Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel International GCSE (9–1)

Centre Number | | | | | |

Candidate Number | | | | |

Friday 14 June 2019

Morning (Time: 1 hour 15 minutes) | Paper Reference **4PH1/2PR**

Physics

Unit: 4PH1

Paper: 2PR

You must have:
Ruler, calculator

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- Show all steps in any calculations and state the units.
- Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Information

- The total mark for this paper is 70.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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FORMULAE

You may find the following formulae useful.

energy transferred = current × voltage × time $E = I \times V \times t$

$$\text{frequency} = \frac{1}{\text{time period}} \qquad f = \frac{1}{T}$$

$$\text{power} = \frac{\text{work done}}{\text{time taken}} \qquad P = \frac{W}{t}$$

$$\text{power} = \frac{\text{energy transferred}}{\text{time taken}} \qquad P = \frac{W}{t}$$

$$\text{orbital speed} = \frac{2\pi \times \text{orbital radius}}{\text{time period}} \qquad v = \frac{2 \times \pi \times r}{T}$$

(final speed)^2 = (initial speed)^2 + (2 × acceleration × distance moved)

$$v^2 = u^2 + (2 \times a \times s)$$

pressure × volume = constant $p_1 \times V_1 = p_2 \times V_2$

$$\frac{\text{pressure}}{\text{temperature}} = \text{constant} \qquad \frac{p_1}{T_1} = \frac{p_2}{T_2}$$

$$\text{force} = \frac{\text{change in momentum}}{\text{time taken}} \qquad F = \frac{(mv - mu)}{t}$$

$$\frac{\text{change of wavelength}}{\text{wavelength}} = \frac{\text{velocity of a galaxy}}{\text{speed of light}} \qquad \frac{\lambda - \lambda_0}{\lambda_0} = \frac{\Delta\lambda}{\lambda_0} = \frac{v}{c}$$

change in thermal energy = mass × specific heat capacity × change in temperature

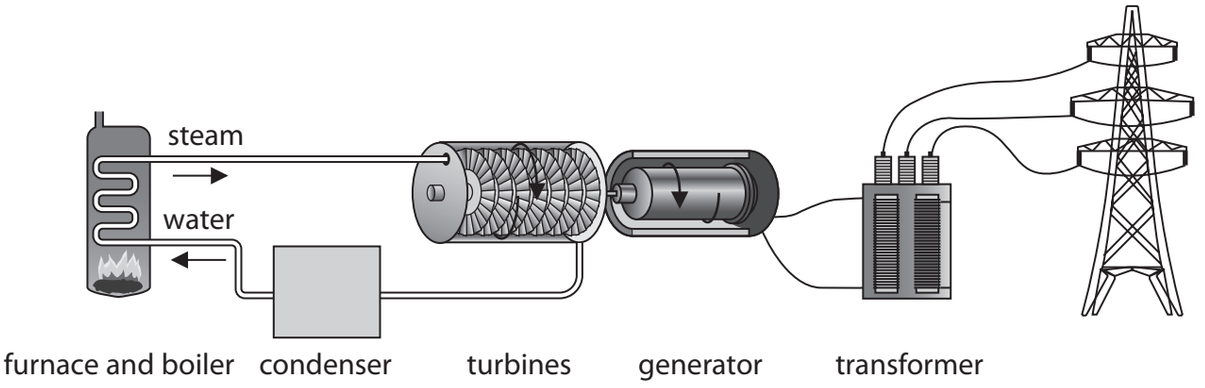
$$\Delta Q = m \times c \times \Delta T$$

Where necessary, assume the acceleration of free fall, $g = 10\ \text{m/s}^2$.

Answer ALL questions.

1 (a) The diagram shows a fossil fuel power station.

Five stages of electricity generation and transmission are shown.



(i) The power station burns a fossil fuel in the furnace.

Give an example of a fossil fuel.

(1)

.....

