Write your name here

Surname	Other names

Pearson Edexcel GCSE (9 - 1)

Centre Number | | | | | |

Candidate Number | | | | |

Combined Science (Physics) and Physics

GCSE to A level Transition Test

Time: 1 hour 45 minutes

Paper Reference
1SC0 / 1PH0

You must have:
Ruler, pencil

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.
- You must **show all your working out** with **your answer clearly identified** at the end of your solution.
- Answer the questions in the spaces provided – *there may be more space than you need*.
- You may use a calculator.

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.

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 ▶

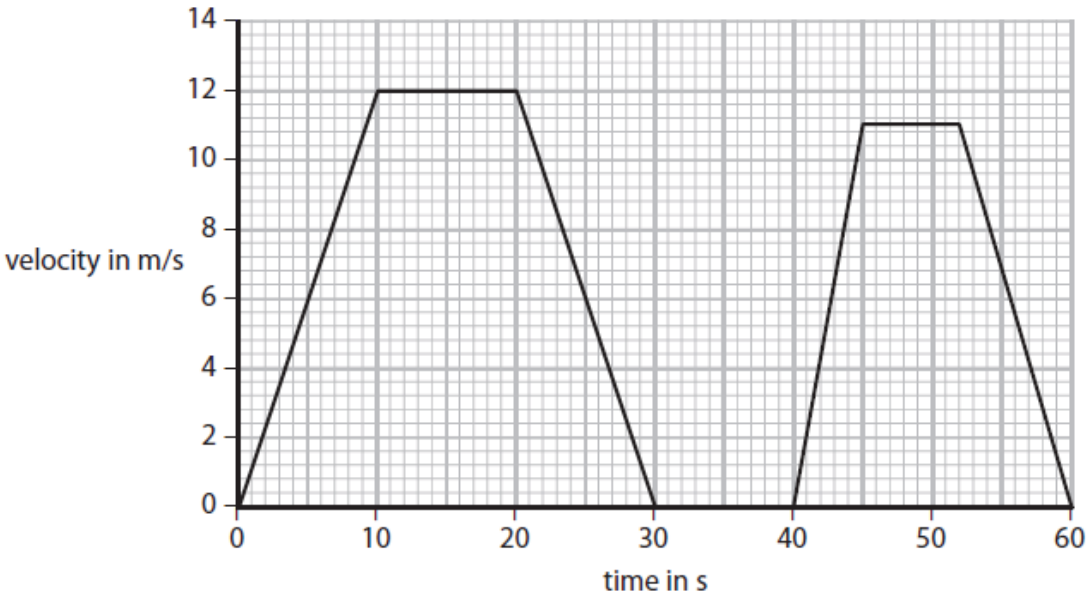
Pearson

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

SECTION A (Combined Science: Physics)

1 A bus travels along a straight road.

The graph shows how the velocity of the bus changes during a short journey.



(a) (i) State the velocity of the bus after 25 s.

(1)

velocity = ... m/s

(ii) How long is the bus stationary during its journey?

(1)

time = ... s

(b) (i) State the equation linking acceleration, change in velocity and time taken.

(1)

(ii) Calculate the acceleration of the bus during the first 10 seconds.

Give the unit.

(3)

acceleration = ... unit .....

(c) (i) State the equation linking average speed, distance moved and time taken.

(1)

(ii) The bus moves a total distance of 390 m during the journey.

Calculate the average speed of the bus.

(2)

average speed = ... m/s

(d) The bus travels further in the first 30 seconds of its journey than it does during the last 30 seconds.

Explain how the graph shows this.

(2)

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(Total for Question 1 = 11 marks)

Turn over ▶

2 Sodium-24 is a radioactive isotope.

(a) What are isotopes?

(2)

(b) Sodium-24 decays by emitting beta particles.

(i) Describe the nature of a beta particle.

(1)

(ii) Name a piece of equipment that can be used to detect beta particles.

(1)

(iii) Describe how a detector can be used with sheets of lead, aluminium and paper to show that a sample of sodium-24 emits beta particles.

