PEARSON EDEXCEL GCSE PHYSICS (HIGHER) · 1PH0

PHYSICS



EXAM QUESTION PACK

TOPIC 11: STATIC ELECTRICITY

SCORE	PERCENTAGE
/59	%

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Q1.

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 ☒.

This question is about static electricity.

A student 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)

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(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)

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(Total for question = 6 marks)

Q2.

A battery sends a current through a metal wire.

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

Direct current is movement of charge

(1)

☒ **A** backwards and forwards

☒ **B** in many directions

☒ **C** in one direction

☒ **D** up and down

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

The particles that flow in the metal wire are

(1)

☒ **A** atoms

☒ **B** electrons

☒ **C** protons

☒ **D** neutrons

(b) The current in a wire is 3.7 A.

Calculate the charge that flows into the wire in 13 s.

(2)

charge = ...C

(c) Plastic is an insulator.

A student rubs a piece of plastic with a cloth.

This gives the plastic a negative charge.

(i) Explain how the plastic is charged by the rubbing.

(2)

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(ii) The cloth is also charged when it rubs against the plastic.

Describe the charge on the cloth.

(2)

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(Total for Question is 8 marks)

Q3.

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 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)

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

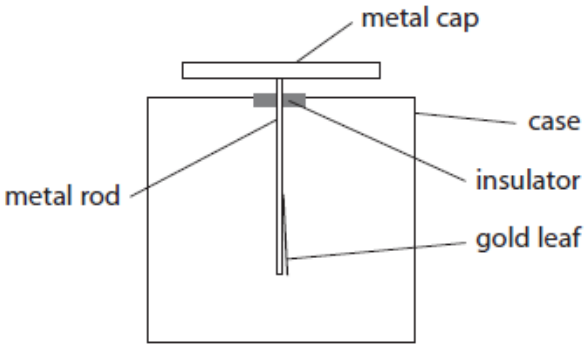


Figure 1

The electroscope has no overall charge.

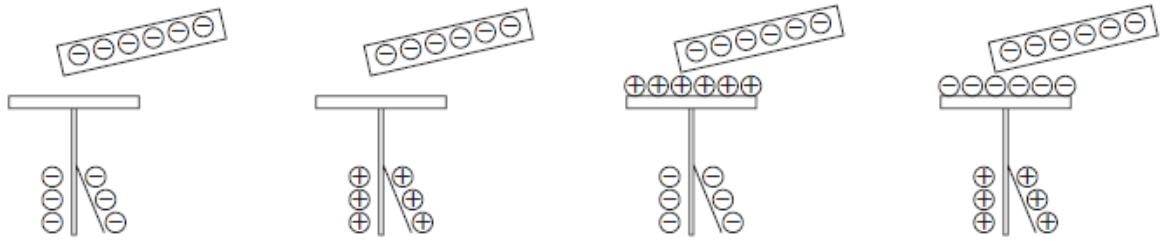
The gold leaf has a very small mass and can bend very easily.

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**

(Total for question = 2 marks)

Q4.

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.

(Total for question = 2 marks)

Q5.

This question is about static electricity.

Draw on Figure 1 the shape and direction of the electric field due to the positive point charge.

(2)



Figure 1

(Total for question = 2 marks)

Q6.

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)

1 .....

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2 .....

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(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)

