Write your name here

Surname	Other names

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

Centre Number | | | | | |

Candidate Number | | | | |

Combined Science

Paper 6: Physics 2

Higher Tier

Friday 15 June 2018 – Morning
Time: 1 hour 10 minutes

Paper Reference
1SC0/2PH

You must have:
Calculator, ruler

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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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) A student uses the apparatus in Figure 1 to determine the specific heat capacity of water.

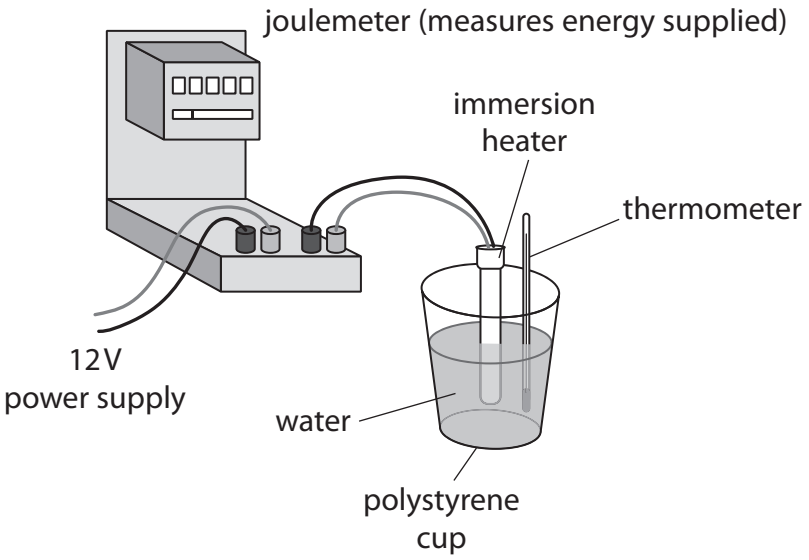


Figure 1

(i) State the measurements needed to calculate the specific heat capacity of water.

(4)

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(ii) State **two** ways that the apparatus could be adapted to improve the procedure.

(2)

1 .....

.....

2 .....

.....

(b) The student decides to measure the temperature of the water every minute while it is being heated.

Figure 2 shows a graph of the student's results.

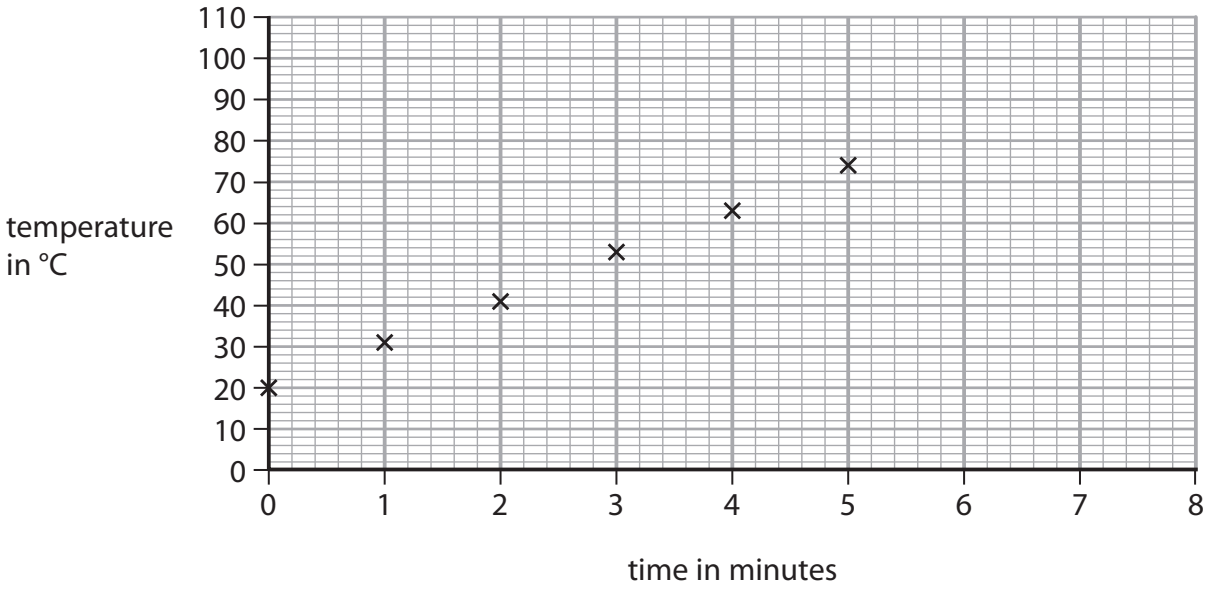


Figure 2

Predict the temperature of the water if the heating continues up to 8 minutes.