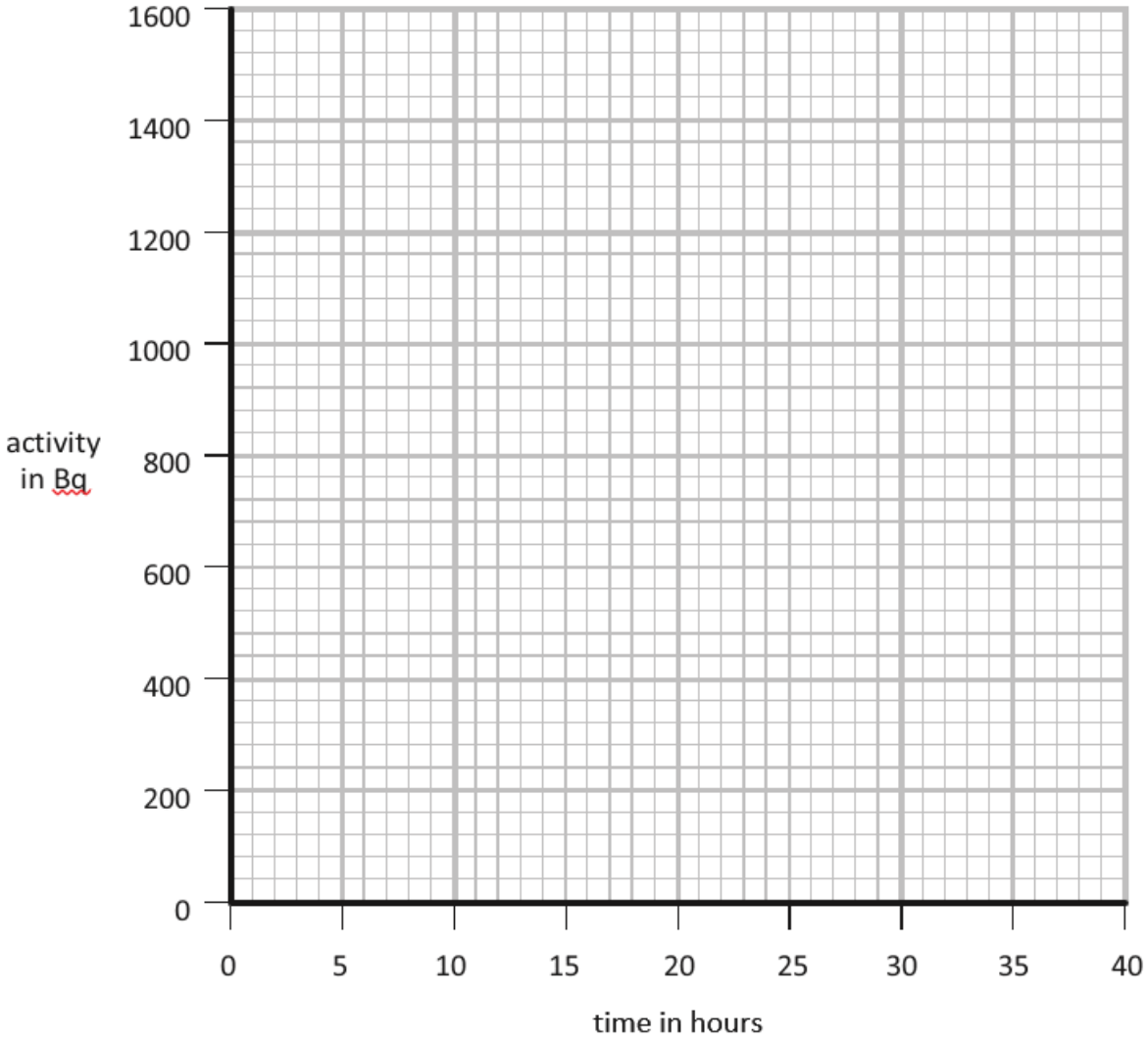
(2)

(c) A sample of sodium-24 has an activity of 1400 Bq.

On the axes, sketch a graph to show how the activity of this sample changes over the next 40 hours.