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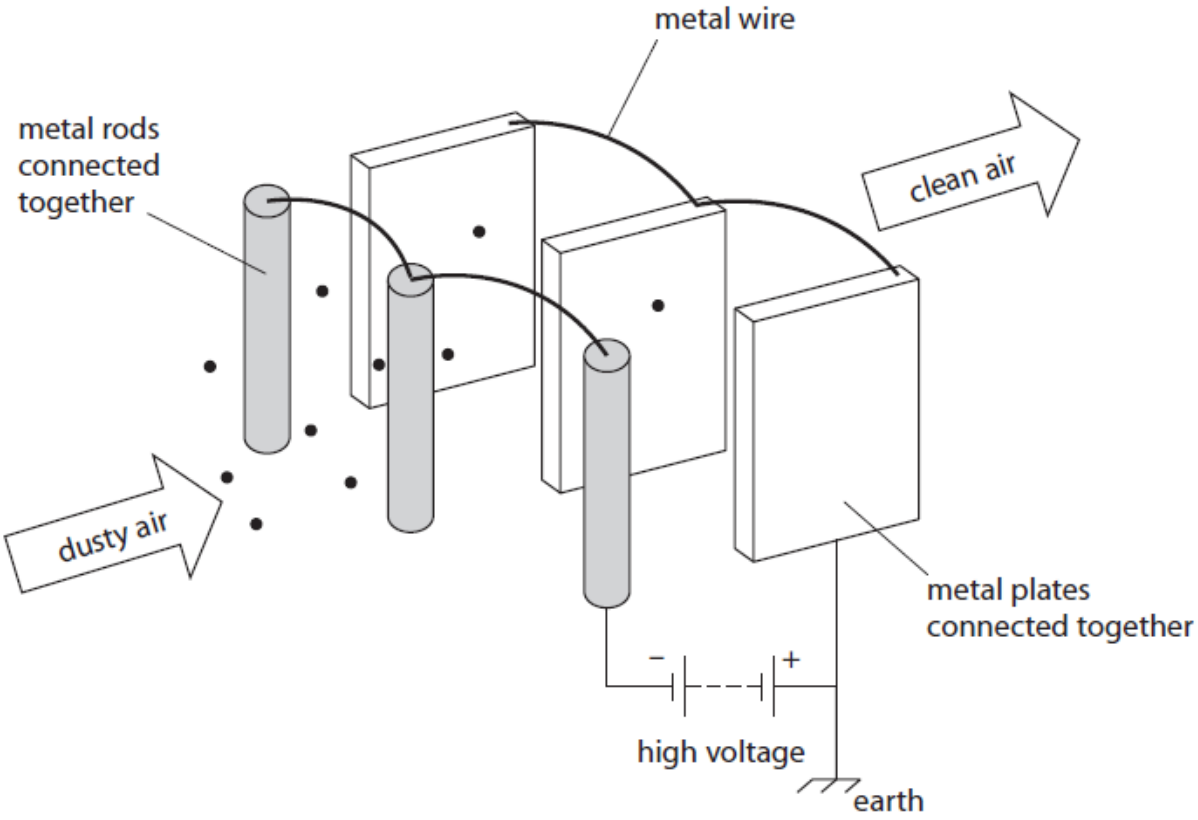
(Total for question = 3 marks)

Q7.

An electrostatic air filter is designed to remove dust particles from the air in a room.

A fan blows dusty air past several metal rods and metal plates.

There is a large potential difference (voltage) between the metal rods and the metal plates.



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

When dusty air goes past the metal rods, the dust particles become negatively charged.

This is because the dust particles

(1)

☒ **A** lose electrons

☒ **B** lose protons

☒ **C** gain electrons

☒ **D** gain protons

(b) When the dusty air flows past the metal plates, the dust particles settle on the metal plates.

Explain why the dust particles settle on the metal plates.

(2)

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(c) (i) State what happens to the charge on the dust particles when they settle on the metal plates.

(1)

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(ii) Explain why the charge does not build up on the metal plates.

(2)

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(d) There is a current of 1.2 mA in the circuit.

Calculate the charge transferred by this current in 40 s.

State the unit.

(3)

charge transferred = ... unit: .....

Q8.

Figure 9 shows an electrostatic method for spray-painting a car door.

The car door has a negative charge.

The droplets of paint receive a positive charge as they leave the spray gun.



(Source: © Jens Brüggemann/123RF)

Figure 9

Explain how charging the door helps the paint to form an even coating on both sides of the door.

You should use ideas of forces and fields in your answer.

