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)

Time 1 hour 45 minutes

Paper reference **1PH0/1F**

Physics
PAPER 1

Foundation Tier

You must have:
Calculator, ruler, Equation Booklet (enclosed)

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.*

Information

- The total mark for this paper is 100.
- 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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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 how the visible spectrum of white light is shown on a screen.

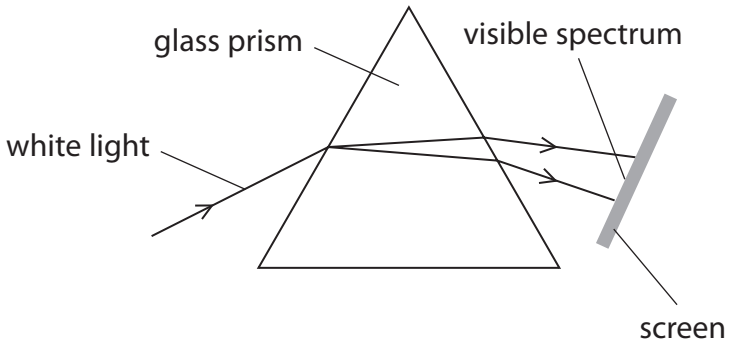

Figure 1

(i) Which of these is the best piece of equipment to produce the white light?

(1)

☒ **A** ray box

☒ **B** ruler

☒ **C** measuring cylinder

☒ **D** ammeter

(ii) Which colour is seen between yellow and blue in the spectrum on the screen?

(1)

☒ **A** red

☒ **B** orange

☒ **C** green

☒ **D** violet

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(b) Figure 2 shows the main parts of the electromagnetic spectrum.

radio	microwaves	infrared	visible light	ultraviolet	x-rays	gamma rays

Figure 2

Complete the following sentences using information from Figure 2. Each part of the electromagnetic spectrum may be used once, more than once or not at all.

(i) The part of the electromagnetic spectrum used to detect broken bones is **(1)**

.....

(ii) The part of the electromagnetic spectrum used in thermal imaging is **(1)**

.....

(iii) The part of the electromagnetic spectrum that

- is used to cook food

AND

- has a shorter wavelength than microwaves is **(1)**

.....

(iv) The part of the electromagnetic spectrum that

- is used to sterilise medical equipment

AND

- has a shorter wavelength than x-rays is **(1)**

.....

(Total for Question 1 = 6 marks)

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2 This question is about waves.

(a) Figure 3 is a diagram of a **water wave** in a ripple tank.

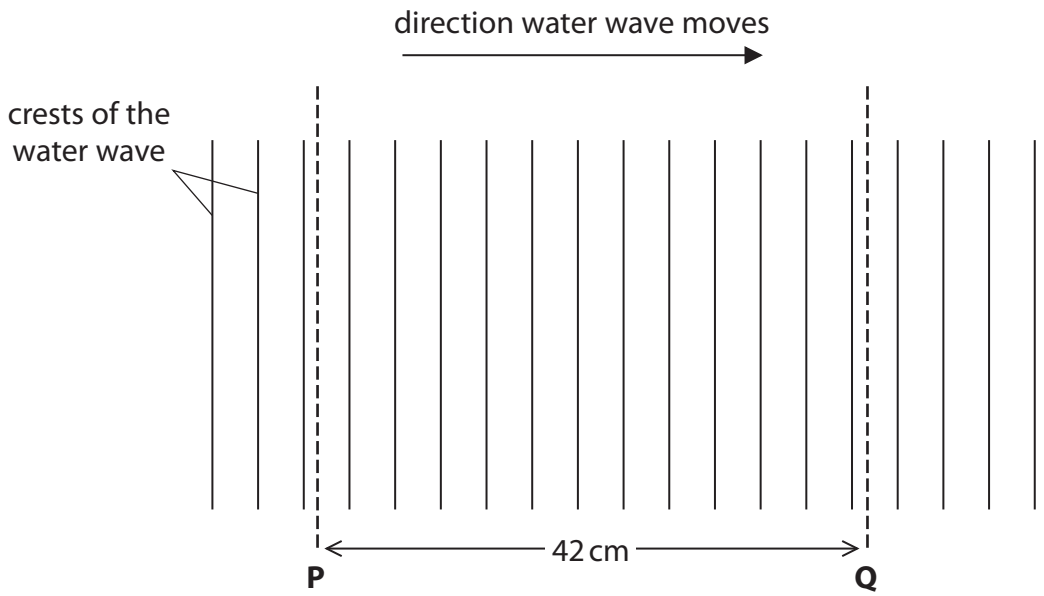

Figure 3

(i) State the number of crests of the wave between **P** and **Q**.