(the half-life of sodium-24 is 15 hours)

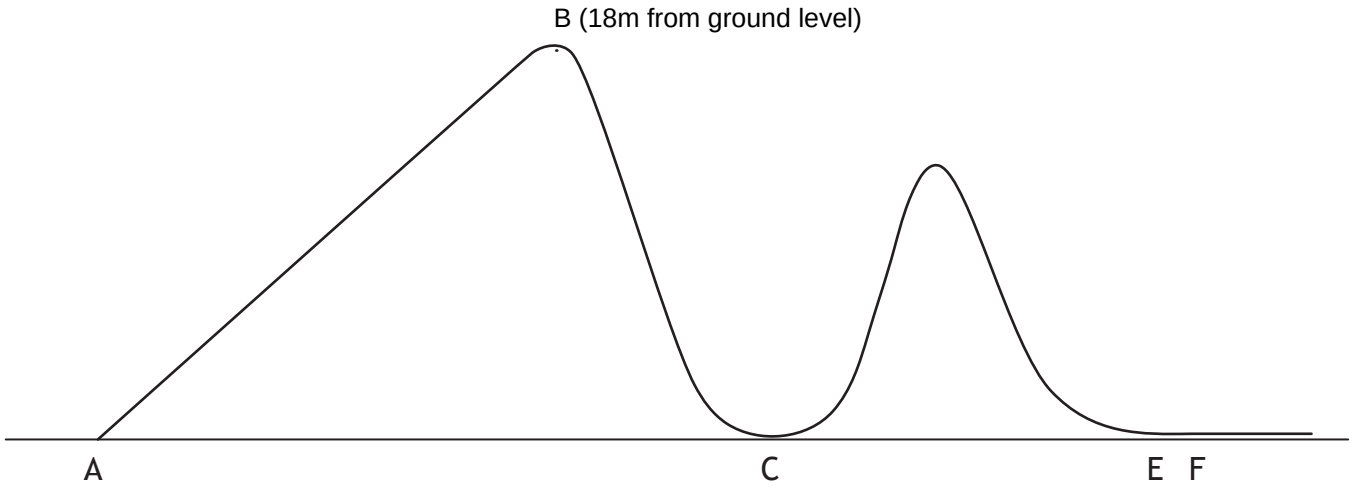
(3)



(Total for Question 2 = 9 marks)

Turn over ▶

3 The diagram shows a car and passengers at the start of a roller coaster ride at an amusement park.



(a) An electric motor pulls the car from A to B at a steady speed.

The total mass of the car and passengers is 9500 kg.

Calculate the amount of work done against gravity on the car and passengers.

[Gravitational field strength, g = 10 N/kg]

(2)

work done = ... J

(b) The car is released at B and continues down the track.

State the maximum possible kinetic energy of the car and passengers at C.

(1)

maximum KE = ... J

(c) Describe the main energy transfer that takes place between C and D.

(2)

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(d) When the car and passengers reach E, they have a total momentum of 150 000 kg m/s.

The total mass of the car and passengers is 9500kg.

Calculate the velocity of the car and passengers at E.

(3)

velocity = ... m/s

(e) Brakes are applied as the car passes E.

This brings the car to a stop at F.

Explain why it is more comfortable for the passengers if there is a large distance between E and F.

(2)

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(Total for Question 3 = 10 marks)

4 A student investigates what happens when light travels from air to glass.

(a) Figure 2 shows some of the apparatus used in the investigation.