(2)

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(Total for question = 2 marks)

Q9.

An insecticide sprayer charges droplets of insecticide.

Figure 2 shows the sprayer being used to spray a leaf.

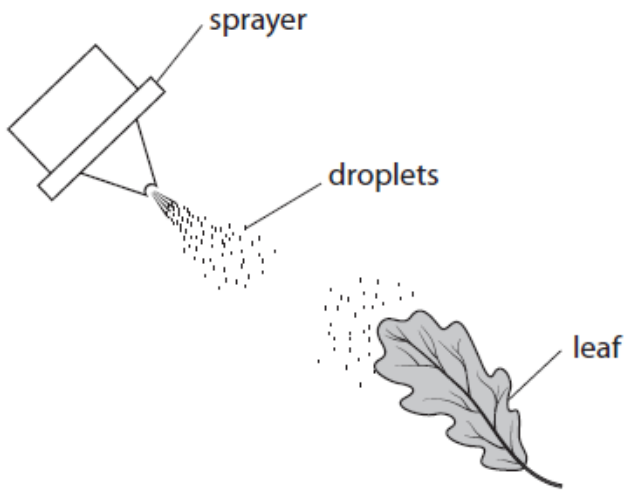


Figure 2

The leaf is connected to the ground (earthed).

Explain how charging the droplets helps to make sure that the leaf gets covered with insecticide.

You may add to Figure 2, including the sign (+ or –) of any charges, to help your answer.

(3)

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(Total for question = 3 marks)

Q10.

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.

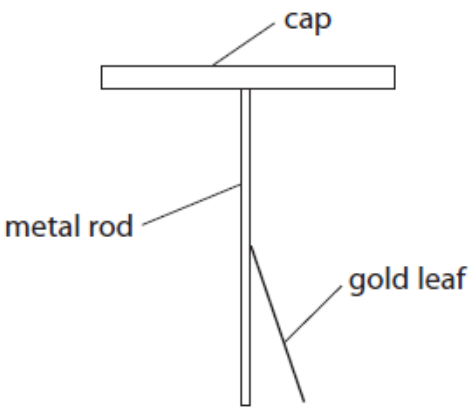


Figure 2a

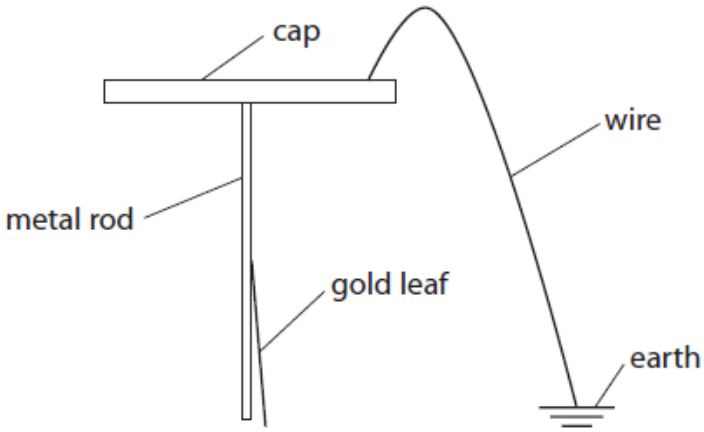


Figure 2b

Explain why the gold leaf has moved.

(2)

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(Total for question = 2 marks)

Q11.

Explain how an aircraft can become electrically charged as it flies through the air.

(2)

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(Total for question = 2 marks)

Q12.

A student rubs a plastic ruler against a woolly jumper.

The student tests the ruler and finds it has a positive charge.

Explain how the ruler becomes positively charged.

(2)

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(Total for question = 2 marks)

Q13.

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 ☒.

This question is about static electricity.

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.

