolerance. All her way of behaving is objective coordinated. .Such characteristics focus on _____ facet of integral intelligence.

a.Emotional competence
b.Entrepreneurial competence
c.Social competence
d.Cognitive capacity

21. Projection means

a.Dismissing anxiety provoking behaviours
b.Love complexion for mother

c.Takes a person back to an earlier stage

d.People attribute their own traits to others

22. Proneness to depression is characteristic of which type of personality?

a.Type A

b.Type B

c.Type D

d.Typce C

23. Rohit believes that he has the power or ability to excel in sports, denotes a high _____

a.Self esteem

b.Self regulation

c.Self confidence

d.Self efficacy

24. Which psychologist distributed all the personalities into introverts, extroverts and ambiverts

a.Freud

b.Erikson

c.Carl Jung

d.Adler

25. Individual psychology was given by which psychologist?

a.Adler

b.Karen Horney

c.Freud

d.Erikson

26. Abhishek found a wrist watch in the clothing section of Big Bazar and then he gave that watch to the lost and found department. Identify the aspect of personality he showed.

a.EGO

b.ID

c.Superego

d.None

27. Which among the following is not a Neo-Freudian?

a.Alfred Adler

b.Carl Jung

c.Carl Rogers

d.Karen Horney

28. Self-esteem means:

a.Coontrol one's behavior

b.None

c.Value judgement of a person about himself

d.Delay the gratification

29. Who gave The Thematic Apperception Test (TAT)?

a.None of the above

b.Herman Rorschach and Cattel

c.Morgan and Murray

d.Hathaway and Mckinely

30. Nisha shows aggression most of the times in her classroom, and often calls her classmates aggressive. Identify the defence mechanism

a.Reaction formation

b.Projection

c.Repression

d.Denial

31. Propensity of respondent to support things in a socially advantageous way is called:

a.Self report

b.Halo effect

c.Social desirability

d.Acquiescence

32.Kritika thinks that she can complete the given classroom tasks effectively and can grab her goal. This is an example of:

a.Self efficacy

b.Self esteem

c.Self concept

d.Self Control

33.Self-regulation means:

a.Ability to organize and monitor our own behaviour

b.Confidence to speak in public

c.Checking one's impule

d.Learning to delay or defer the gratification of needs

34.The concept of self-efficacy is based on

a.Skinner theory of learning

b.Rogers theory

c.Behaviourist school of thought

d.Bandura's Social learning theory

36. 16 PF Questionnaire was given by:

a.MCKinley

b.Eysenck

c.Cattel

d.Hathaway

37. Whose theory focused on different neurotic needs?

a.Carl Rogers

b.Abraham Maslow

c.Carl Jung

d.Karen Horney

38.Rajat is head of his company. He is highly motivated and hardworking. However he is unable to relax and is always in a hurry. This is an example of:

a.Type D

b.Type C

c.Type B

d.Type A

39.Which theory was developed by Carl Jung

a.Individual Psychology

b.Social Psychology

c.Psychoanalytic Psy

d.Analytical psychology

40.Rahul is rejected in the interview of a multinational company, which he was eager to join. Now he claims that his present job of a salesman in Big Bazar is better. Identify which defence mechanism he is using:

a.Rataionalization

b.Repression

c.Reaction formation

d.Projection

41. When people try to make unreasonable feelings or behaviors seem reasonable and acceptable, it is known as

a.Rataionalization

b.Regression

c.Denial

d.Reaction formation

42. According to situationism, what influences our behaviour?

(a) personal characteristics

(b) situational factors

(c) one's own instinct

(d) polite behaviour towards others

43. "Intelligence is the global capacity of an individual to think rationally, act purposefully and deal effectively with the environment". This definition was proposed by:

(a) Wechsler

(b) Binet

(c) Gardner

(d) Sternberg

44. The first step in understanding a psychological quality is-

(a) observation of behaviour

(B) Keeping an eye on the way of talking

(c) evaluation

(d) intelligence test

Ans-(c)

45. Entrepreneurial Competence refers to:

(a) Respect for social order

(b) Self-exposure

(c) Discrimination

(d) Commitment

Ans-(d)

46. What term refers to the study of how individuals differ from one another in terms of their behavior and psychological characteristics?

(a) Cognitive psychology

(b) Developmental psychology

(c) Personality psychology

(d) Abnormal psychology

Ans-(c)

47. The concept of 'Emotional Intelligence' has been proposed by:

(a) Morgan and Murray

(b) Binet and Simon
(c) Salovey and Mayer
(d) Guilford and Thurstone

48. The Theory of Multiple Intelligences was proposed by:
(a) Charles Spearman
(b) Arthur Jensen
(c) Howard Gardner
(d) J.P. Guilford
Ans-(c)

49. the context of psychological attributes, heritability estimates typically range from:
(a) 0% to 10%
(b) 20% to 40%
(c) 50% to 70%
(d) 80% to 100%
Ans-(c)
50. The term "phenotype" in psychology refers to:
(a) An individual's genetic makeup
(b) An individual's observable characteristics and behaviors
(c) The role of culture in behavior
(d) The impact of environment on behavior
Ans-(b)

Army Public School Dagshai

Class XII

Chemistry (Homework)

- Do revise the important topics given below and practice the following questions related to the topic, first of all ensure to complete these portions one by one and don't forget to do written practice.

Ch. Solutions

- Molarity & molality (Numerical)
- Solubility of gases in liquids (Henry's law)
- Raoult's law and Ideal & Non ideal solution
- Azeotrope
- RLVP, ΔTb, ΔTf and Osmotic pressure,
- Abnormal molecular mass, Van't Hoff factor.

NCERT Solved examples:-5,6,7,8,9,10,11,12,13

NCERT Intext Ques: 5,7,8, 10,11,

NCERT ex. Ques :-6,10,14,17,23,33,40,41

Ch. Electrochemistry

- Specific and molar conductivity,
- Variations of Molar conductivity with concentration,
- Kohlrausch's law,
- Electrolysis, products of electrolysis at different electrodes and laws of electrolysis (Faraday)
- Nernst equation and its application to chemical cells,
- Relation between Gibb's energy change, Kc and emf of a cell,
- Fuel cells, Batteries & corrosion.

NCERT Solved examples:-1,2,3,4,5,8,9,10,

NCERT Intext Ques: -2,5,6,7,9,12

NCERT ex. Ques :-3,5,9,11,12,13,16,18

__Ch. Chemical Kinetics__

- Factors affecting rate of reaction
- Order and molecularity of a reaction,
- Rate law and specific rate constant,
- Integrated rate equations and half-life (for zero and 1^{st} order reactions),
- Activation energy, arrhenius equation.

NCERT Solved examples:-3,5,6,8,910,11

NCERT Intext Ques:-1,4,9

NCERT ex. Ques :-2,3,6,9,11,14,18,20,21,29,30

*__Ch. The d- & f- Block*__

- Characteristics of transition metals, general trends in properties of the first row transition metals –
- Metallic character, oxidation states, colour, catalytic property,
- Magnetic properties, interstitial compounds, alloy formation,
- Lanthanoids contraction and its consequences.

NCERT Solved examples:-2,4,7,8,9,10

NCERT Intext Ques:-1,2,4,6,7,10

NCERT ex. Ques :-3,6,11,14,15,16,17,21,25,32,