(1)

number of crests = ...

(ii) The distance between **P** and **Q** is 42 cm.

Calculate the wavelength of the water wave in Figure 3.

(2)

wavelength = ... cm

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(iii) Describe how a student could determine the wave speed of the water wave in Figure 3.

(3)

.....

.....

.....

.....

.....

.....

(b) (i) Which row of the table is correct for **sound waves**?

(1)

		sound waves are	can sound waves transfer energy?
☒	**A**	longitudinal	yes
☒	**B**	longitudinal	no
☒	**C**	transverse	yes
☒	**D**	transverse	no

(ii) A sound wave has a frequency of 440 Hz and a wavelength of 0.75 m.

Calculate the wave speed of the sound wave.

(2)

wave speed = ... m/s

(Total for Question 2 = 9 marks)

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3 This question is about reflection and refraction of light.

(a) (i) Figure 4 shows a ray of light travelling to a plane mirror.

On Figure 4, draw the ray of light after it **reflects** off the mirror surface.

(2)

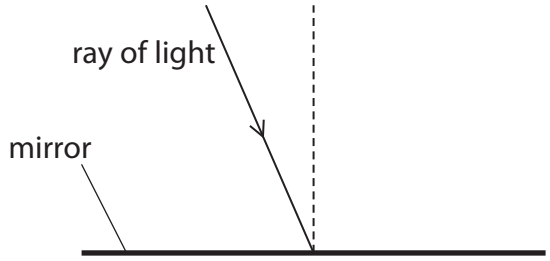

Figure 4

(ii) Figure 5 shows a ray of light in air travelling to a glass block.

On Figure 5, draw the ray of light after it **refracts** at the surface of the glass block.

(2)

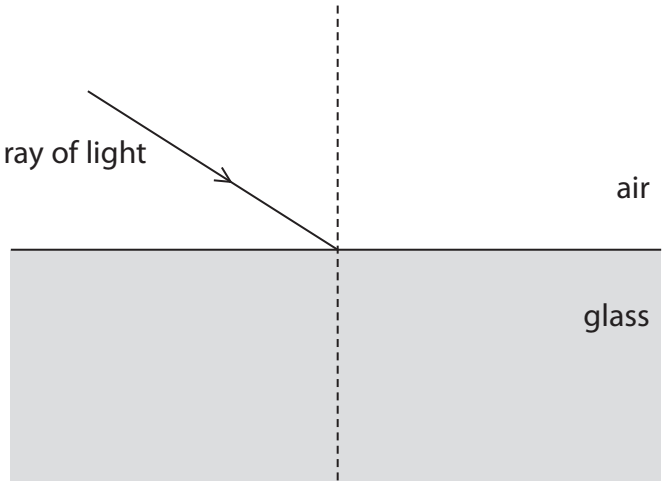

Figure 5

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(iii) Figure 6 shows a ray of light in water, travelling to the surface of the water.

The angle marked **X** is greater than the critical angle.

On Figure 6, draw the ray of light after it reaches the surface of the water.

(2)

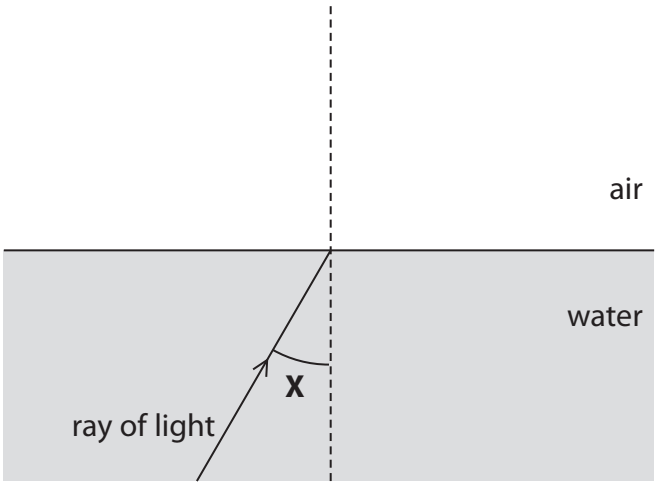

Figure 6

(b) A converging lens has a focal length of 40 cm.