(ii) Which stage of the power station transfers energy from a chemical store to a thermal store?

(1)

☒ **A** condenser

☒ **B** furnace and boiler

☒ **C** generator

☒ **D** turbines

(iii) Which stage of the power station transfers energy electrically from a kinetic energy store?

(1)

☒ **A** condenser

☒ **B** furnace and boiler

☒ **C** generator

☒ **D** turbines

(b) Electricity can also be generated by solar farms.



(Source: © Zoonar GmbH/Alamy)

Energy is transferred from the Sun to the solar farm by radiation.

The solar farm uses photovoltaic cells to transfer this energy electrically.

Discuss the advantages and disadvantages of generating electricity using solar farms.

(4)

(Total for Question 1 = 7 marks)

2 This question is about sound waves.

(a) Sound is an example of a type of wave.

State the name of this type of wave.

(1)

.....

(b) The speed of sound in liquids is greater than the speed of sound in gases.

(i) Describe the arrangement of particles in liquids and in gases.

You may use diagrams to help your answer.

(2)

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(ii) Suggest why the speed of sound in liquids is greater than the speed of sound in gases.

(2)

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(c) A buzzer is an electrical device that produces sound.

The frequency of sound produced by the buzzer is 1400 Hz.

(i) State the formula linking speed, frequency and wavelength of a wave.

(1)

(ii) Sound travels at a speed of 340 m/s in air.

Calculate the wavelength of the sound wave from the buzzer.

(2)

wavelength = ... m

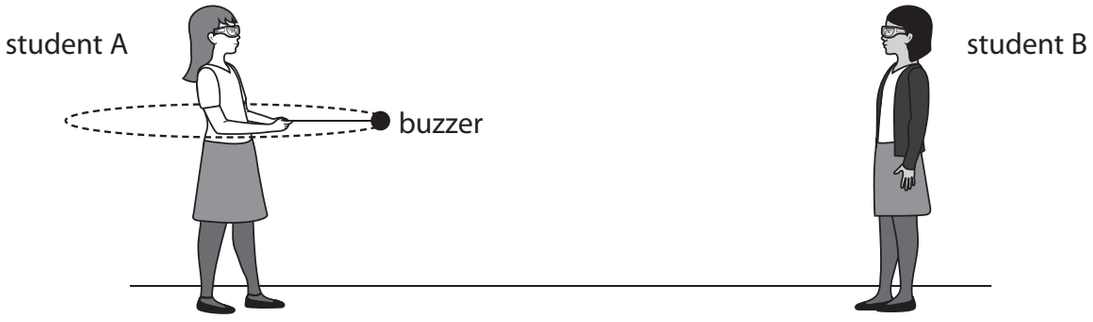
(iii) Two students use this method to investigate sound from a moving source.

Student A connects a piece of string to the buzzer.

She spins round so that the buzzer moves in a horizontal circular path.

- she spins round at a slow speed
- she then spins round at a high speed

Student B stands several metres away from student A.



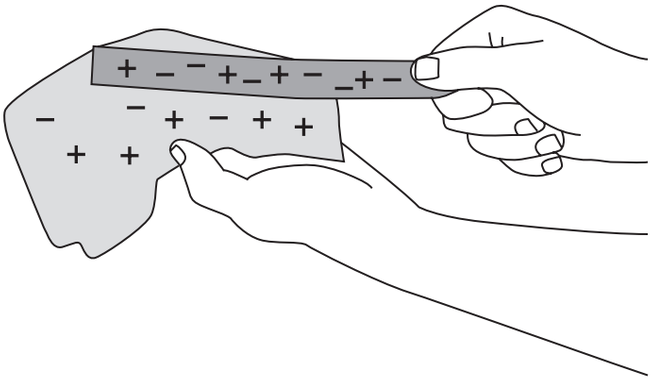
The sound heard by student A is different to the sound heard by student B.

Discuss the differences in the sounds heard by student A and student B.