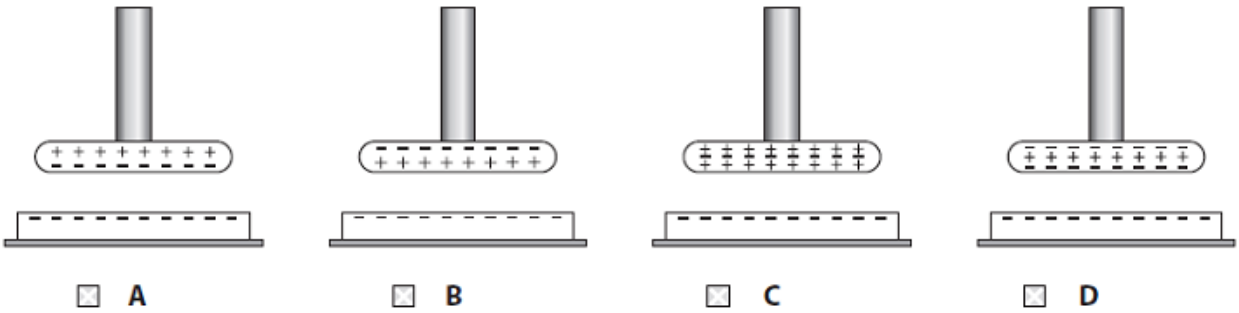


Figure 9

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)



☒ A ☒ B ☒ C ☒ D

(ii) The student keeps holding the metal disc above the charged plastic block and taps the metal disc with a finger.

This earths the metal disc for a short time.

Explain why the disc now has an overall positive charge.

(2)

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

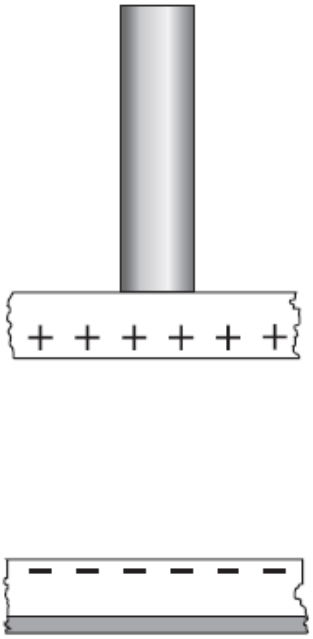


Figure 10

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

(2)

(Total for question = 5 marks)

Q14.

Figure 7 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.