Calculate the power of this lens in dioptres.

Use the equation

$$\text{power in dioptres} = \frac{1}{\text{focal length } \textbf{in metres}}$$

(3)

power of the lens = ... dioptres

(Total for Question 3 = 9 marks)

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4 (a) Figure 7 shows a truck lifting a box.

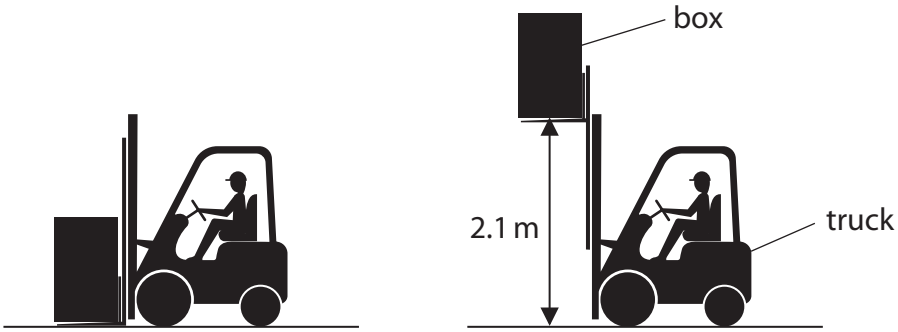

Figure 7

The box has a mass of 57 kg.

The truck lifts the box through a vertical height of 2.1 m.

The gravitational field strength, $g = 10$ N/kg

Calculate the change in the gravitational potential energy of the box.

Use the equation

$$\Delta GPE = m \times g \times \Delta h$$

(2)

change in gravitational potential energy = ... J

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(b) A cyclist of mass 70 kg travels at a constant velocity of 8 m/s.

Calculate the kinetic energy of the cyclist.

(3)

kinetic energy of the cyclist = ... J

(c) Figure 8 shows a trolley at the top of a slope.

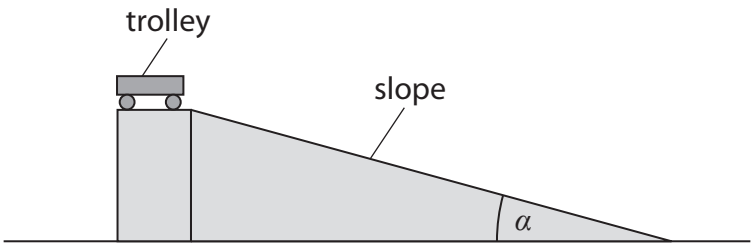

Figure 8

A student gently pushes the trolley until it just starts to roll down the slope.

The student measures the time it takes for the trolley to roll down the slope.

The student repeats this for different values of the angle α.

Figure 9 is a graph of the student's results.

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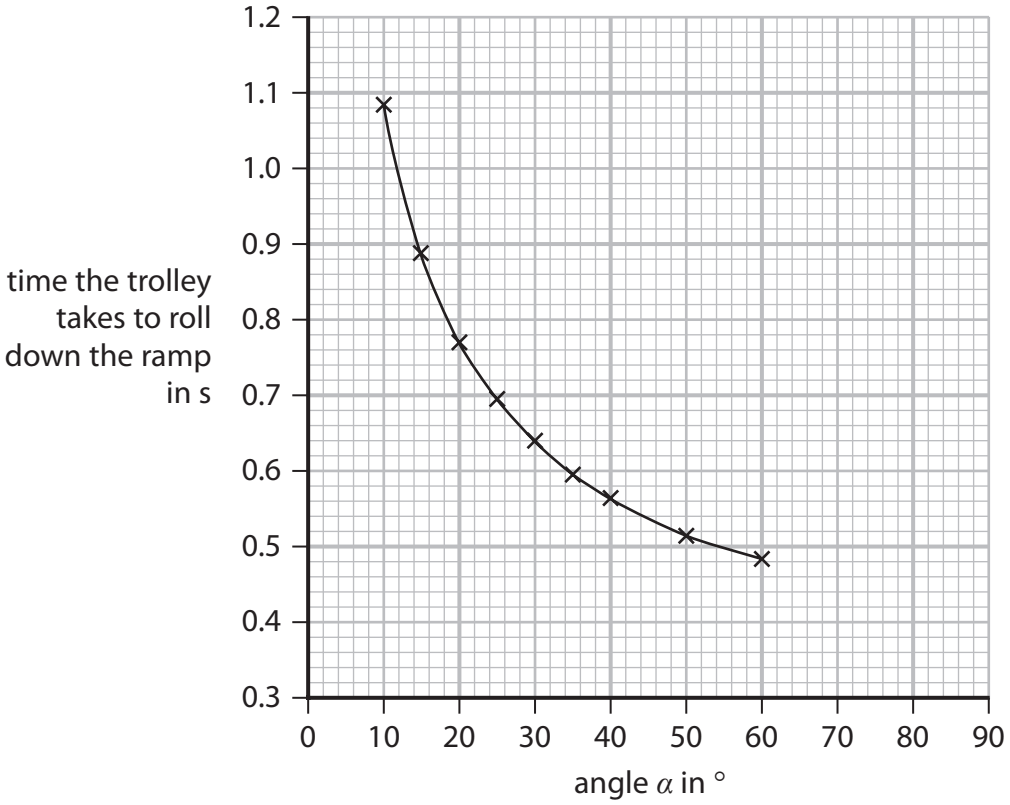