(5)

(Total for Question 2 = 13 marks)

3 (a) A student charges a plastic rod by rubbing it with a cloth.



The rod becomes negatively charged.

(i) Which statement explains how the rod becomes negatively charged?

(1)

☒ **A** the rod gains positively charged electrons

☒ **B** the rod loses positively charged electrons

☒ **C** the rod gains negatively charged electrons

☒ **D** the rod loses negatively charged electrons

(ii) Describe how the student could demonstrate that the rod is charged.

(2)

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(b) The student has several other rods made from different kinds of plastic.

Some rods can be charged positively and some can be charged negatively.

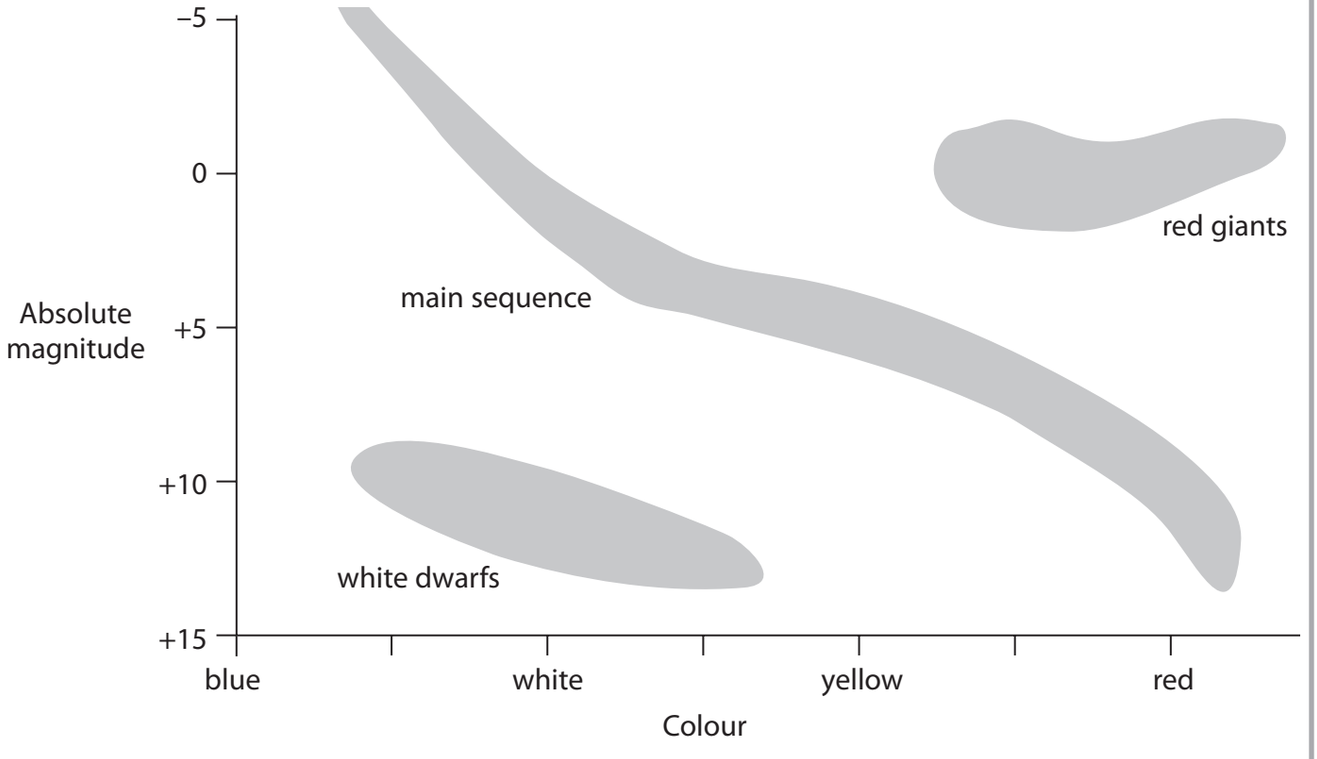
Describe an experiment to show that different rods have different types of charge.