(1)

temperature of the water = ... °C

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(c) Another student decides to melt some ice.

The student melts 380 g of ice at 0 °C.

The specific latent heat of fusion of ice is 3.34×10^5 J/kg.

Calculate the thermal energy needed to melt the ice.

Select an equation from the list of equations at the end of this paper.

(2)

thermal energy needed = ... J

(Total for Question 1 = 9 marks)

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2 A cyclist is riding a bicycle at a steady velocity of 12 m/s.

The cyclist and bicycle have a total mass of 68 kg.

(a) Calculate the kinetic energy of the cyclist and bicycle.

Use the equation

$$KE = \frac{1}{2} \times m \times v^2$$

(2)

kinetic energy = ... J

(b) Describe the energy transfers that happen when the cyclist uses the brakes to stop.

(2)

.....

.....

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.....

(c) The cyclist starts to cycle again.

The cyclist does 1600 J of useful work to travel 28 m.

Calculate the average force the cyclist exerts.

(3)

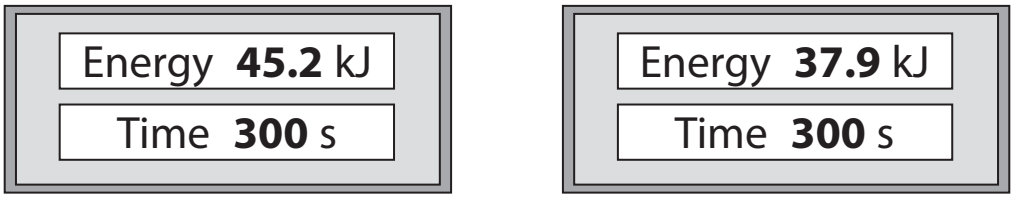
average force = ... N

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(d) An athlete uses a training machine in a gym.

The display on the machine shows the time spent on the machine and the amount of energy transferred during a training session.

Figure 3 shows the displays for two different sessions by the same athlete.



session 1 session 2

Figure 3

Explain what the displays show about the average power of the athlete in each of these two sessions.

(2)

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(Total for Question 2 = 9 marks)

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3 (a) A student has a bar magnet, a piece of iron the same size as the magnet, and some paper clips.

Describe how the student could use these items to demonstrate temporary induced magnetism.

(3)

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(b) A student sets up the apparatus shown in Figure 4.

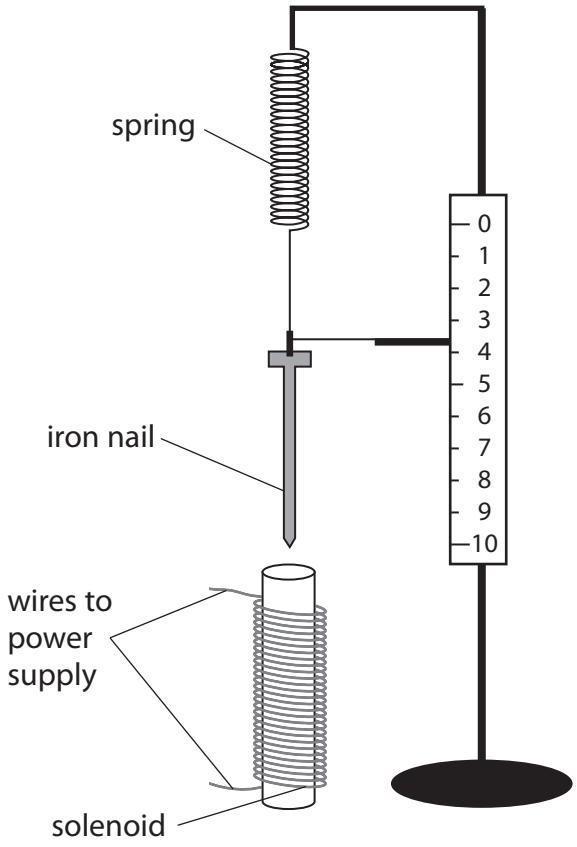


Figure 4

(i) When the current in the solenoid is switched on, the solenoid attracts the iron nail.

