Topic: _____
Class: _____

Name: _____
Date:_____

Static electricity ws

Question 1a

This question is about static electricity.

a)
Astudent has a rubber balloon tied to a long piece of cotton thread.

The student gives the balloon an overall electrostatic charge.

i)
Describe one way that the student could give the balloon an overall electrostatic charge.

(2)

ii)
The student gives the balloon an overall negative charge.

Which of these sentences explains why the overall charge on the balloon is negative?

(1)

- ☐ A Negative charge has been removed from the balloon.
- ☐ B Negative charge has been added to the balloon.
- ☐ C Positive charge has been removed from the balloon.
- ☐ D Positive charge has been added to the balloon.

iii)
The student charges another balloon on a long thread.

Explain how the student can show that the two balloons have the same type of charge.

(3)

[6 marks]

Question 1b

b)

Figure 9 shows a plastic block and a metal disc with an insulating handle.

The top surface of the plastic block has a negative charge.

The metal disc has no overall electric charge.

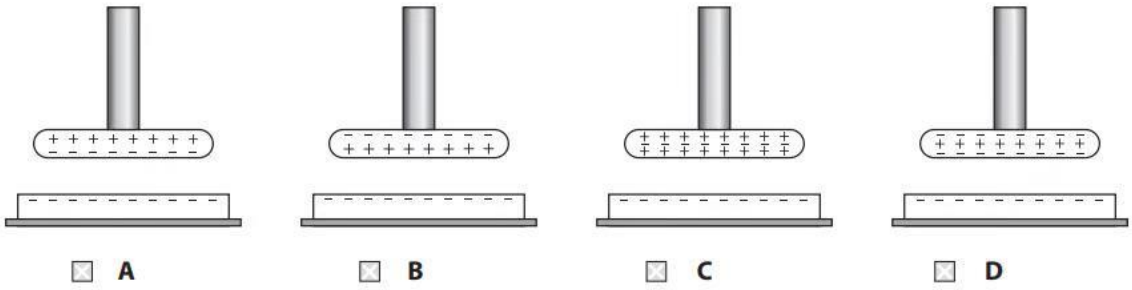
Figure 9

A student uses the insulating handle to hold the metal disc above the plastic block.

i)

Which of these diagrams shows how the charge is distributed on the metal disc?

(1)



ii)

The student keeps holding the metal disc above the charged plastic block and taps the metal disc with a fnger.

This earths the metal disc for a short time.

Explain why the disc now has an overall positive charge.

(2)

iii)

Figure 10 shows the charges on part of the metal disc and the plastic block.

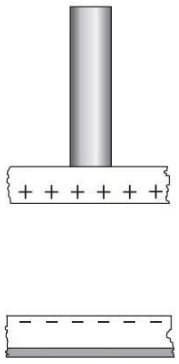


Figure 10

On Figure 10, draw lines to show the shape and direction of the electric field between the metal disc and the plastic block.

(2)

[5 marks]

Question 2a

a)

Astudent gives a plastic strip an overall electric charge.

i)

Describe one way that the student can give the plastic strip an overall electric charge.

(1)

ii)

Figure 1 shows a gold leaf electroscope that can be used to investigate static electricity.

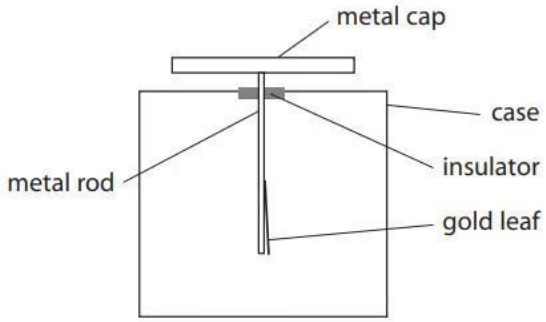
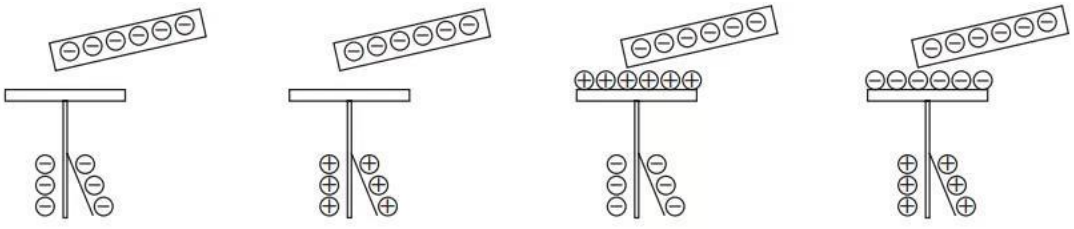


Figure 1

The electroscope has no overall charge.
The gold leaf has a very small mass and can bend very easily.
The student brings a negatively charged plastic strip near to the cap of the electroscope.

