Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel
Level 1/Level 2 GCSE (9–1)

Friday 12 June 2020

Morning (Time: 1 hour 10 minutes) | Paper Reference **1SC0/2PF**

Combined Science

Paper 6

Foundation Tier

You must have:
Calculator, ruler, protractor

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.*
- Calculators may be used.
- Any diagrams may NOT be accurately drawn, unless otherwise indicated.
- You must **show all your working out** with **your answer clearly identified** at the **end of your solution**.

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*
- In questions marked with an **asterisk (*)**, marks will be awarded for your ability to structure your answer logically, showing how the points that you make are related or follow on from each other where appropriate.
- A list of equations is included at the end of this exam paper.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over

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P 6 2 1 0 1 A 0 1 2 8

Pearson

Answer ALL questions. Write your answers in the spaces provided.

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 ☒.

1 (a) Figure 1 shows the inside of a mains plug.

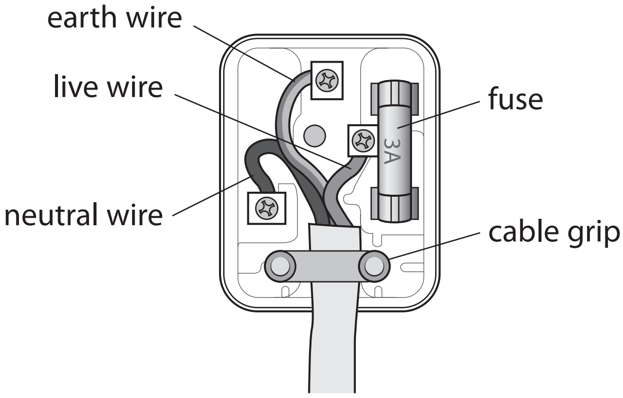

Figure 1

The mains plug has three safety features.

One of these safety features has been ticked in the table.

Put **two** more ticks in the table to show the other two safety features.

(2)

part of plug	**safety feature**
cable grip	✓
earth wire	
fuse	
live wire	
neutral wire	

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(b) Figure 2 shows a charger for a car battery.

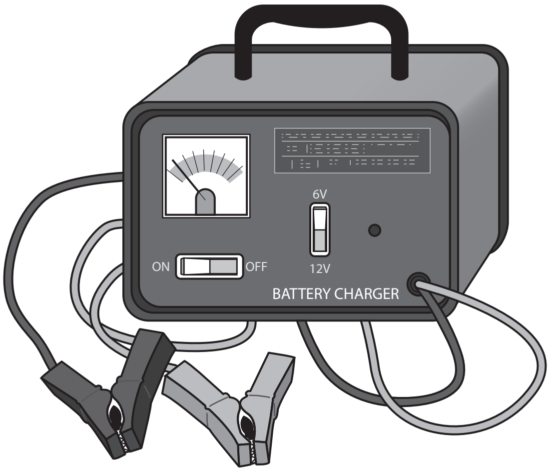

Figure 2

(i) The meter on the battery charger shows the current supplied to a battery.

The meter on the battery charger is

(1)

☒ **A** an ammeter

☒ **B** an ohmmeter

☒ **C** a voltmeter

☒ **D** a wattmeter

(ii) The battery charger supplies a steady current of 2.5 A to the battery.

Calculate the charge flowing to the battery in 8 minutes.

Use the equation

$$\text{charge} = \text{current} \times \text{time}$$

(2)

charge = ... C

(c) The transformer in another battery charger has a primary coil and a secondary coil.

The voltage across the primary coil = 230 V.

The voltage across the secondary coil = 15 V.

The current in the secondary coil is 3.1 A.

Calculate the current in the primary coil.

Use the equation

$$\text{primary current} = \frac{\text{secondary voltage} \times \text{secondary current}}{\text{primary voltage}}$$

(2)

current = ... A

(Total for Question 1 = 7 marks)

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2 Figure 3 shows a toy used to launch a ball.