Figure 9

(i) Use the graph in Figure 9 to find the time the trolley takes to roll down the ramp when the angle $\alpha = 45°$.

(1)

time = ... s

(ii) Use the graph in Figure 9 to estimate the time the trolley takes to roll down the ramp when the angle $\alpha = 80°$.

Show your working on the graph.

(2)

time = ... s

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(iii) The student had a choice of how to measure the time the trolley takes to roll down the ramp.

1. Use a hand-held stopwatch.
2. Use light gates at the top and bottom of the slope.

The student chose to use the light gates.

Explain why this was the correct choice.

You should refer to the data on the time axis of Figure 9 in your answer.

(2)

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(Total for Question 4 = 10 marks)

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5 This question is about stars.

(a) Use words from the box to complete the following sentences.

black hole		main sequence
nebula	red giant	white dwarf

(i) Stars of similar mass to our Sun were formed from a cloud of gas and dust called a ..... .

(1)

(ii) Our Sun is a ..... star.

(1)

(b) (i) Which will be the next stage in the evolution of our Sun?

(1)

☒ **A** red dwarf

☒ **B** red giant

☒ **C** white dwarf

☒ **D** white giant

(ii) The core of a star with a much bigger mass than our Sun is most likely to end as a

(1)

☒ **A** white dwarf

☒ **B** red giant

☒ **C** protostar

☒ **D** black hole

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(c) A nuclear fusion reaction is happening in our Sun.

The nuclear fusion reaction produces helium and radiates energy.

(i) State **one** of the conditions necessary for this nuclear fusion reaction to start.

(1)

.....

.....

(ii) Describe what happens in this nuclear fusion reaction.

(2)

.....

.....

.....

.....

(iii) The intensity of the Sun's radiation in W/m^2 on the surface of Earth is 1.32×10^3.

The intensity of the Sun's radiation in W/m^2 on the surface of Mars is 4.92×10^2.

Calculate the ratio

$$\frac{\text{intensity of the Sun's radiation on the surface of Earth}}{\text{intensity of the Sun's radiation on the surface of Mars}}$$

(2)

ratio = ...

(Total for Question 5 = 9 marks)

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6 (a) Figure 10 shows a safety sign on the door of a laboratory where radioactive materials are used.

Figure 10

(i) State **one** way that radioactivity can be dangerous to humans.

(1)

.....

.....

(ii) State **one** piece of equipment that can be used to measure radioactivity.

(1)

.....

.....

(iii) Alpha (α) radiation and ultraviolet (UV) radiation are ionising radiations.

Give **two** other ionising radiations.

(2)

1 .....

.....

2 .....

.....

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(b) Sulfur-35 is a radioactive isotope of sulfur.

Figure 11 represents a nucleus of sulfur-35.

$$^{35}_{16}S$$

Figure 11

Draw one line from each type of particle to the number of that type of particle in a nucleus of sulfur-35.

(3)

type of particle	**number of particles**
proton	35
neutron	16
nucleon	51
	19

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(c) A sample of a radioactive isotope has a mass of 520 g.

The half-life of the radioactive isotope is 18 days.

