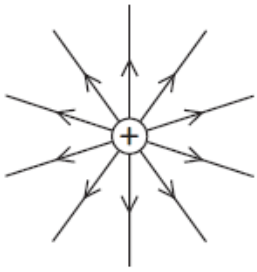
Questions

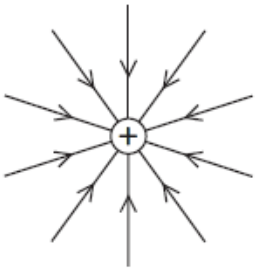
Q1.

Which of these diagrams shows the shape and direction of the electric field around a positive point charge?

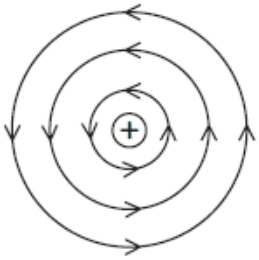
(1)



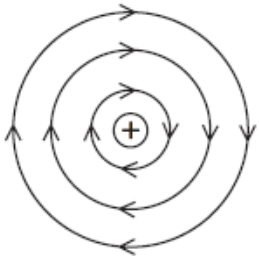
☒ **A**



☒ **B**



☒ **C**



☒ **D**

(Total for question = 1 mark)

Q2.

Describe **one** situation where separation of electric charge can create a spark.

(2)

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Q3.

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)

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(Total for question = 3 marks)

Q4.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

A student uses a cloth to give a plastic rod a positive charge.

(i) Explain how the rod becomes positively charged.

(3)

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(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.

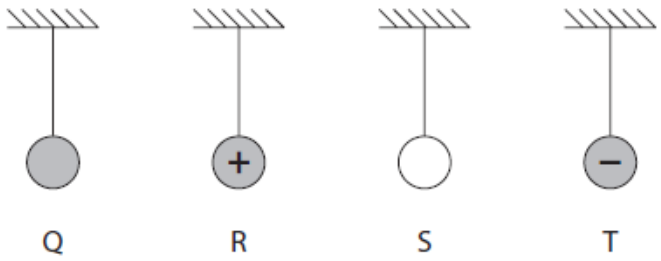

Figure 12

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

(Total for question = 4 marks)

Q5.

Figure 20 shows two metal spheres.

Metal sphere A is fixed to a table.
Metal sphere B can be moved.

Metal sphere B is placed at a short distance from metal sphere A.

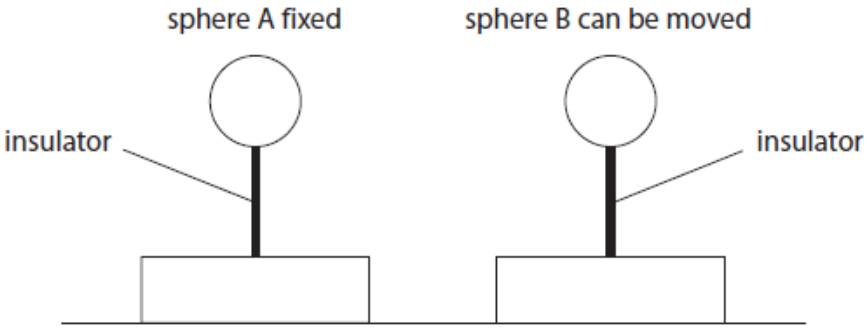

Figure 20

Both spheres are insulated from the table and given a negative charge.

The force between the charged spheres is measured.

(i) Explain, in terms of electric fields, why a force is exerted on sphere B.

(2)

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(ii) Sphere B is moved and the force between the spheres is measured at several different distances.

Figure 21 is a graph of force on sphere B against distance between the centres of the spheres.