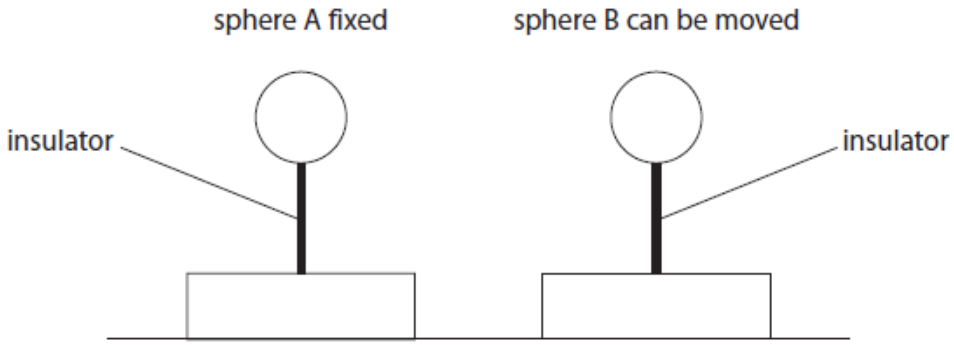


Figure 7

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

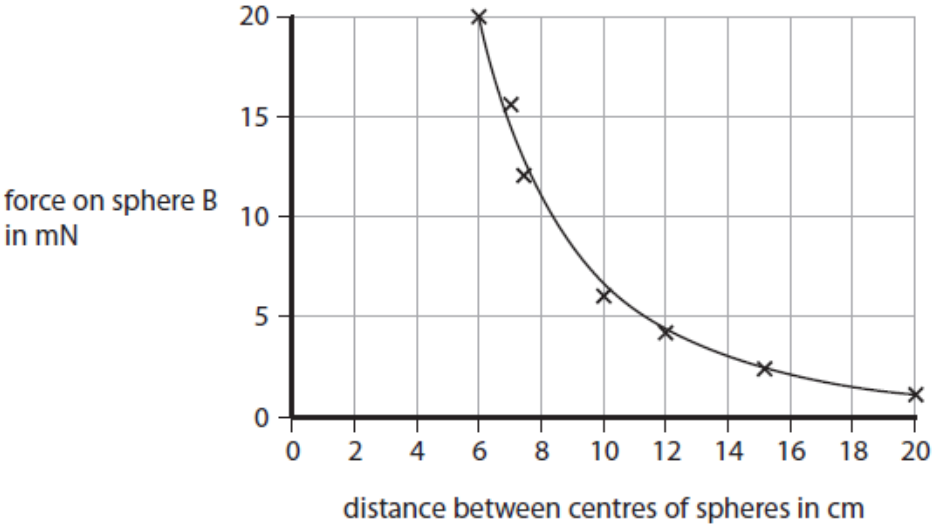


Figure 8

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)

Q15.

Figure 5 shows a metal chair being sprayed with paint.

The paint droplets come from a gun with an electric charge.

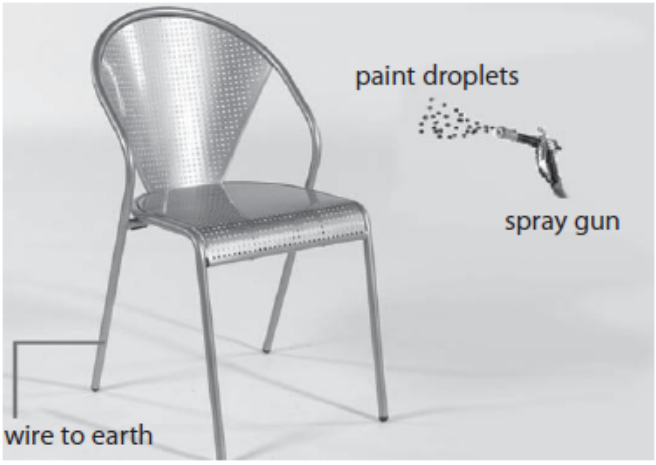


Figure 5

Inside the spray gun, electrons move along a charged wire towards the nozzle to charge the paint.

The charged paint droplets are sprayed from the nozzle.

The chair is connected to earth.

Which row of the table shows the correct combination of the charges as the charged paint droplets get near to the chair?

(1)

	paint droplets	chair
☐ **A**	negative	negative
☐ **B**	negative	positive
☐ **C**	positive	negative
☐ **D**	positive	positive

(Total for question = 1 mark)

Q16.

A battery sends a current through a metal wire.

Plastic is an insulator.

A student rubs a piece of plastic with a cloth.

This gives the plastic a negative charge.

(i) Explain how the plastic is charged by the rubbing.

(2)

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(ii) The cloth is also charged when it rubs against the plastic.

Describe the charge on the cloth.

(2)

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Q17.

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

Figure 6 shows the charged plastic comb picking up small pieces of paper.



(Source © GIPhotoStock/SCIENCE PHOTO LIBRARY)

Figure 6

(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)

Q18.

Glass is an insulator.

A student rubs a piece of glass with some silk.

The glass becomes positively charged.

(i) Explain how rubbing silk charges the glass.

(2)

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(ii) The silk is also charged when it rubs against the glass.

Explain how the silk becomes charged.

(2)

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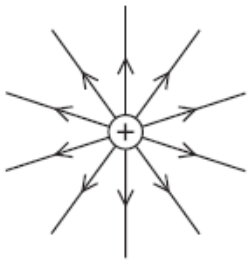
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(Total for question = 4 marks)

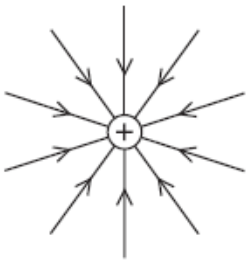
Q19.