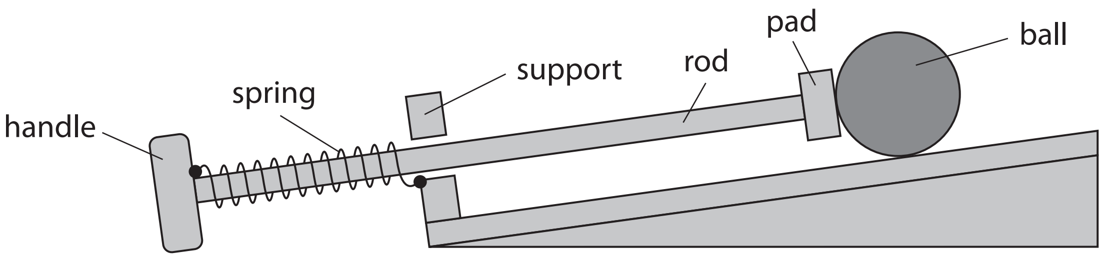


Figure 3

One end of the spring is fixed to the handle.

The other end of the spring is fixed to the support.

(a) A child pulls the handle, stretching the spring.

Figure 4 shows the toy with the spring stretched.

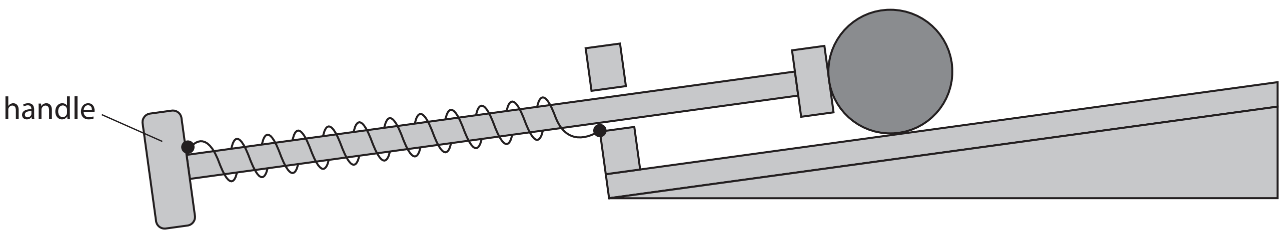
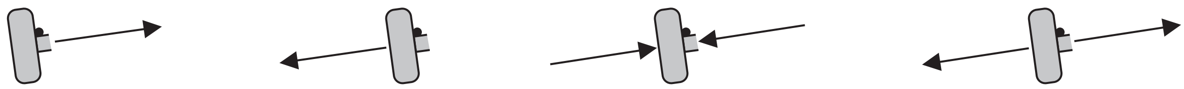


Figure 4

(i) Which of these shows the forces acting on the handle when the child keeps the spring stretched?

Ignore the force due to gravity.

(1)



☒ **A** ☒ **B** ☒ **C** ☒ **D**

(ii) In Figure 4, the extension of the spring is 0.070 m.

The spring constant (k) is 20 N/m.

Calculate the force used to extend the spring.

Use the equation

$$\text{force} = k \times \text{extension}$$

(2)

force = ... N

(b) The child pulls the handle until the pad is against the support as shown in Figure 5.

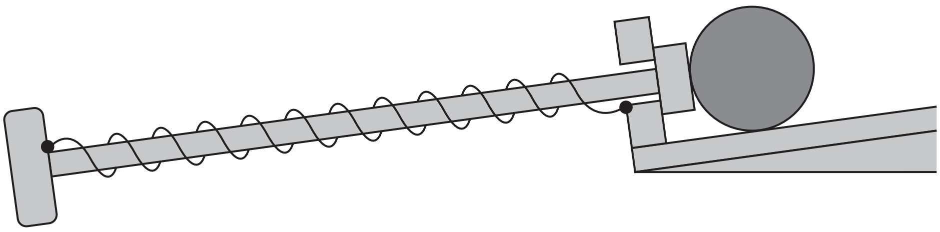


Figure 5

(i) The extension of the spring is 0.09 m.

The spring constant (k) is 20 N/m.

