Electric Charge and Fields

1. **Assertion (A):** The tyres of aircrafts are slightly conducting.
   Reason (R): If a conductor is connected to ground, the extra charge induced on conductor will flow to ground.
   (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
   (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
   (3) (A) is true but (R) is false
   (4) Both (A) and (R) are false

2. **Assertion (A):** Both the charge and mass are invariant.
   Reason (R): Charge is always associated with mass.
   (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
   (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
   (3) (A) is true but (R) is false
   (4) Both (A) and (R) are false

3. **Assertion (A):** The electric field due to a charge configuration with total charge zero may not be zero.
   Reason (R): Electric field obeys the principle of superposition.
   (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
   (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
   (3) (A) is true but (R) is false
   (4) Both (A) and (R) are false

4. **Assertion (A):** Vehicles carrying highly inflammable materials have hanging chains, slightly touching the ground.
   Reason (R): The body of a vehicle gets charged when moving through air at high speed.
   (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
   (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
   (3) (A) is true but (R) is false
   (4) Both (A) and (R) are false

5. **Assertion (A):-** The tyres of aeroplanes are slightly conducting.
   Reason (R): During take off and landing of aeroplanes, the friction between tyres and the runway may cause electrification of tyres.
   (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
   (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
   (3) (A) is true but (R) is false
   (4) Both (A) and (R) are false

6. **Assertion (A):** We can shield a charge from electric fields by putting it inside a hollow conductor but we can not shield a body from the gravitational influence of near by matter by putting it inside a hollow sphere.
   Reason (R): Gravitational force in between two point mass bodies is independent of the intervening medium them.
   (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
   (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
   (3) (A) is true but (R) is false
   (4) Both (A) and (R) are false

7. **Assertion (A):** A metal sphere of radius 1 cm cannot hold a charge of 1 coulomb in air.
   Reason (R): The dielectric strength of air (minimum field required for ionisation of a medium) is 3 MV/m.
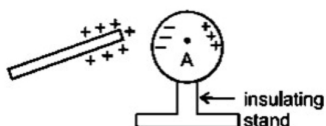   (1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
   (2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
   (3) (A) is true but (R) is false
   (4) Both (A) and (R) are false

8. **Assertion (A):** In any electrostatic field, a charge cannot be in stable equilibrium.
Reason (R): An electrostatic field is a conservative force field.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

9. **Assertion (A):** A positively charged rod is held near a neutral conducting solid sphere as illustrated below. The sphere lies on a insulated stand. The potential of ground (or earth) is zero. The potential at point A (point A need not be centre of the sphere) is higher compared to potential of ground (earth).

Reason (R): In the situation of assertion, the potential at the centre of conducting sphere is positive. The solid sphere being conducting, potential at each point in the sphere is same.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

10. **Assertion (A):** A point charge q is placed near an arbitary shaped solid conductor as shown in figure. The potential difference between the points A and B within the conductor remain same irrespective of the magnitude of charge q.
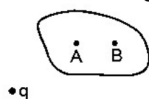
Reason (R): The electric field inside a solid conductor is zero under electrostatic conditions.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

11. **Assertion (A):** If a proton and an electron are placed in the same uniform electric field one by one, they experience different accelerations (The only force acting on proton and electron is that exerted by uniform electric field).
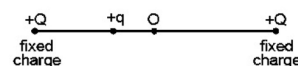**Reason (R):** Electric force on a test charge is independent of its mass.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

12. **Assertion (A):** When a negative charge –q is released at a distance R from the centre and along the axis of a uniformly and positively charged fixed ring of radius R, the negative charge does oscillation but not SHM.
Reason (R): The force on negative charge is always towards the centre of the ring but it is not proportional to the displacement from the centre of the ring.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

13. **Assertion (A):** Two point charges +Q are fixed some distance apart. O is a point exactly in middle of both fixed charges. A charge +q is released from rest at a certain distance left of O as shown in figure. The speed of charge +q is maximum at O.

**Reason (R):** The speed of a moving particle is maxima at stable equilibrium position.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

14. **Assertion (A):** There is an isolated system of two charged conducting spheres A and B. The resultant electric field at point P is the sum of electric field at P due to charged sphere A only (that is, assuming sphere B and all its effects to be absent) and the electric field at P only due to sphere B (that is, assuming sphere A and all its effects to be absent).
Reason (R): Superposition theorem for electric field due to point charges states that resultant electric field at a point due to point charges is the sum of electric field at that point due to individual charges.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

15. **Assertion (A):** A small uncharged solid conducting sphere is suspended from a fixed point O by a light insulating string (fig-1). The system is in equilibrium. Now an horizontal uniform electric field E is switched on. As a result the conducting sphere is deflected towards left as shown(fig-2).