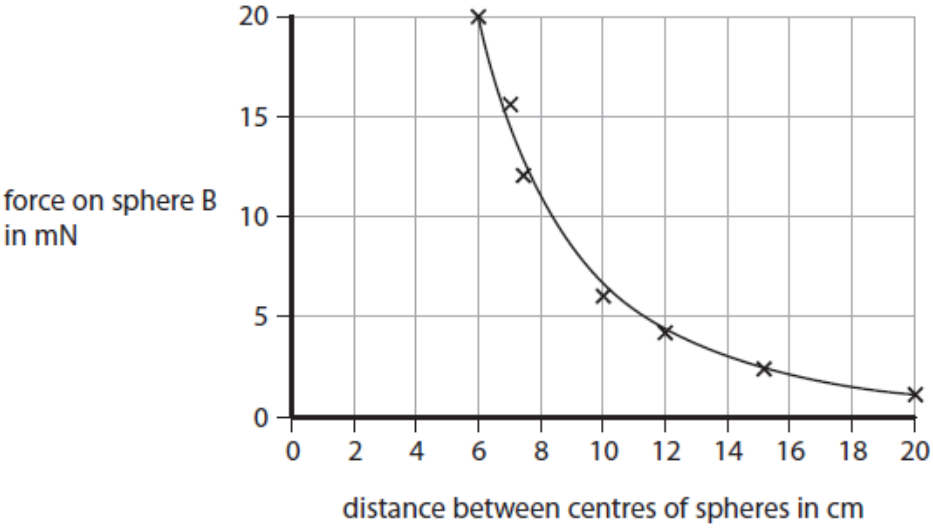

Figure 21

Describe how the force on sphere B varies with the distance between the centres of the spheres.

(2)

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(Total for question = 4 marks)

Q6.

An atom contains electrons, neutrons and protons.

At a petrol station, a pipe is used to transfer petrol to the storage tanks.

The pipe is earthed.

There is friction between the petrol and the end of the pipe.

(i) Explain why it is dangerous **not** to earth the pipe.

(2)

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(ii) Explain how earthing the pipe makes this process much safer.

(2)

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Q7.

A plastic rod and a piece of cloth are both uncharged.

A student rubs the plastic rod with the cloth.

The plastic rod becomes negatively charged.

(i) Compared with the plastic rod, which row of the table is correct for the charge on the cloth?

Put a cross (☒) in the box next to your answer.

(1)

	sign of charge	size of charge
☒ **A**	positive	equal
☒ **B**	negative	equal
☒ **C**	positive	bigger
☒ **D**	negative	bigger

(ii) Explain how the plastic rod becomes negatively charged.

(2)

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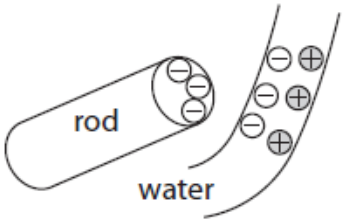
(iii) The student then holds the plastic rod near to a stream of water coming from a tap.

The stream of water bends towards the plastic rod.

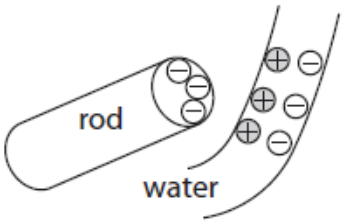
Which picture shows the correct arrangement of charges in the stream of water?

Put a cross (☒) in the box next to your answer.

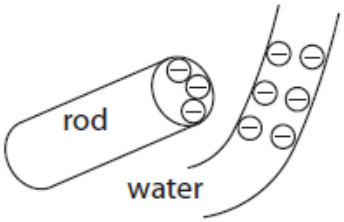
(1)



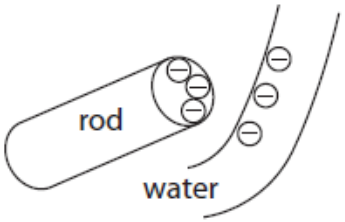
☒ **A**



☒ **B**



☒ **C**



☒ **D**

(iv) The student puts the plastic rod into the stream of water and pulls it out.

Now, when he holds the plastic rod near the stream of water, the stream of water does not bend.

Suggest why the stream of water does not bend.

(1)

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Q8.

* Figure 14 shows fuel being transferred to an aeroplane.