Calculate the work done in extending the spring by 0.09 m.

Use the equation

$$\text{work done} = \tfrac{1}{2} \times k \times (\text{extension})^2$$

(2)

work done = ... J

(ii) The child lets go of the handle.

The ball starts to move.

The spring returns to its original length.

Describe the energy transfer that takes place when the ball starts to move.

(2)

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(iii) The child can only stretch the spring until the pad is pressing against the support.

Explain how the design of the toy prevents the spring from becoming damaged.

(2)

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(Total for Question 2 = 9 marks)

3 (a) Figure 6 shows a part of a machine used to separate steel cans from aluminium cans.

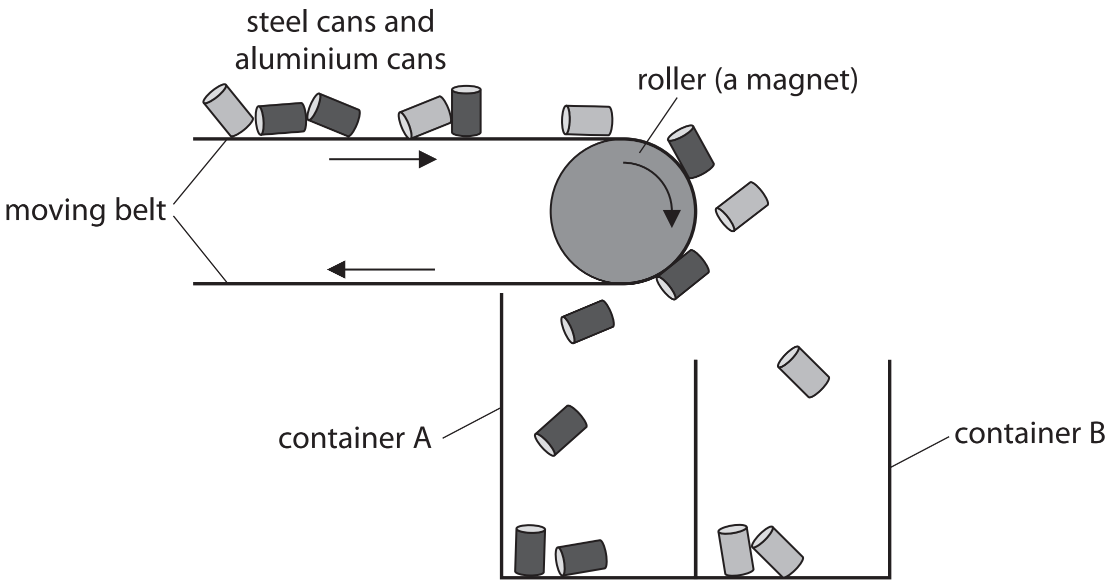

Figure 6

The cans are carried along a moving belt.

The belt goes around a roller.

The roller is a magnet.

Each can falls into one of the containers.

Explain how this machine separates the steel cans from the aluminium cans.

(2)

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(b) A student investigates magnetism using two toys as shown in Figure 7.