You may draw a diagram to help your answer.

(3)

(Total for Question 3 = 6 marks)

4 A Hertzsprung-Russell diagram shows how different astronomical objects may be classified according to their colour and absolute magnitude.



The diagram shows three stages of evolution for stars of similar mass to the Sun.

Describe the evolution of stars of similar mass to the Sun.

You should refer to the temperature and brightness of the stars in your answer.

(6)

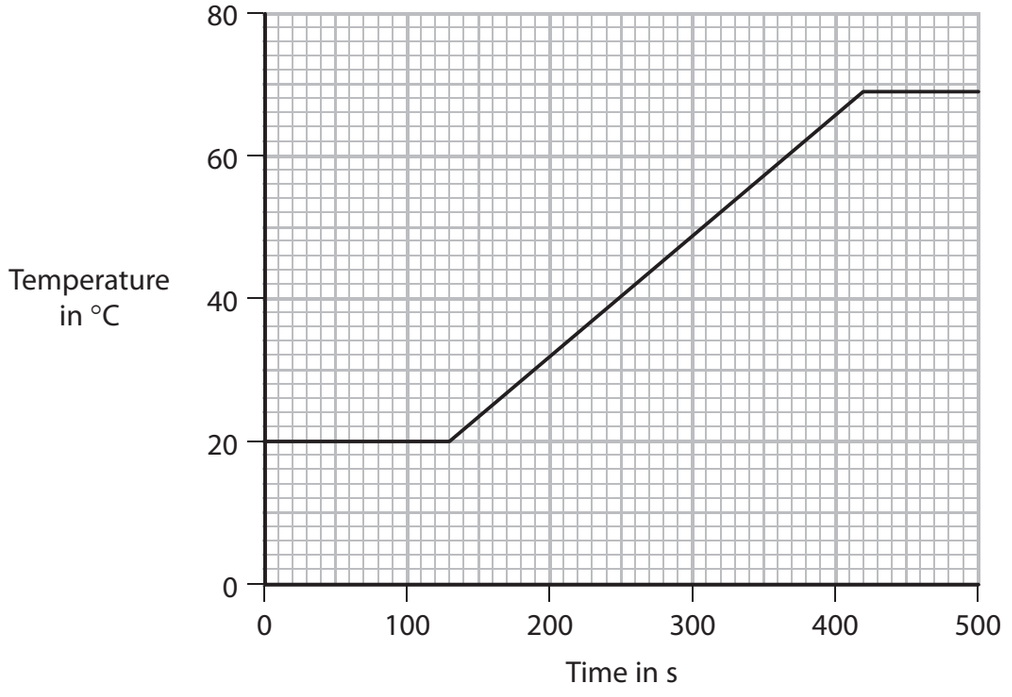
(Total for Question 4 = 6 marks)

5 Stearic acid is a solid at room temperature and melts at a temperature of 69 °C.

A student investigates the specific heat capacity of solid stearic acid.

He heats a sample of stearic acid from room temperature using an electrical heater and measures its temperature using a data logger and temperature sensor.

The graph shows his results.



(a) The student starts heating the stearic acid at 130 seconds.

(i) Determine the time it takes to heat the stearic acid until it reaches its melting point.

(1)

time = ... s

(ii) The stearic acid gains 39 kJ of energy during the time it is heated to its melting point.

Calculate the mean (average) power of the heater.

Give a unit with your answer.

[assume no energy lost to surroundings]

(3)

mean power = ... unit .....

(b) The mass of stearic acid used in the investigation is 0.45 kg.

The stearic acid gains 39 kJ of energy when it is heated to its melting point.

Calculate the specific heat capacity of stearic acid.

You should use data from the graph in your calculation.