The gold leaf bends away from the metal rod.
Which diagram shows the way that electric charge is now distributed?

(1)



☒ A ☒ B ☒ C ☒ D

[2 marks]

Question 2b

b)

Figure 2a shows another gold leaf electroscope that has been given an overall negative charge.

A student connects the metal cap of the charged electroscope to earth with a piece of wire as shown in Figure 2b.

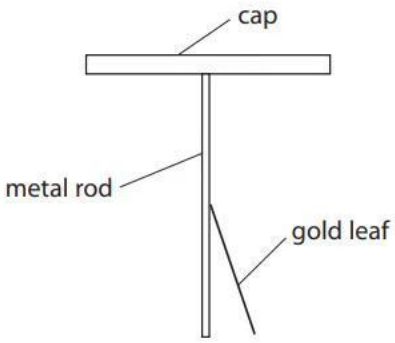


Figure 2a

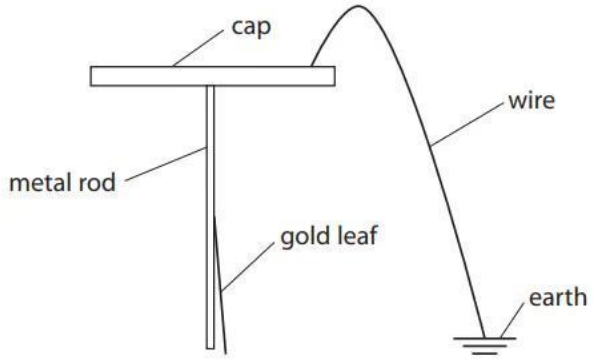


Figure 2b

Explain why the gold leaf has moved.

(2)

[2 marks]

Question 2c

c)

Two small objects, P and Q, are each given an electric charge.

Figure 3 represents the electric fields around the objects, P and Q.

Figure 3

i)

Use information from Figure 3 to give two differences between the charge on P and the charge on Q.

(2)

ii)

Object P and object Q are held near to each other so that their electric fields interact with each other.

State the effect that the electric field of object Q has on object P.

(1)

[3 marks]

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Question 3a

a)

Figure 13 shows a negatively charged metal sphere, M.

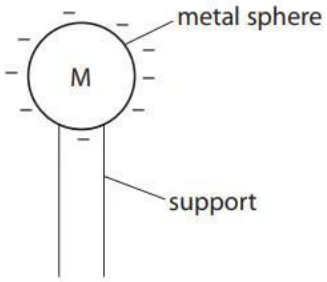

Figure 13

i)

Sphere M is negatively charged because it has

(1)

☐ A gained electrons

☐ B lost electrons

☐ C gained protons

☐ D lost protons

ii)

A metal sphere, N, is connected to earth by a wire.

N is moved near to M as shown in Figure 14.

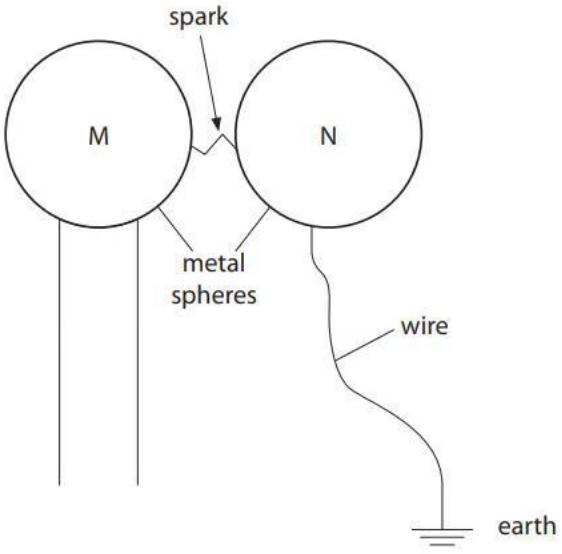

Figure 14

A spark jumps between the spheres, discharging sphere M.

