2022 Sec 4 Physics Notes Answers
Chapter 13 Static Electricity

Example 13.1
(a) A (+8 mC) C (+6 mC) B (+4 mC)

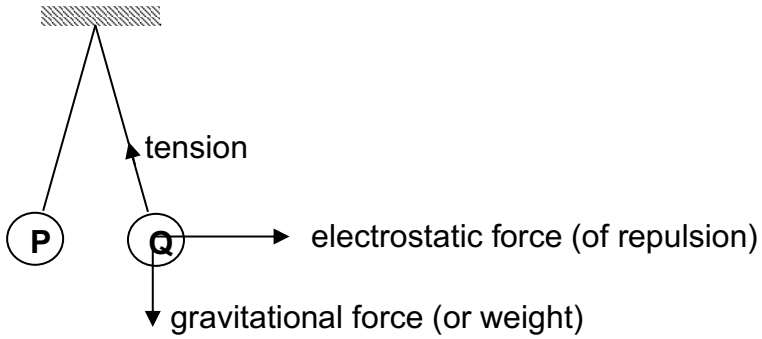
(b) A (+4 mC each) B (+2 mC each) C (+3 mC each)

Example 13.2
Unlike charges attract each other, when the negatively charged rod is brought close, the positive charges on the neutral paper that are closer to the charged rod will exert a net attractive forces than the negative charges. The attractive electrostatic force is stronger than the repulsive force as distance decreases. Hence the rod exerts a net attractive force on each small piece of paper.

Example 13.3
Answer: C

Exercise 13.1

1 (a)



(b) Q will be discharged and immediately becomes neutral.
Electrostatic induction will occur on Q and the two spheres then attract.
On touching, charge will be redistributed between the two spheres.
Having the same type of charge they will then repel each other once again.

2

	Pair of materials	**Positively charged**	**Negatively charged**
(a)	glass & wool	glass	wool
(b)	fur & polyethylene	fur	polyethylene
(c)	silk & PVC	silk	PVC

3 (a) positive
(b) The perspex is higher than polyethylene in the triboelectric series and hence has a greater tendency to lose electrons.
OR perspex lost electrons to polyethylene

4 (a) negative

(b) Rod A: Rods attract. Unlike charges attract
Rod B: Rods repel. Like charges repel.
Rod C: Rods attract. Unlike charges attract towards 4th rod. Unlike charges between rods is closer than like charges. The attractive force is stronger than the repulsive force.

(c) Electrons in the aluminium shaving are repelled to its far end leaving the positive charges to be closer to rod. Since the unlike charges are closer than the like charges, the force of attraction is stronger than the force of repulsion. As a result, the aluminium shaving is attracted to the rod.

On contact, the aluminium shaving gains excess negative charges from the rod and becomes negatively charged. Since like charges repel, the aluminium shaving is repelled away from the rod.

Once the aluminium shaving touches the ground, it is discharged through the floor and becomes neutral. The process will then repeat itself.

5 (a)

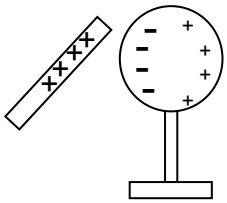


Fig. 5.1

(b) zero

(c) When the sphere is earthed, negative charges (electrons) will flow from the ground (finger) to the metal sphere and discharge some of the positive charge. When the finger is removed, the sphere is negatively charged as it has excess negative charges now.

6 (a) The negatively-charged sphere S induces positive charges at the near end and negative charges at the far end of the metal ball (by repelling electrons to the far end). Since the force of attraction between unlike charges is stronger than the force of repulsion between like charges, the metal ball is attracted towards S.

(b) When the metal ball touches S, some negative charges from S will be attracted towards the positive charges in the ball to neutralize some positive charges in the ball. This causes the ball to be negatively charged due to excess negative charges. Since both objects are now of the same charge, the ball will be repelled away from S.