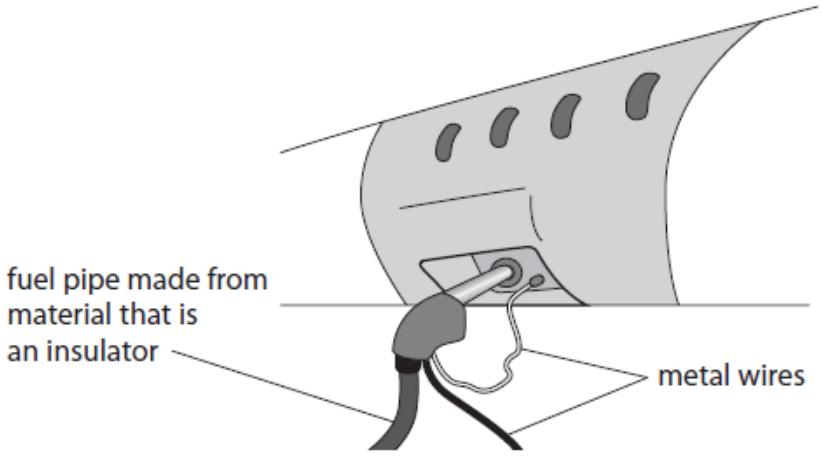

Figure 14

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

(6)

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(Total for question = 6 marks)

Q9.

A student rubs a plastic comb with a dry cloth to give the comb a positive electric charge.

Figure 19 shows the charged plastic comb picking up small pieces of paper.

(Source © GIPhotoStock/SCIENCE PHOTO LIBRARY)

Figure 19

(i) Explain how rubbing the comb with a dry cloth gives the comb a positive electric charge.

(3)

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(ii) Explain how the positively-charged plastic comb picks up the small pieces of paper.

(3)

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(Total for question = 6 marks)

Q10.

The student rubs another balloon with a cloth.
This balloon becomes negatively charged.

(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

Compared to the charge gained by the balloon, the cloth gains

(1)

☒ **A** a larger negative charge

☒ **B** a larger positive charge

☒ **C** an equal negative charge

☒ **D** an equal positive charge

(ii) Explain why the balloon became negatively charged when it was rubbed with the cloth.

(2)

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(iii) The student then puts this charged balloon against a metal cabinet.

Describe what happens to the charge on the balloon where it touches the metal cabinet.

(2)

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(iv) The student charges another balloon and holds it against a wall. The charged balloon sticks to the wall when he lets go.

Suggest why the balloon is attracted to the wall.

(1)

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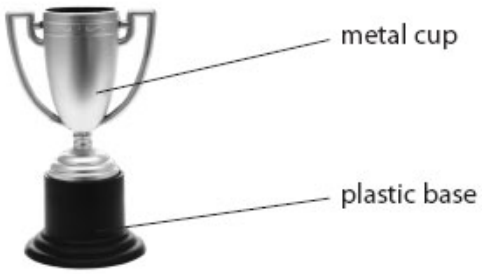
Q11.

(a) A student wins a trophy. It is a metal cup on a black plastic base.



The student cleans the trophy.
She holds one of the metal handles and rubs the rest of the trophy with a dry cloth.

(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

The plastic base becomes negatively charged because it gains

(1)

☒ **A** atoms

☒ **B** becquerel

☒ **C** einstein

☒ **D** radium

(ii) Explain why the base gains a negative charge when she rubs the trophy with the cloth.

(2)

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(iii) The metal cup does not become charged when she rubs the trophy.
Suggest why the cup does not become charged.