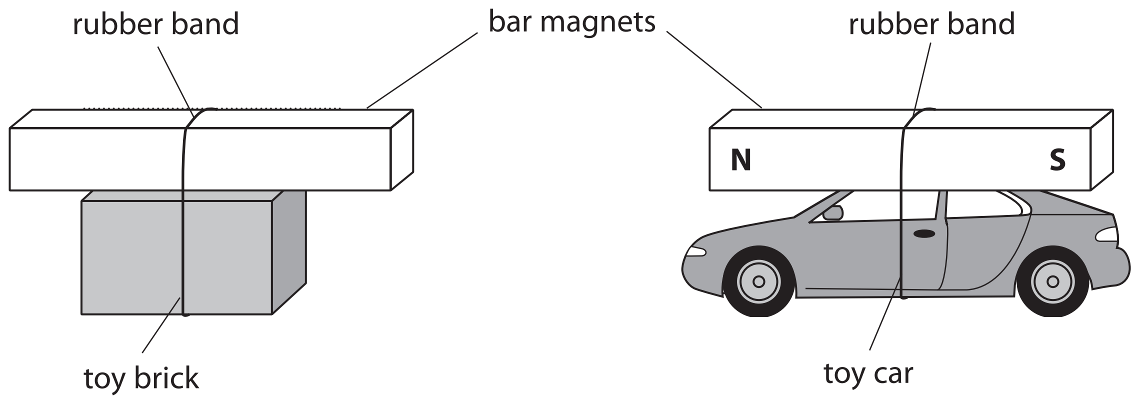

Figure 7

(i) There is a magnet attached to the top of each toy.

The student moves the toy brick towards the toy car.

The magnet on the toy brick repels the magnet on the toy car.

On Figure 7, label the north pole and the south pole on the magnet attached to the toy brick.

(1)

(ii) Explain why the toy car starts to move only when the toy brick gets near to the toy car.

(2)

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(iii) The student thinks that two magnets on top of each other will produce a magnetic field that is stronger than the magnetic field from a single magnet.

The student has a metre rule and more magnets available.

Describe how the student could develop this investigation to test this theory.

(4)

(Total for Question 3 = 9 marks)

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4 A student investigates resistors connected in series in an electrical circuit.

The student has

- a 3.0 V battery
- a 22 Ω resistor
- a resistor marked X.

The student does not know the value of the resistor marked X.

The student decides to measure the potential difference (voltage) across resistor X.

Figure 8 shows the circuit that the student connected.

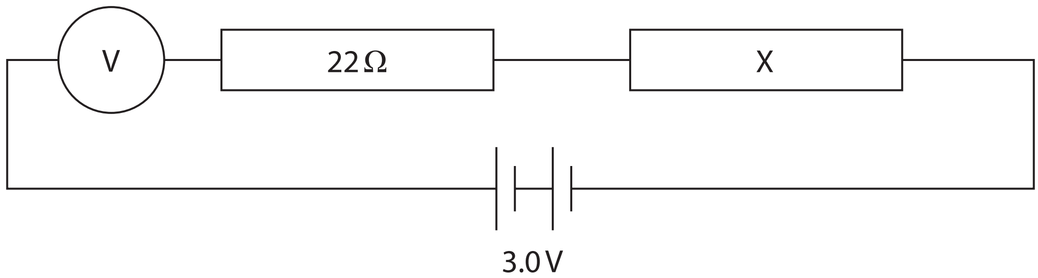

Figure 8

(a) The circuit is connected incorrectly.

Describe how the student should correct the mistake.

(2)

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(b) The student corrects the mistake.

The voltage across resistor X is 2.1 V.

The circuit is connected to a 3 V battery.

(i) State the value of the voltage across the 22 Ω resistor.

(1)

voltage across 22 Ω resistor = ... V

(ii) The current in resistor X is 0.041 A.

The voltage across resistor X is 2.1 V.

Show that the resistance of resistor X must be about 50 ohms.

Use the equation

$$V = I \times R$$

(2)

(iii) Calculate the power in resistor X when the voltage across X is 2.1 V and the current in resistor X is 0.041 A.

(2)

power = ... W

(iv) Calculate the overall resistance of the 22 ohm resistor and resistor X.

(2)

overall resistance = ... Ω

(v) The current in the circuit is 0.041 A.

The voltage across the battery is 3.0 V.

Calculate the energy transferred in 2 minutes.

Use the equation

$$E = I \times V \times t$$

(2)

energy = ... J

(Total for Question 4 = 11 marks)

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5 (a) Figure 9 shows a small piece of copper about 3 cm high.

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Figure 9

A student wants to determine the density of copper.

The student uses a balance to measure the mass of the piece of copper.

(i) Explain how the student could measure the volume of the piece of copper.

(3)

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(ii) The mass of the piece of copper is 0.058 kg.

The volume of the piece of copper is $6.5 \times 10^{-6}\,m^3$.

Calculate the density of copper.