(i) Calculate the mass of the original radioactive isotope remaining after 18 days.

(1)

mass after 18 days ..... g

(ii) Calculate the mass of the original radioactive isotope remaining after 54 days.

(2)

mass after 54 days ..... g

(Total for Question 6 = 10 marks)

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7 (a) A rock on the surface of the Earth has a mass of 12 kg.

(i) Calculate the weight of this rock on the surface of the Earth.

The gravitational field strength on the surface of the Earth is 10 N/kg.

Use the equation

$$W = m \times g$$

(2)

weight on the Earth = ... N

(ii) The weight of the same rock on the surface of the Moon is 20 N.

Calculate the gravitational field strength on the surface of the Moon.

(3)

gravitational field strength on the Moon ..... N/kg

*(b) Describe the Solar System in terms of the Sun, the planets, and the other objects which move in the Solar System.

Your answer should include the patterns of movement of the planets and the other objects in the Solar System.

You may draw a labelled diagram if it helps your answer.

(6)

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(Total for Question 7 = 11 marks)

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8 (a) Which statement describes conservation of energy in a closed system?

(1)

☒ **A** when there are energy transfers, the total energy reduces

☒ **B** when there are energy transfers, the total energy does not change

☒ **C** when there are no energy transfers, the total energy reduces

☒ **D** when there are no energy transfers, the total energy increases

(b) A student uses the apparatus in Figure 12 to find out which of two materials, sand or sawdust, is the better insulator.

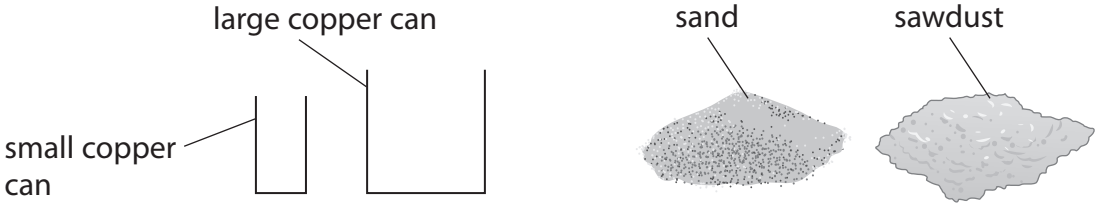

Figure 12

The student also has a kettle to boil water, a thermometer and a stop clock.

(i) Draw a labelled diagram to show how the student should set up the equipment to investigate which material is the better insulator.

(3)

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(ii) Give **three** factors that the student must control in this investigation.

(3)

1 .....

.....

2 .....

.....

3 .....

.....

(c) Expanded polystyrene, used to insulate buildings, has different densities.

Figure 13 shows how the thermal conductivity of expanded polystyrene changes with the density of expanded polystyrene.

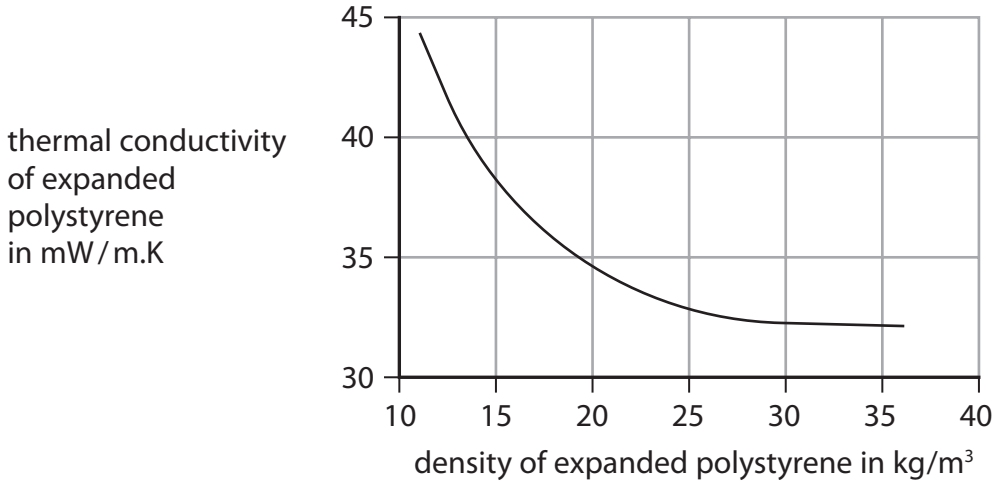

Figure 13

Using the graph in Figure 13, describe how the thermal conductivity of expanded polystyrene changes with the density of expanded polystyrene.