(fig.1)   (fig.2)
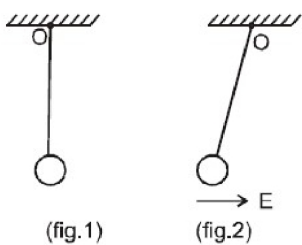
Reason (R): When a solid conducting sphere having zero net charge is placed in uniform electric field, charges are induced on the surface of sphere.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

16. **Assertion (A):** The electric field due to point charge configuration with total charge zero is not zero.
Reason (R): Gauss law does not hold for a configuration with total charge zero.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

17. **Assertion (A):** Electric field is always zero in a cavity inside a conductor.
Reason (R): All points in a cavity inside a conductor are always at same potential.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

18. **Assertion (A):** If a charge is released from rest in an electric field, it will always move along an electric field line.
Reason (R): Force on a charged particle is always in the direction of electric field.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

19. **Assertion (A):** A charged particle is free to move in an electric field. It may or may not move along an electric line of force.
Reason (R): Initial conditions affect the motion of charged particle.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

20. **Assertion (A):** If a positron and an electron are placed in same uniform electric field, they experience same acceleration.

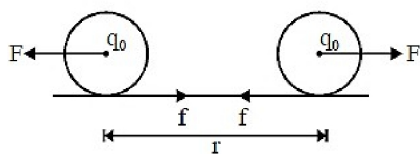**Reason (R):** Electric force on a test charge is independent of its mass.

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

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

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

(4) Both (A) and (R) are false

21. **Assertion (A):** Two rigid, identical and uniformly charged non conducting spheres with same charge are placed on a sufficiently rough surface, then spheres must be in equilibrium.

Reason (R): If net force on a point charge is zero it is in equilibrium.

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

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

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

(4) Both (A) and (R) are false

22. **Assertion (A):** We cannot produce electric field in a neutral conductor.

Reason (R): Neutral conductor cannot produce electric field.

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

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

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

(4) Both (A) and (R) are false

23. **Assertion (A):** In a given situation of arrangement of charges, an additional charge is placed outside the Gaussian surface. In this situation, in the Gauss theorem $\oint \vec{E}.d\vec{s} = \dfrac{q_{in}}{\epsilon_0}, q_{in}$ remains unchanged whereas electric field $\vec{E}$ is changed.

Reason (R): Electric field $\vec{E}$ at any point on the Gaussian surface is due to inside charge only.

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

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

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

(4) Both (A) and (R) are false

24. **Assertion (A):** When a charge is placed at rest in an electric field its path will always be along electric line of force.

Reason (R): The force on the charge is along the tangent drawn on electric field line.

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

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

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

(4) Both (A) and (R) are false

25. **Assertion (A):** Angular momentum of the two dipole system is not conserved.

Reason (R): There is a net torque on the system.

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

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

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

(4) Both (A) and (R) are false

26. **Assertion (A):** Continuity equation explains conservation of electric charge.
Reason (R): Gauss law shows diversion when inverse square law is not obeyed.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

27. **Assertion (A):** A moving charge particle may gets energy from electric field.
Reason (R): Electric field works on moving charge.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

28. **Assertion (A):** Electric field intensity at surface of a uniformly charged spherical shell is E. If shell is punctured at a point then intensity at punctured point becomes E/2.
Reason (R): Electric field intensity due to a spherical charge distribution can be found out by using Gauss law.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

29. **Assertion (A):** If X-ray is allowed to fall on uncharged gold leaf in evacuated glass chamber of electroscope, leaves will diverge.
Reason (R): Uncharged gold leaves will get charged positively when x-ray falls on it.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

30. **Assertion (A):** When a dipole is placed in a non- uniform electric field dipole must experience non zero force and torque.
Reason (R): Electric dipole is in stable equilibrium in non uniform electric field.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

31. **Assertion (A):** When charges are shared between two bodies, there occurs no loss of charge, but there does occur a loss of energy.
Reason (R): In case of sharing of charges energy of conservation fails.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

32. **Assertion (A):** If dipole $(\vec{p}_1)$ is moved along the line normal to the axis (dotted line shown) of another dipole $(\vec{p}_2)$, their interaction energy does not change.

Reason (R): Electric field of $\vec{p}_2$ at the position of $\vec{p}_1$ is normal to $\vec{p}_1$.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false

(4) Both (A) and (R) are false

33. **Assertion (A):** Excess charge on a conductor resides entirely on the outer surface.
Reason (R): Like charges repel each other.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

34. **Assertion (A):** The whole charge of a conductor cannot be transferred to another conductor.
Reason (R): The total transfer of charge from one to another is not possible.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

35. **Assertion (A):** At a point in space, the electric field points toward east. In the region, surrounding this point the potential will be constant along north and south.
Reason (R): Electric field at a point in space is proportional to rate of change of potential with distance.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

36. **Assertion (A):** A point charge is brought in an electric field. The field at a nearby point will increases, whatever be the nature of charge.
Reason (R): The direction of electric field lines is independent of the nature of charge.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

37. **Assertion (A):** If a point charge be rotated in a circle around another stationary charge at the centre of the circle, the work done by electric field will be zero.
Reason (R): Work done by centripetal force is always zero.
(1) Both (A) & (R) are true and the (R) is the correct explanation of the (A)
(2) Both (A) & (R) are true but the (R) is not the correct explanation of the (A)
(3) (A) is true but (R) is false
(4) Both (A) and (R) are false

ANSWER KEY

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ans.	1	4	1	1	1	1	1	2	1	1	2	1	1	4	4	3	4	4	1	4
Que.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37			
Ans.	4	3	3	4	4	2	1	2	1	4	3	1	2	4	1	4	1			