Additional Assessment Materials
Summer 2021

Pearson Edexcel GCSE in Physics (1PH0)
Foundation

Resource Set Topic G: Static electricity, Electromagnetic induction

Questions

(Public release version)

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Additional Assessment Materials, Summer 2021

General guidance to Additional Assessment Materials for use in 2021

Context

- Additional Assessment Materials are being produced for GCSE, AS and A levels (with the exception of Art and Design).
- The Additional Assessment Materials presented in this booklet are an **optional** part of the range of evidence teachers may use when deciding on a candidate's grade.
- 2021 Additional Assessment Materials have been drawn from previous examination materials, namely past papers.
- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.

Purpose

- The purpose of this resource to provide qualification-specific sets/groups of questions covering the knowledge, skills and understanding relevant to this Pearson qualification.
- This document should be used in conjunction with the mapping guidance which will map content and/or skills covered within each set of questions.
- These materials are only intended to support the summer 2021 series.

1 (a) Complete the following sentences using one of the phrases from the box below.

efficiency is reduced the national grid a power station heat loss is reduced a transformer

(i) Electrical power is generated at

(1)

a power station

(ii) Electricity is transmitted over long distances by transmission lines that are part of

(1)

the national grid

(iii) Electricity is transmitted at high voltages so that

(1)

heat loss is reduced

(b) Which statement is true for transformers?

(1)

☐ **A** Transformers can only step-up voltages.

☐ **B** Transformers can only step-down voltages.

☐ **C** Transformers can work with direct current.

☒ **D** Transformers have primary and secondary coils.

(c) In a small transformer

- the primary voltage is 230 V
- the primary current is 0.020 A
- the secondary voltage is 5.0 V

Calculate the secondary current.

Use the equation

$$I_s = \frac{V_p \times I_p}{V_s}$$

$$= \frac{230 \times 0.020}{5}$$

$$= 0.92$$

(2)

secondary current = 0.92 A

10 (a) 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)

The rubbing process causes the negatively charged electrons in the comb to move to the dry cloth. Since the comb has less electrons, the overall charge becomes positive.

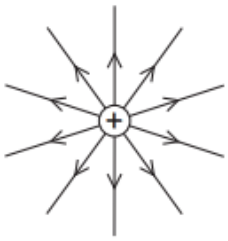
(ii) Explain how the positively-charged plastic comb picks up the small pieces of paper.

(3)

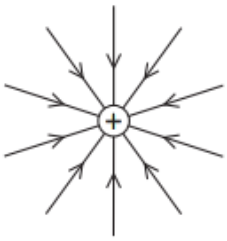
The comb causes separation of charge in the paper. The part of the paper pieces with negative charge is attracted to the comb. The attractive force is larger than the weight of the paper.

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

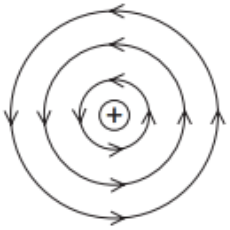
(1)



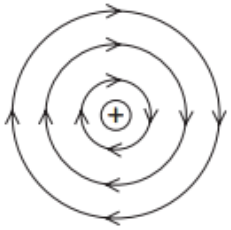
☒ **A**



☐ **B**



☐ **C**



☐ **D**

(c) 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.

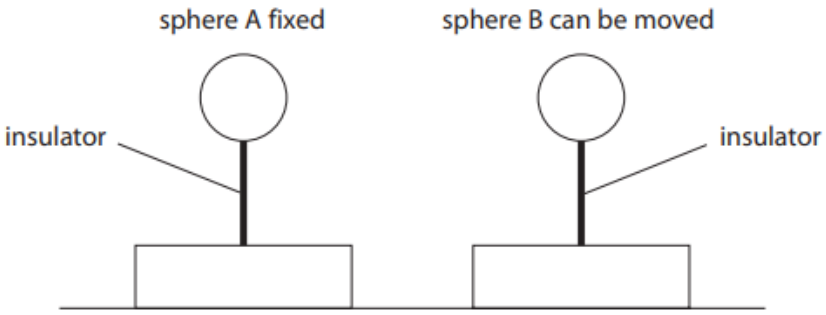


Figure 20

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)

The negative charges in the sphere A exert a repulsive force on the negative charges in sphere B.

(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.

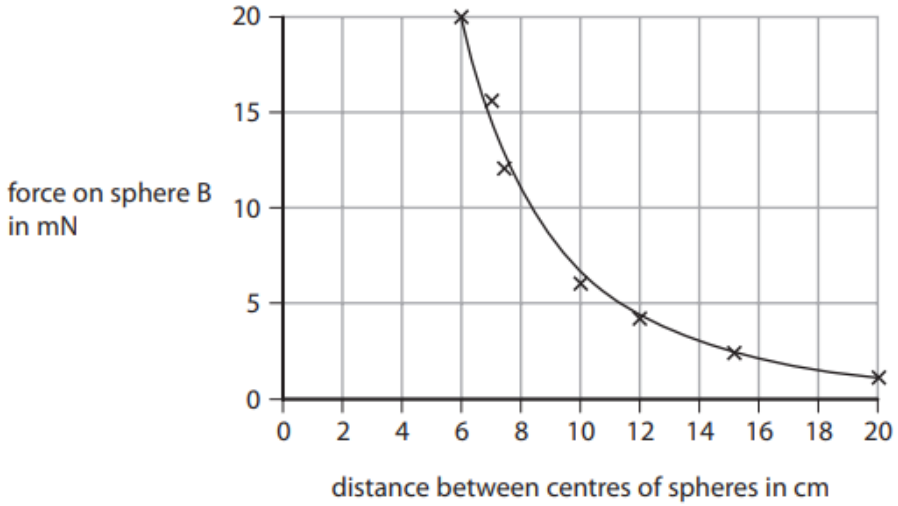


Figure 21

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

(2)

The force is maximum at 20mN when the two spheres are in contact.