(2)

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(d) Figure 14 is an energy diagram for an electric kettle, used to heat water.

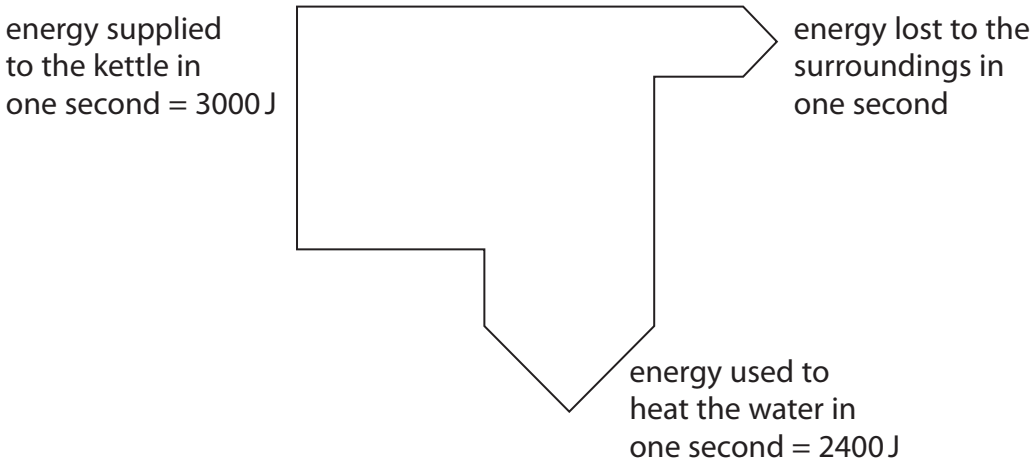

Figure 14

(i) Calculate the amount of energy lost to the surroundings in one second.

(1)

energy lost to the surroundings in one second = ... J

(ii) Calculate the efficiency of the kettle.

Use the equation

$$\text{efficiency} = \frac{\text{useful energy transferred by the kettle in one second}}{\text{total energy supplied to the kettle in one second}}$$

(2)

efficiency = ...

(Total for Question 8 = 12 marks)

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9 (a) Figure 15 is a speed limit sign from a European motorway.

The speeds shown are in km/h (kilometres per hour).

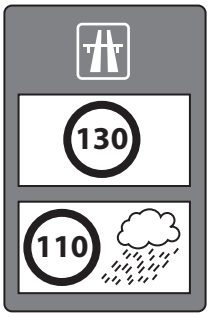

Figure 15

(i) The sign tells drivers to drive at a slower speed in wet weather.

Explain why it is safer for drivers to drive at a slower speed in wet weather.

(2)

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.....

(ii) Show that a speed of 31 m/s is less than a speed of 130 km/h.

(2)

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(iii)

The driver's reaction time is the time between the driver seeing an emergency and starting to brake.

A car is travelling at a speed of 31 m/s.

The car travels 46 m between the driver seeing an emergency and starting to brake.

Calculate the driver's reaction time.

Give your answer to 2 significant figures.

(3)

driver's reaction time = ... s

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*(b) Figure 16 is a velocity/time graph for a toy train on a straight track for 7 seconds.