Describe how the student could use this apparatus to investigate how the size of the current in the solenoid affects the force of attraction between the solenoid and the iron nail.

(4)

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(ii) The spring constant of a different spring is 24 N/m.

The spring is extended from its unstretched length by 12 cm.

Calculate the energy transferred in extending the spring by 12 cm.

Use an equation selected from the list of equations at the end of this paper.

(2)

energy transferred = ... J

(Total for Question 3 = 9 marks)

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4 (a) (i) Figure 5 shows the vertical forces on an aeroplane.

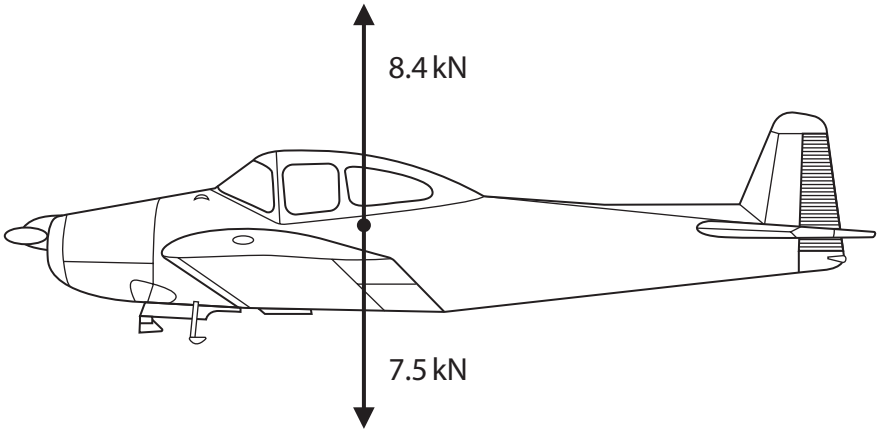


Figure 5

Use information from the diagram to determine the size and direction of the resultant vertical force on the aeroplane.

(2)

size = ... kN, direction is .....

(ii) The aeroplane is descending.

Figure 6 shows a diagram of the resultant vertical and horizontal forces on the aeroplane as it is descending.

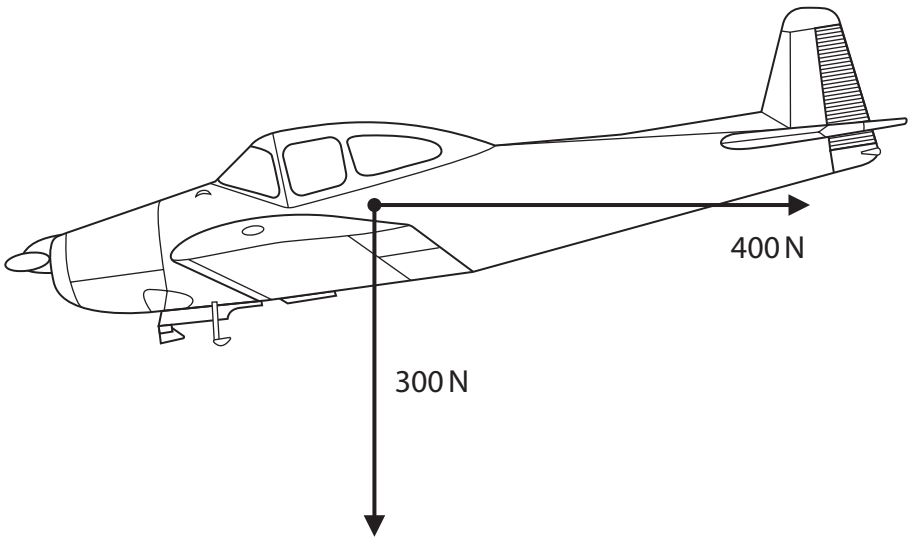


Figure 6

Complete the diagram to show the resultant of these two forces.

(1)

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(iii) The mass of the aeroplane is 750 kg.

Calculate the change in gravitational potential energy of the aeroplane as it descends from 1300 m to the ground.

Gravitational field strength (g) = 10 N/kg

(2)

energy = ... J

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(b) The aeroplane is powered by an engine that burns fuel.

The fuel supplies a total of 6500 kJ of energy every minute.