Describe what happens in the wire connecting sphere N to earth when the spark jumps between M and N.

(2)

iii)
Describe a use of earthing in everyday life.

Your answer should state the use and describe why earthing is needed.

(2)

[5 marks]

Question 3b

b)

Figure 15 shows two parallel metal plates.

The plates are charged using a very high voltage.

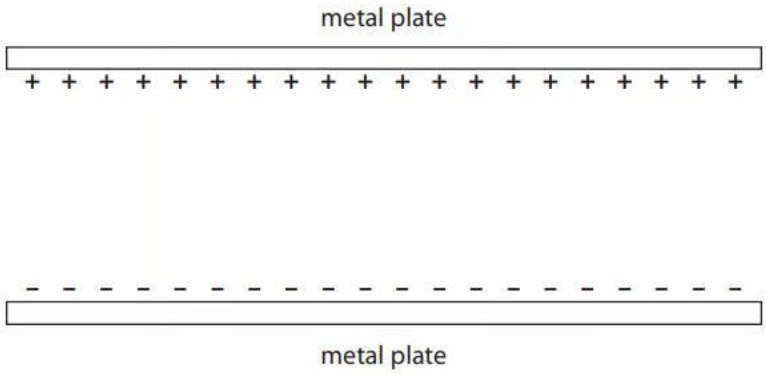

Figure 15

Draw on Figure 15 the shape and direction of the electric field between the plates.

(2)

[2 marks]

Question 3c

c)

This question is about electrostatic charges and the forces between them.

Figure 16 shows some apparatus that can be used to show that like charges repel and unlike charges attract.

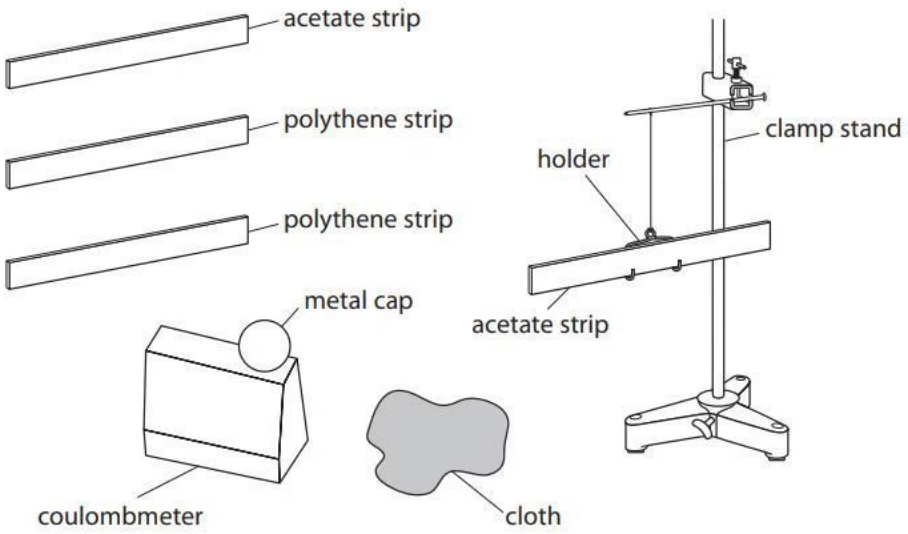

Figure 16

An acetate strip can be charged positively.

A polythene strip can be charged negatively.

A coulombmeter can be used to measure charge and whether the charge is positive or negative.

Explain how you would use the apparatus in Figure 16 to show that like charges repel and unlike charges attract.

(6)

[6 marks]

Topic: _____
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Question 4a

a)

Figure 1 shows a paint sprayer.