The force decreases with decreasing gradient as the distance between the two centres increase.

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

(i) Explain how the rod becomes positively charged.

(3)

When the cloth is rubbed on the plastic rod, negatively charged electrons in the plastic rod move to the cloth. Since the rod has more positively charged particles than negatively charged ones the overall charge becomes positive.

(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.

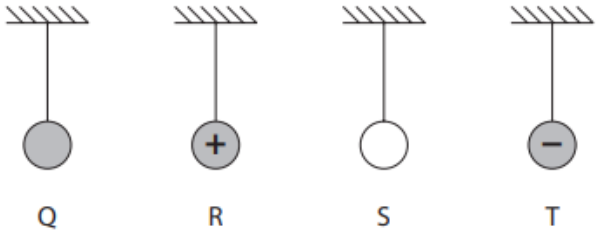


Figure 12

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

(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)

When the cloud is above the ground, it induces a positive charge on the ground due to the negative charge of the cloud. As the voltage is very high, it causes a spark between the cloud and the ground. This is known as lightning.

*(c) Figure 14 shows fuel being transferred to an aeroplane.

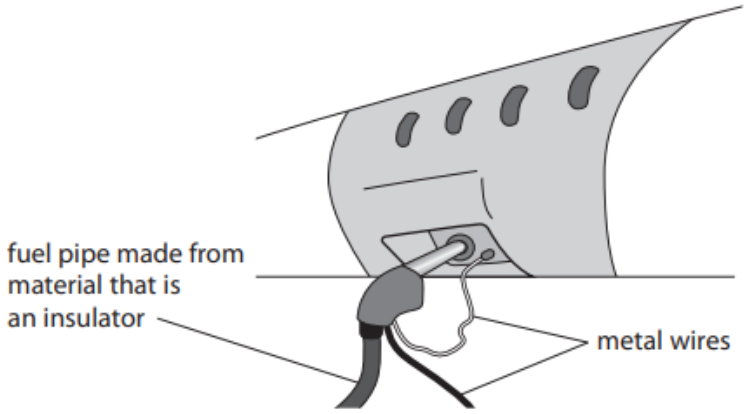


Figure 14

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

(6)

Since aeroplanes have a large amount of fuel and are highly charged in the sky it is very important to prevent any sparks that may occur to prevent explosions due to the high flammability of the fuel. The metal wire allows the charges to flow safely to the ground without interacting with the pipe that feeds the fuel to the plane.

10 This question is about static electricity.

(a) 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)

The student can rub the balloon with a cotton wool cloth for a few minutes.

(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)

He can hold the balloons at a close distance from each other and if the balloons repel each other, they have the same charges.

(b) Figure 26 shows a plastic block and a metal disc with an insulating handle.

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

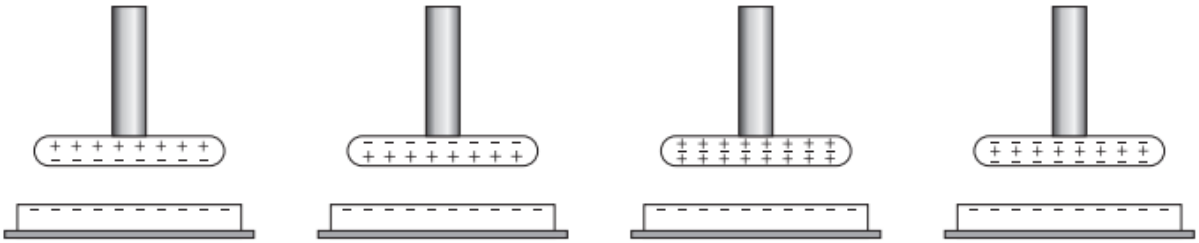
The metal disc has no overall electric charge.

Figure 26

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)

Some electrons flow from the metal disk to the ground which reduces the amount of electrons (negative charge) on the disk. This gives an overall positive charge on the disk.

(iii) Figure 27 shows the charges on part of the metal disc and the plastic block.

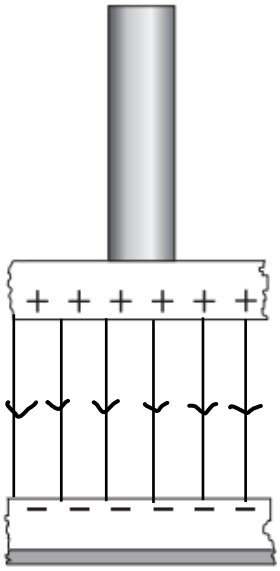


Figure 27

On Figure 27, draw lines to show the shape and direction of the electric field between the metal disc and the plastic block.

(2)

TOTAL FOR PAPER IS 41 MARKS