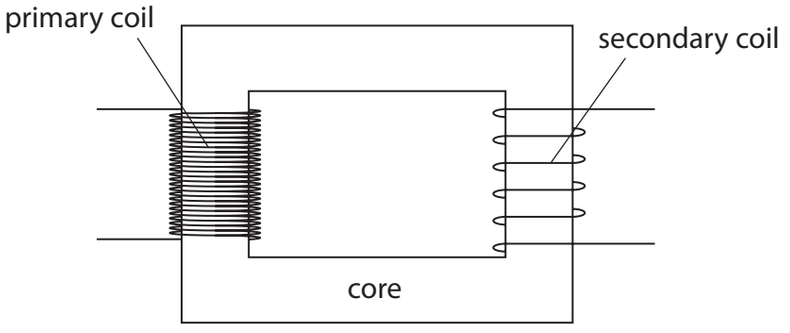
(4)

specific heat capacity = ... J/kg °C

(Total for Question 5 = 8 marks)

6 A student investigates transformers.

(a) The diagram shows a typical transformer.



State the name given to this type of transformer.

(1)

.....

(b) The student investigates the effect of changing the number of turns in the secondary coil.

This is his method.

- apply a constant maximum voltage to a primary coil with 1200 turns
- use a secondary coil with 100 turns
- measure the output voltage of the transformer
- replace the secondary coil with one that has 200 turns
- measure the output voltage again

The student repeats this method using different numbers of turns in the secondary coil.

(i) Suggest how the student could improve the reliability of his investigation.

(1)

.....

.....

.....

(ii) These are the student's results.

number of turns = 100,
output voltage = 1.3 V

number of turns = 200,
output voltage = 2.5 V

number of turns = 300,
output voltage = 3.8 V

number of turns = 400,
output voltage = 5.0 V

number of turns = 500,
output voltage = 6.3 V

number of turns = 600,
output voltage = 7.5 V

Draw a table of these results.

(3)

(iii) Suggest how the student could improve the precision of his voltage measurement.

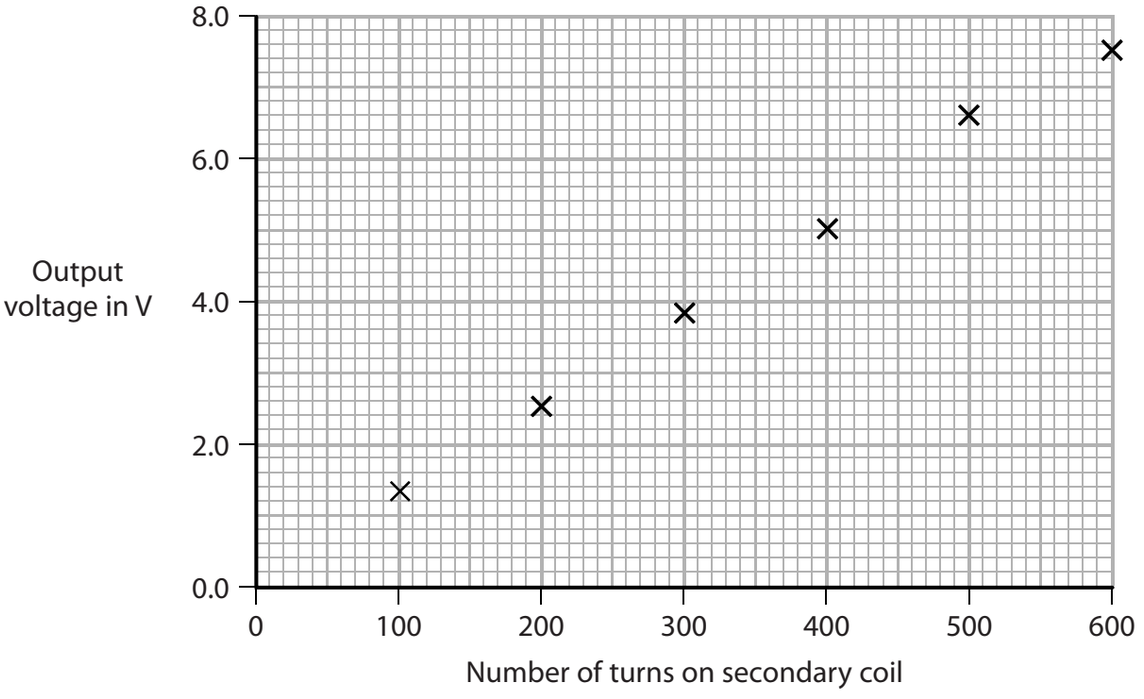
(1)