The efficiency of the engine is 0.70 (70%).

(i) Calculate the power output of the engine.

Give your answer in kW.

(4)

power = ... kW

(ii) Explain why the efficiency of the engine is less than 1 (100%).

(2)

.....

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(Total for Question 4 = 11 marks)

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5 (a) A resistor is connected to a power supply.

The potential difference across the resistor is 6.0 V.

(i) Which of these corresponds to a potential difference of 6.0 V?

(1)

☒ **A** 6.0 joules per ohm

☒ **B** 6.0 amps per coulomb

☒ **C** 6.0 joules per coulomb

☒ **D** 6.0 amps per ohm

(ii) The resistor remains connected for a period of time.

The current in the resistor is 200 mA.

A total charge of 42 C flows through the resistor.

Calculate, in minutes, the time taken for this amount of charge to flow through the resistor.

(3)

time = ... minutes

(iii) Calculate the total energy transferred by the 6.0 V power supply when a charge of 42 C flows through the resistor.

(2)

energy = ... J

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(b) The resistor becomes warm while there is a current in it.

Explain why the resistor becomes warm.

(2)

(c) Figure 7 shows a cardboard tube with a wire coming out from each end.



Figure 7

There are two 10 ohm resistors inside the cardboard tube.

A potential difference of 6.0 V is connected between P and Q.

There is a current of 1.2 A in the wires.

Deduce how the resistors have been arranged inside the cardboard tube.

(3)

(Total for Question 5 = 11 marks)

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6 (a) Figure 8 shows identical filament lamps connected together to a 12 V power supply.

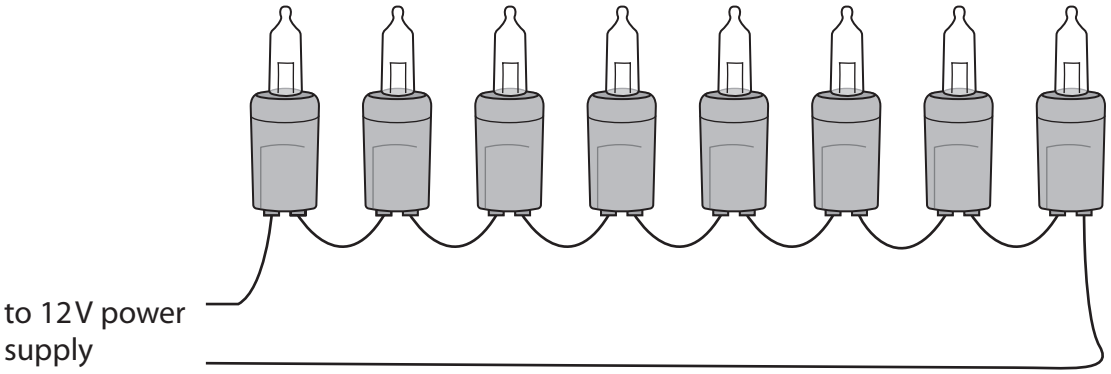


Figure 8

(i) Calculate the potential difference across each lamp.

(1)

potential difference = ... V

(ii) The power output of each lamp is 0.75 W

Calculate the resistance of each lamp.

(4)

resistance = ... Ω

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*(b) Explain, with the aid of a circuit diagram, the method a student could use to investigate how the resistance of a single lamp changes with the potential difference across the lamp.

(6)

(Total for Question 6 = 11 marks)

TOTAL FOR PAPER = 60 MARKS

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Equations

(final velocity)^2 – (initial velocity)^2 = 2 × acceleration × distance

$v^2 - u^2 = 2 \times a \times x$

force = change in momentum ÷ time

$$F = \frac{(mv - mu)}{t}$$

energy transferred = current × potential difference × time

$E = I \times V \times t$

force on a conductor at right angles to a magnetic field carrying a current = magnetic flux density × current × length

$F = B \times I \times l$

$$\frac{\textit{voltage across primary coil}}{\textit{voltage across secondary coil}} = \frac{\textit{number of turns in primary coil}}{\textit{number of turns in secondary coil}}$$

$$\frac{V_p}{V_s} = \frac{N_p}{N_s}$$

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

$E = ½ \times k \times x^2$

pressure due to a column of liquid = height of column × density of liquid × gravitational field strength

$P = h \times \rho \times g$

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