(2)

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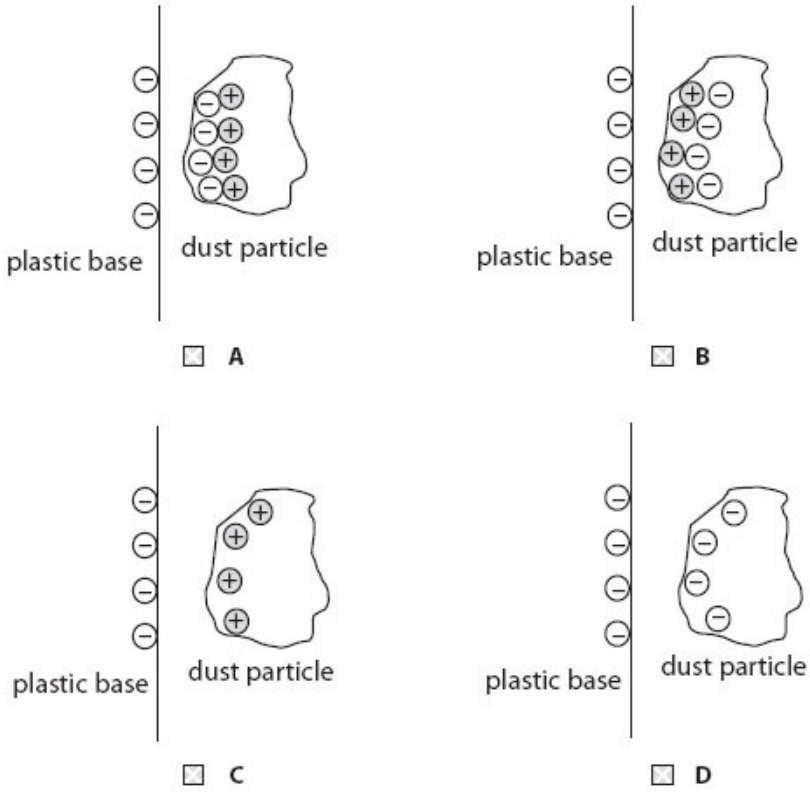
(iv) Some dust particles in the air drift near to the plastic base just after she cleans the trophy.

Which diagram shows the correct distribution of charges on a dust particle near to the charged plastic base?

Put a cross (☒) in the box next to your answer.

(1)



☐ **A** ☒ **B**

☐ **C** ☒ **D**

(b) Describe **one** situation where separation of electric charge can create a spark.

(2)

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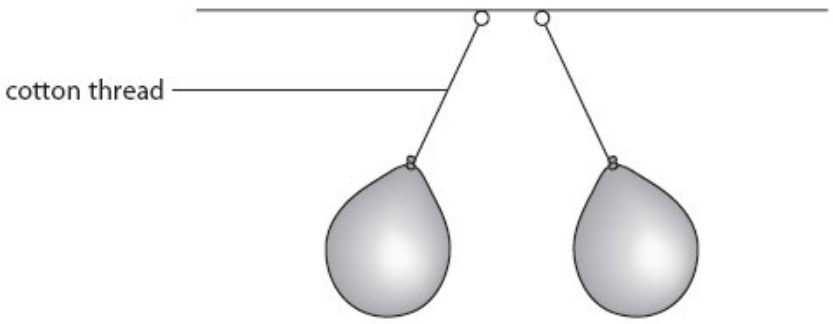
(Total for Question = 8 marks)

Q12.

(a) A student charges two balloons and hangs them side by side.



Explain why the cotton threads are not vertical.

(2)

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(b) The student rubs another balloon with a cloth.
This balloon becomes negatively charged.

(i) Complete the sentence by putting a cross (☒) in the box next to your answer.

Compared to the charge gained by the balloon, the cloth gains

(1)

☒ **A** a larger negative charge

☒ **B** a larger positive charge

☒ **C** an equal negative charge

☒ **D** an equal positive charge

(ii) Explain why the balloon became negatively charged when it was rubbed with the cloth.

(2)

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(iii) The student then puts this charged balloon against a metal cabinet.

Describe what happens to the charge on the balloon where it touches the metal cabinet.

(2)

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(iv) The student charges another balloon and holds it against a wall. The charged balloon sticks to the wall when he lets go.

Suggest why the balloon is attracted to the wall.