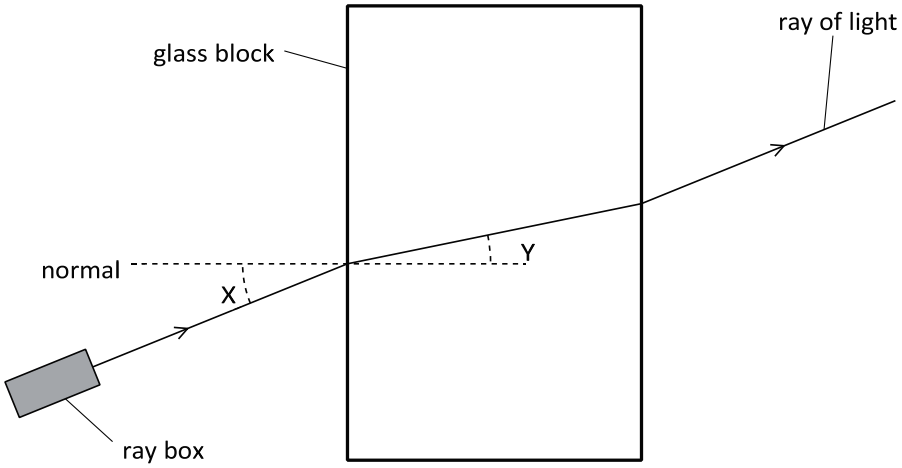

Figure 2

Figure 3 is a graph of the student's results.

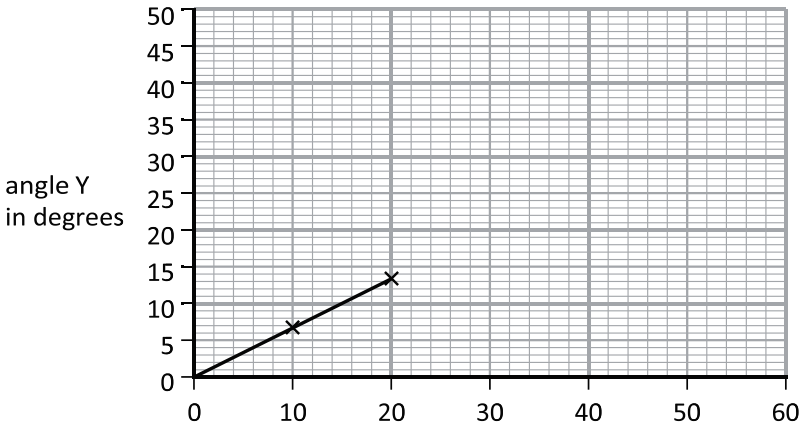

Figure 3

(i) Use the graph to calculate a value for

(2)

$$\frac{\text{angle Y}}{\text{angle X}}$$

$$\frac{\text{angle Y}}{\text{angle X}} = \text{.....}$$

(ii) The student concludes that angle Y is directly proportional to angle X.

Explain what the student must do to test this conclusion in more detail.

(3)

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(b) The speed of light is 3.0×10^8 m/s.

The wavelength of yellow light is 5.8×10^{-7} m.

Calculate the frequency of yellow light.

State the unit.

Use the equation

$$\text{frequency} = \frac{\text{speed}}{\text{wavelength}}$$

(3)

frequency = ... unit .....

(Total for Question 4 = 8 marks)

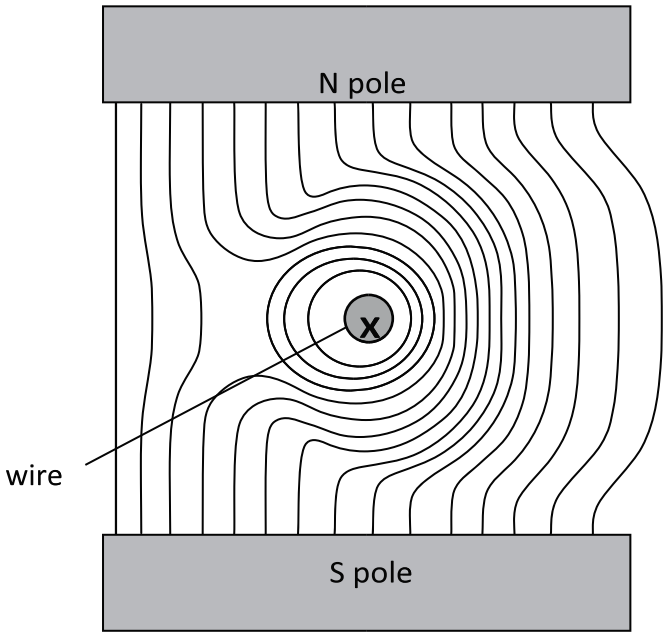
Turn over ▶

5 Magnetic field lines show the shape and direction of a magnetic field.

(a) The diagram shows a cross-section through a wire placed between two magnetic poles.