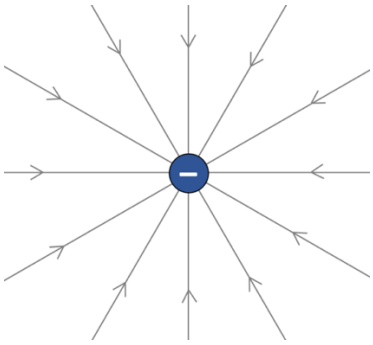
Exercise 13.2

1 It is the region where a charged particle will experience an electric force.

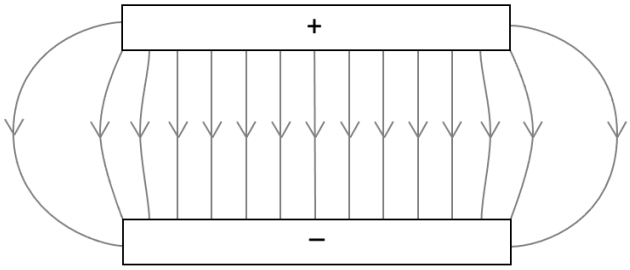
2 The direction of an electric field at a point is the direction of the force acting on a small positive test charge placed at that point.

3 (Refer textbook pages 323 & 324 for accurate drawings)

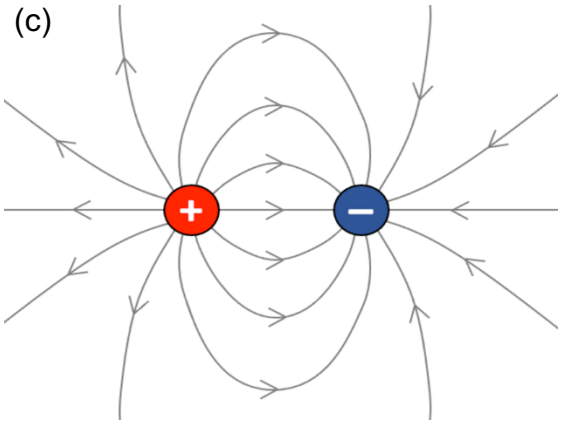
(a) Radial Field



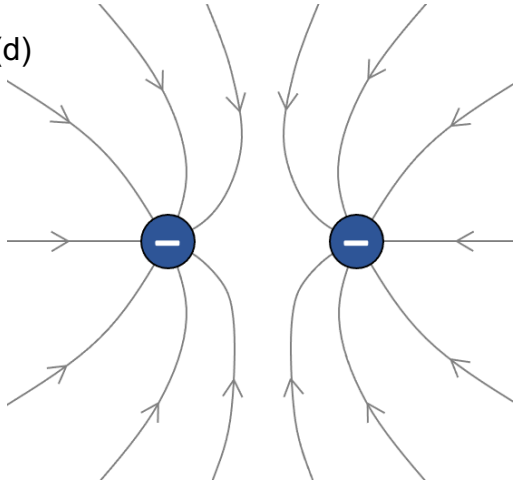
(b) Uniform field



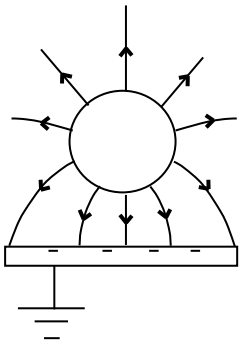
(c)



(d)



(e)



4 (a) Incorrect field line spacing; missing field line direction; field lines not leaving the charged object at right angles; insufficient field lines.

(b) Intersecting field lines; wrong field direction for the left charged object, missing field line direction.

(c) Non-parallel lines, missing field line direction, field lines not leaving the conductor at right angles.

Exercise 13.3

1 (a) This allows the discharge of any excess charges that has already built up on the tanker to prevent ignition of the flammable liquid due to sparking.

(b) Carbon (graphite) is an electrical conductor. It will allow excess charges to be continually discharged before the charges accumulate.

2 When the paper passes through the nylon friction pads, it is being charged (negatively). The glue droplets are charged oppositely to the paper (positively) when passed through the nozzle, hence the glue droplets are attracted to the paper. The droplets repel each other, spread out and stick on the paper evenly.