(1)

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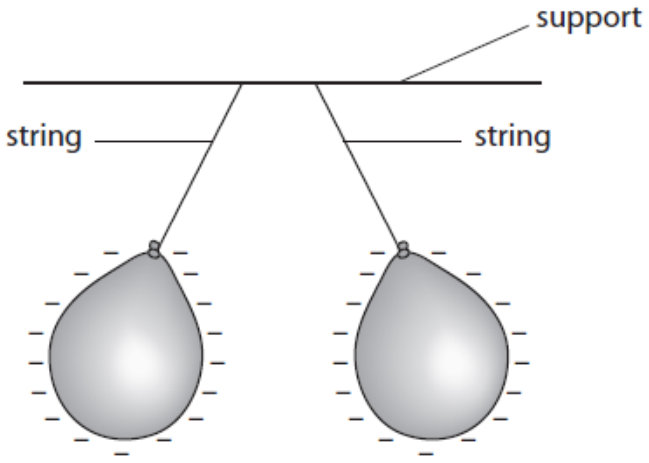
(Total for Question = 8 marks)

Q13.

(a) A student ties two balloons to a support with some string.
The student rubs both balloons with a dry cloth which gives the balloons a negative charge.
The diagram shows the balloons after they were rubbed.



Use words from the box to complete the sentences.

(4)

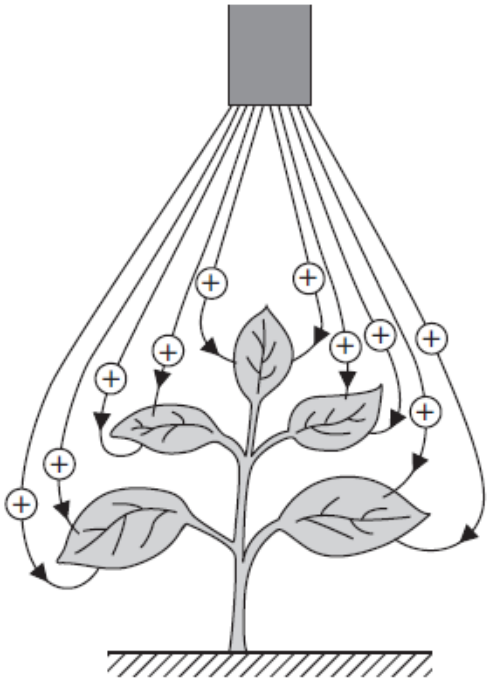
attract	charge	electrons	negative	neutral
neutrons	positive	protons	repel	support

The balloons ..... each other because they have the same .....

The cloth is left with a ..... charge.

The charged particles that are transferred from the cloth to the balloons are called .....

(b) The diagram shows an electrostatic insecticide spray being used on a plant. The plant is initially uncharged.
Each droplet of spray is given a positive charge.



(i) Explain the advantages of using an electrostatic insecticide spray compared to an uncharged insecticide spray.

(3)

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(ii) There is a current of 0.008 A in the sprayer for a time of 10 minutes.

Calculate the charge supplied to the sprayer in this time.

(3)

charge = ... C

(Total for Question = 10 marks)

Q14.

An atom contains electrons, neutrons and protons.

(a) Use words from the box to complete the sentences.

neutral	negative
much larger than a neutron	much smaller than a neutron
positive	the same size as a neutron

(i) The charge on an electron is .....

(1)

(ii) An electron has a mass that is .....

(1)

(b) At a petrol station, a pipe is used to transfer petrol to the storage tanks.

The pipe is earthed.

There is friction between the petrol and the end of the pipe.

(i) Explain why it is dangerous **not** to earth the pipe.

(2)

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(ii) Explain how earthing the pipe makes this process much safer.

(2)

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*(c) The photographs show some electrostatic effects.

positively charged balloon near hair

positively charged rod near some paper

positively charged balloon near a thin stream of water

Explain in terms of electric charges how one of these effects is caused.

You may include diagrams to help with your answers.

(6)

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(Total for Question is 12 marks)