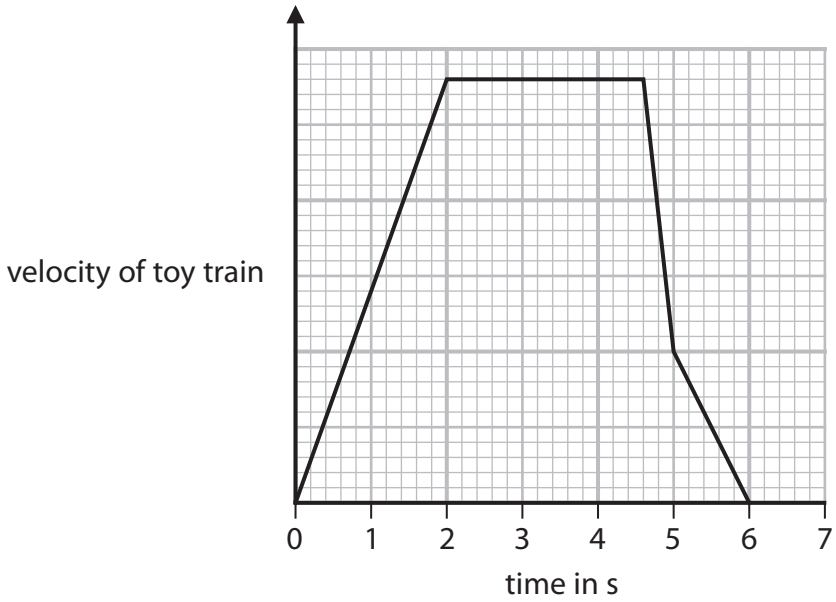

Figure 16

Using information from the graph, describe when and how the velocity and acceleration of the toy train change at different times during the 7 seconds shown on the graph.

(6)

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(Total for Question 9 = 13 marks)

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10 (a) Radioactive tracers can be used when scanning a person's kidneys.

A radioactive isotope is injected into a person's blood stream.

The isotope emits radiation.

As the blood flows through the kidneys, this radiation is detected outside the body by a scanner.

(i) What type of radiation travels from the kidney to the scanner?

(1)

☒ **A** alpha

☒ **B** beta plus

☒ **C** beta minus

☒ **D** gamma

(ii) During the scan, a technician needs to take readings for about 30 minutes.

The half-life of the isotope used is about 6 hours.

1. State why an isotope with a half-life of about 6 minutes is **not** suitable.

(1)

.....

.....

2. State why an isotope with a half-life of about 6 days is **not** suitable.

(1)

.....

.....

(iii) State **two** ways of reducing the radiation risks to the technician.

(2)

1 .....

.....

2 .....

.....

(b) Figure 17 is a diagram of a nuclear reactor.

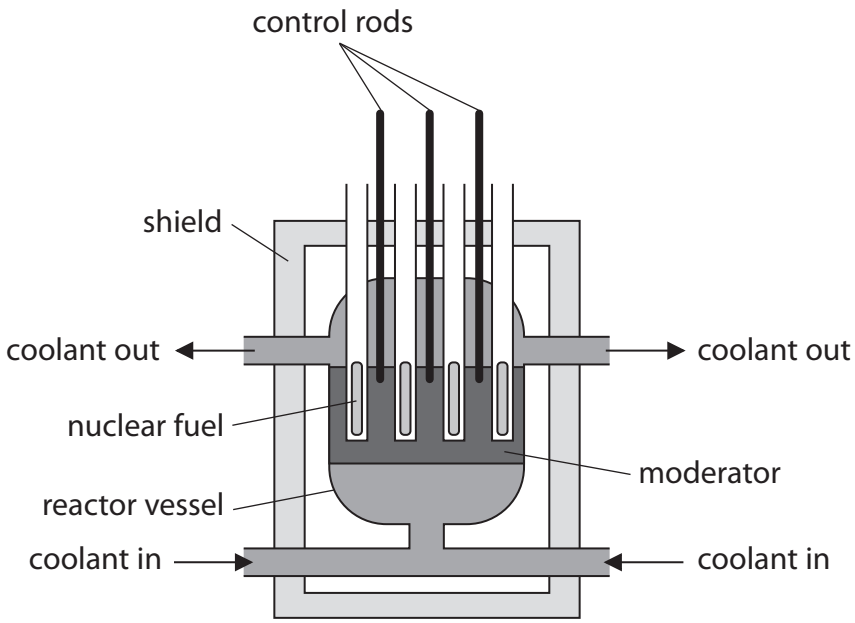

Figure 17

(i) Explain how pushing the control rods further into the reactor slows down the nuclear chain reaction.

(2)

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(ii) The moderator in a nuclear reactor slows down the neutrons so that the neutrons are more likely to start other fission reactions.

In a nuclear reactor,

- the average speed of the fast neutrons is 3.0×10^7 m/s
- the average speed of the slow neutrons is 4.0×10^3 m/s

Calculate the average speed of the slow neutrons as a percentage of the average speed of the fast neutrons.

(2)

.....%

(iii) The nuclear reaction is the first stage in the process of generating electricity.

Describe how energy is transferred from the nuclear reaction to the next stage in the process.

(2)

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(Total for Question 10 = 11 marks)

TOTAL FOR PAPER = 100 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 $E = ½ \times k \times x^2$

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