(2)

density of copper = ... kg/m^3

(b) A student wants to determine the specific heat capacity of copper.

Figure 10 shows a piece of copper, with a thread tied around it, in a glass beaker of boiling water.

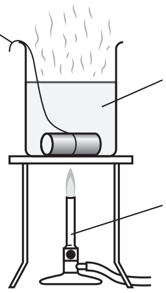

Figure 10

The student leaves the piece of copper in the boiling water so that the copper reaches a temperature of 100 °C.

The student uses the thread to take the piece of copper out of the boiling water.

The student puts the hot piece of copper into a different beaker of cold water at 20 °C.

The apparatus is shown in Figure 11.

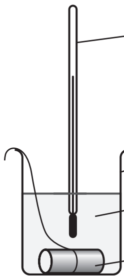

Figure 11

The student assumes that the thermal energy gained by the water equals the thermal energy lost by the piece of copper.

The water and copper both reach a temperature of 22 °C.

The cold water gains 1050 J of energy.

The mass of the piece of copper is 0.058 kg.

(i) Calculate a value for the specific heat capacity of copper, using these results.

Use the equation

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

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

(2)

specific heat capacity of copper from these results = ... J/kg °C

(ii) The value for the specific heat capacity of copper obtained from the student's results is lower than the correct value.

State **two** ways that the experiment could be improved to give a value that is closer to the correct value.

(2)

1 ....

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2 ....

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(c) A long piece of wire is made into a coil as shown in Figure 12.

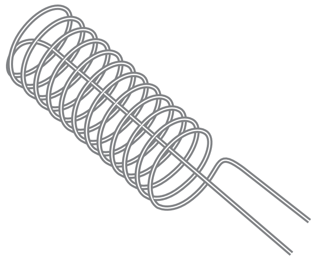

Figure 12

The coil is connected to a low voltage power supply.

Describe how this coil could be used instead of the Bunsen burner in Figure 10.

(2)

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(Total for Question 5 = 11 marks)

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6 (a) Figure 13 shows a drone.

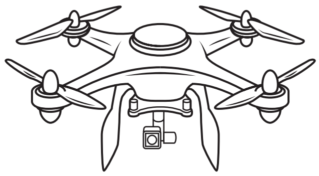

Figure 13

The drone has four spinning blades.

The upward force produced enables the drone to rise in the air.

The speed at which the blades spin is measured in turns per minute.

Figure 14 shows how the upward force produced by the four blades depends on the speed at which the blades spin.