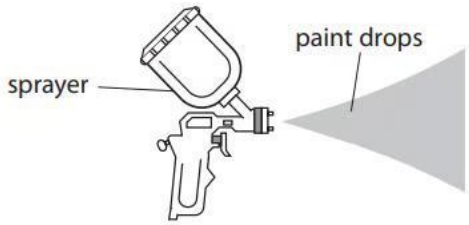

Figure 1

Some paint sprayers give the paint drops a positive charge as they leave the sprayer.

i)

The paint drops have a positive charge because the sprayer

- ☐ A removes electrons from the paint drops
- ☐ B adds electrons to the paint drops
- ☐ C removes protons from the paint drops
- ☐ D adds protons to the paint drops

(1)

ii)

Figure 2 shows the spray pattern from two different paint sprayers.

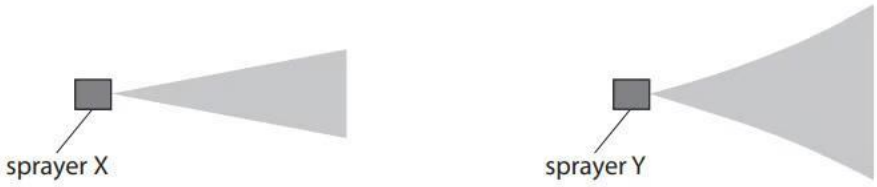

Figure 2

Sprayer X does not charge the paint drops. Sprayer Y gives the paint drops a positive charge.

Explain how charging the paint drops changes the shape of the spray pattern.

(2)

iii)

Sprayer Y is used in a factory to paint a metal object.

The object hangs by a metal wire that is connected to earth.

Explain why a metal wire is used to connect the object to earth.

(2)

[5 marks]

Question 4b

b)

Figure 3 shows two charged metal plates.

Figure 3

The top plate has a negative electric charge.

The bottom plate has a positive electric charge.

On Figure 3, draw the electric field lines between the two plates and show the direction of this electric field.

(2)

[2 marks]

Question 5a

a)

Astudent uses a cloth to give a plastic rod a positive charge.

i)

Explain how the rod becomes positively charged.

(3)

ii)

Figure 12 shows four light balls, Q, R, S and T.

Each ball is suspended on a nylon string.

Balls Q, R and T are coated with a conducting material.

Ball S is an insulator.

Q and S have no charge, R is positively charged and T is negatively charged.

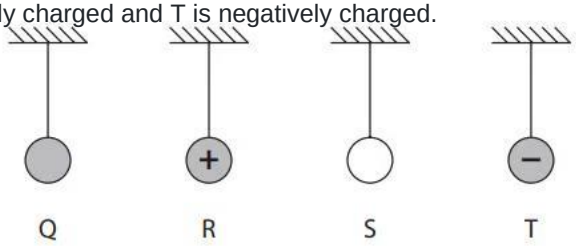

Figure 12

The student brings the positively charged rod near to each ball in turn.

Which ball is repelled by the positively charged rod?

(1)

☐ A Q
☐ B R
☐ C S
☐ D T

[4 marks]

Question 5b

b)

Figure 13 shows part of a cloud, above the ground.

The base of the cloud is negatively charged.

Figure 13

Explain how lightning is produced between the cloud and the Earth.

Your answer should refer to induced charges.

You may add to the diagram in Figure 13 to help your answer.

(3)

[3 marks]

Question 5c

c)

Figure 14 shows fuel being transferred to an aeroplane.

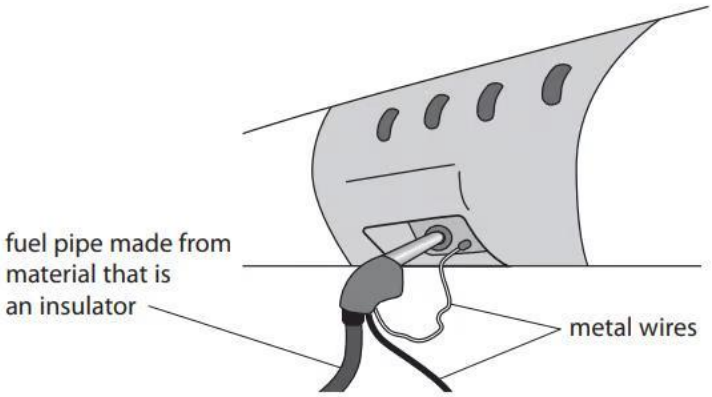

Figure 14

Explain why transferring fuel can be dangerous and how the use of metal wires makes the process much safer.

(6)

[6 marks]