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.....

.....

(c) The student plots this graph to show the results of his investigation.



(i) The student plots one of his results incorrectly.

Draw a circle around the incorrectly plotted result on the graph.

(1)

(ii) Draw the line of best fit.

(1)

(iii) Describe the relationship shown by the graph.

(2)

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(d) The primary coil has 1200 turns.

Using the student's data, calculate the primary voltage used in his investigation.

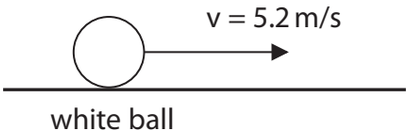
(4)

primary voltage = ... V

(Total for Question 6 = 14 marks)

7 A game is played on a table with balls of different colours.

(a) The diagram shows the white ball moving across a flat surface.



(i) State the formula linking momentum, mass and velocity.

(1)

(ii) The white ball has a mass of 170 g.

Calculate the momentum of the white ball.

(2)

momentum = ... kg m/s

(b) The white ball collides with a stationary black ball.



before collision

after collision

(i) The black ball has a mass of 160 g.

After the collision, the black ball moves away from the white ball with a velocity of 5.0 m/s.

Calculate the velocity of the white ball after the collision.

(4)

velocity of white ball = ... m/s

(ii) During the collision, the white ball exerts a force of 80 N on the black ball.

The direction of this force is to the right.

State the magnitude and direction of the force the black ball exerts on the white ball during the collision.

(2)

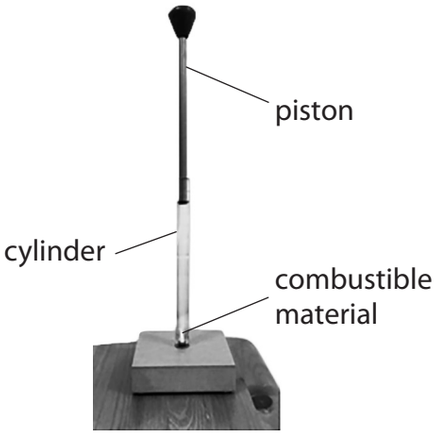
magnitude of force = ... N

direction of force = ...

(Total for Question 7 = 9 marks)

8 The photograph shows a device that can be used to ignite small pieces of combustible material.

The device consists of a cylinder containing trapped air and a piston.



before pushing piston



after pushing piston

A small piece of combustible material is placed at the bottom of the cylinder.

When the piston is pushed quickly into the cylinder, the trapped air is compressed and heats up.

This increase in temperature is enough to ignite the combustible material.

(a) The piston is quickly pushed down a distance of 145 mm.

The average force exerted on the piston is 4.2 N.

(i) State the formula linking work done, force and distance moved in the direction of the force.

(1)

(ii) Calculate the work done on the trapped air when the piston is quickly pushed down.

(2)

work done = ... J

(iii) State the maximum amount of energy that could be transferred to the trapped air.

(1)

energy transferred = ... J

(iv) Using ideas about molecules, explain why the trapped air heats up.

(2)

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(b) Suggest why the trapped air does not reach a high enough temperature to ignite the combustible material if the piston is slowly pushed into the cylinder.

(1)

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(Total for Question 8 = 7 marks)

TOTAL FOR PAPER = 70 MARKS