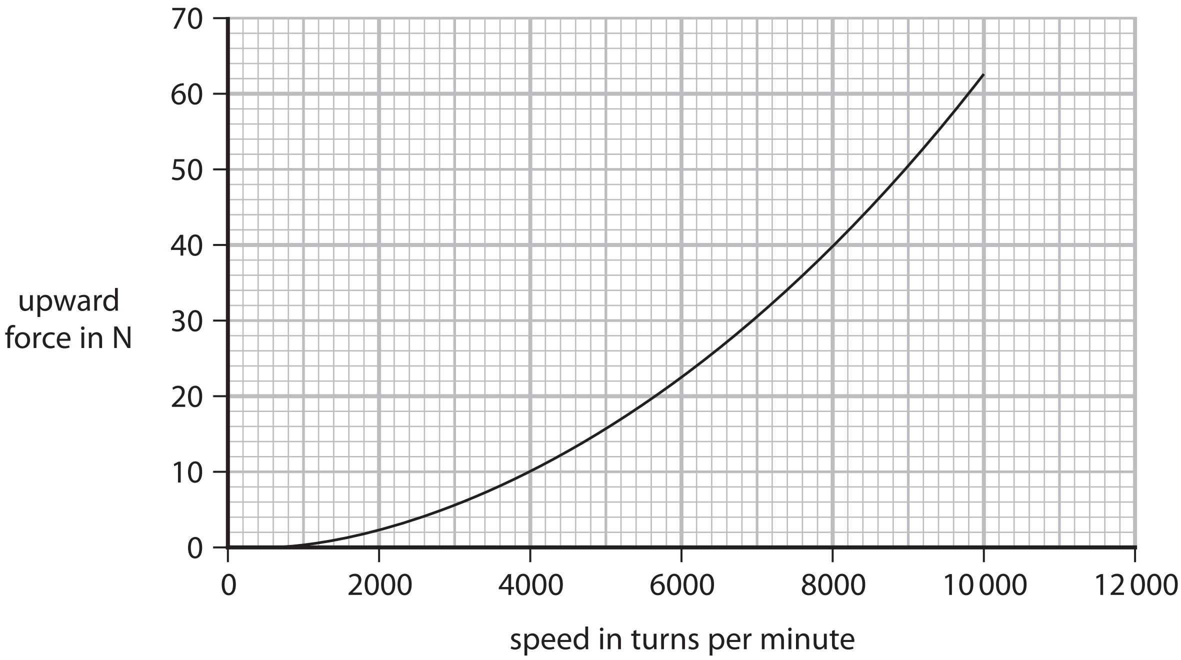

Figure 14

Describe the relationship between upward force and speed shown by this graph.

(2)

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(b) A different drone has a mass of 4.5 kg.

This drone rises from the ground to a height of 20 m.

(i) Calculate the change in gravitational potential energy when the drone rises through a height of 20 m.

The gravitational field strength g = 10 N/kg.

(2)

change in gravitational potential energy = ... J

(ii) State the amount of useful work done by the blades as the drone rises through 20 m.

(1)

useful work done = ... J

(iii) It takes 4 s for the drone to rise through 20 m.

Calculate the useful power developed by the blades in this time of 4 s.

(2)

useful power developed = ... W *(c) The blades on the drone are turned by electric motors.

The electric motors are powered by a battery.

Figure 15 represents the energy transfers involved when the drone rises from the ground.

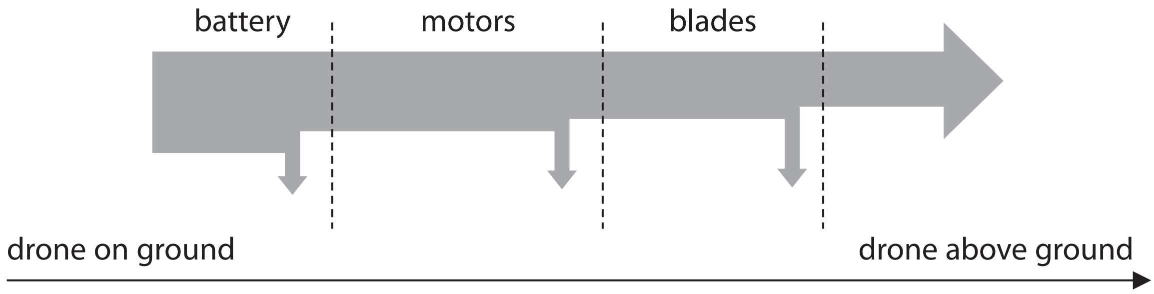

Figure 15

Describe the changes in the way energy is stored when the drone rises from the ground.

Your answer should refer to energy transfers.

(6)

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(Total for Question 6 = 13 marks)

TOTAL FOR PAPER = 60 MARKS

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Equations

(final velocity)^2 – (initial velocity)^2 = 2 × acceleration × distance $v^2 - u^2 = 2 \times a \times x$
energy transferred = current × potential difference × time $E = I \times V \times t$
potential difference across primary coil × current in primary coil = potential difference across secondary coil × current in secondary coil $V_p \times I_p = V_s \times I_s$
change in thermal energy = mass × specific heat capacity × change in temperature $\Delta Q = m \times c \times \Delta\theta$
thermal energy for a change of state = mass × specific latent heat $Q = m \times L$
to calculate pressure or volume for gases of fixed mass at constant temperature $P_1 V_1 = P_2 V_2$
energy transferred in stretching = 0.5 × spring constant × (extension)^2 $E = \frac{1}{2} \times k \times x^2$