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

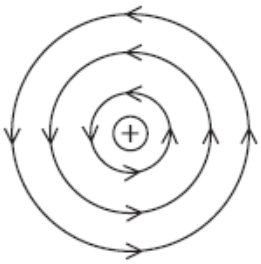
(1)



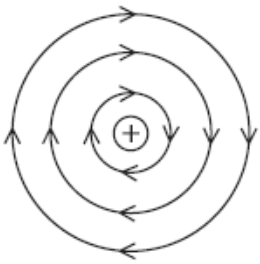
☒ **A**



☒ **B**



☒ **C**



☒ **D**

(Total for question = 1 mark)

Q20.

Figure 8 shows an airport worker refuelling an aircraft.



(Source: © Stanisław Tokarski/123RF)

Figure 8

Pumping fuel into an aircraft can be dangerous.

The worker connects an earth wire to the aircraft before pumping fuel.

Give **one** reason why earthing reduces the risk of fire.

(1)

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.....

(Total for question = 1 mark)

Q21.

(a) A student rubs a plastic rod with a dry cloth. The cloth becomes positively charged.

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

The cloth becomes positively charged because

(1)

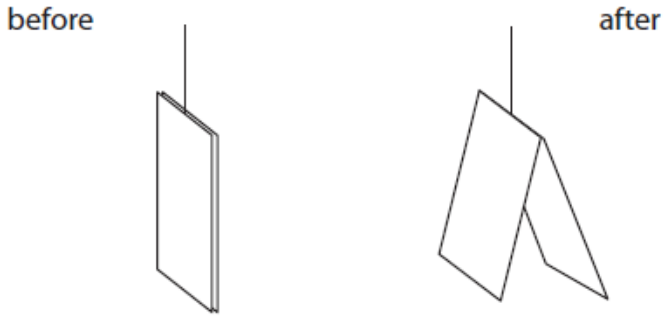
☒ **A** negative charge has moved from the cloth to the rod

☒ **B** negative charge has moved from the rod to the cloth

☒ **C** positive charge has moved from the cloth to the rod

☒ **D** positive charge has moved from the rod to the cloth.

(ii) Two plastic strips are joined at the top and are hanging by a thread.
The student rubs both strips with another dry cloth.
The diagram shows the two plastic strips before and after the student rubs them.



Explain why the strips behave in this way after they are rubbed with the cloth.

(2)

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(b) The student reads an article about the possible build-up of static electricity during the refuelling of an aircraft.

(i) Explain why this build-up could be dangerous.

(2)

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(ii) The article also states that the aircraft is connected by a metal cable to the ground.
The aircraft is also connected by a metal cable to the refuelling tanker.

Explain how these cables reduce the dangers when refuelling the aircraft.

(3)

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(Total for Question = 8 marks)

Q22.

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

(2)

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(ii) In a spark, the total charge of 0.22 μC (microcoulombs) flows in 2 ms (milliseconds).

Calculate the average current in that time.

(4)

average current = ... A

(Total for question = 6 marks)

Q23.

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 ☒.

Figure 1 shows a paint sprayer.

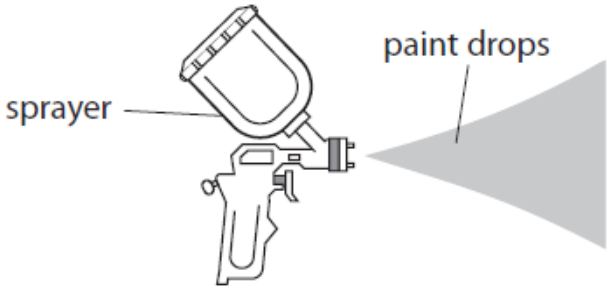


Figure 1

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

(1)

☒ **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

(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)

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(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)

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(Total for question = 5 marks)