The wire carries electric current into the page at X.

The shape of the magnetic field is shown.



(i) Add arrows to two of the magnetic field lines to show the direction of the magnetic field.

(1)

(ii) Draw an arrow on the diagram to show the direction of the force on the wire.

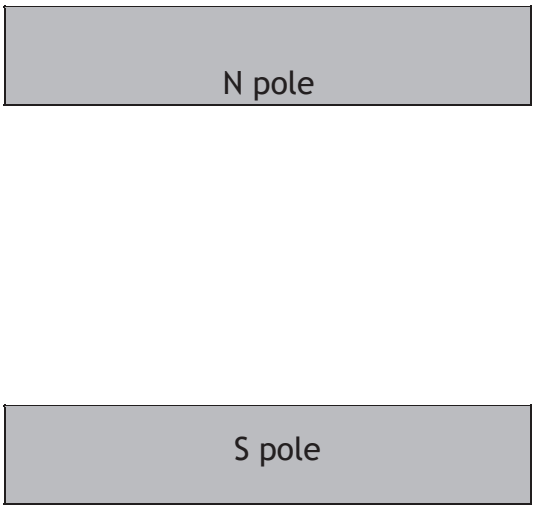
Label this arrow **F**.

(2)

(b) The wire is removed and the magnetic field between the poles changes.

Sketch the new magnetic field.

(2)



(c) Explain how you could use a plotting compass to investigate the magnetic field around a bar magnet.

You may draw a diagram to help your answer.

(3)

(Total for Question 5 = 8 marks)

6 The mass of an aeroplane is 750 kg.

(a) 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

(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 6 = 8 marks)

7 Kinetic theory describes the behaviour of particles in solids, liquids and gases.

(a) State what happens to the average distance between particles when a sample of liquid matter turns into a gas.

(1)

(b) Gases are stored in cylinders at high pressure for use in hospitals.

(i) Explain how the gas in the cylinder exerts pressure.

(3)

(ii) Explain why the pressure of the gas inside the cylinder increases if the cylinder gets hot.

(2)

(c) The diagram shows a diver using a gas bottle to provide air for a dive 50 m below the surface of the sea.

When the diver breathes out, small bubbles of air are produced that rise to the surface.

Every 10 m increase in the depth of seawater gives an increase of pressure of 101 kPa.

Normal atmospheric pressure at the surface is 101 kPa.

(i) Show that the pressure at a depth of 50 m is about 6×10^5 Pa.

(1)

(ii) As the diver breathes out, bubbles are produced.
At a depth of 50 m, one particular bubble has a volume of 1.25×10^{-6} m^3.

Calculate the volume of this bubble when it reaches the surface.
Assume that the temperature of the bubble remains constant and that it doesn't lose or gain any molecules in the process.

(3)

volume of bubble at the surface = ... m^3

(Total for Question 7 = 10 marks)

8 Figure 18 shows identical filament lamps connected together to a 12 V power supply.

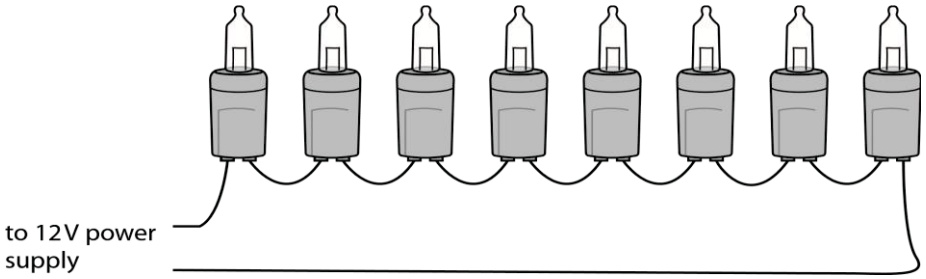


Figure 18

(a)

(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

(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)

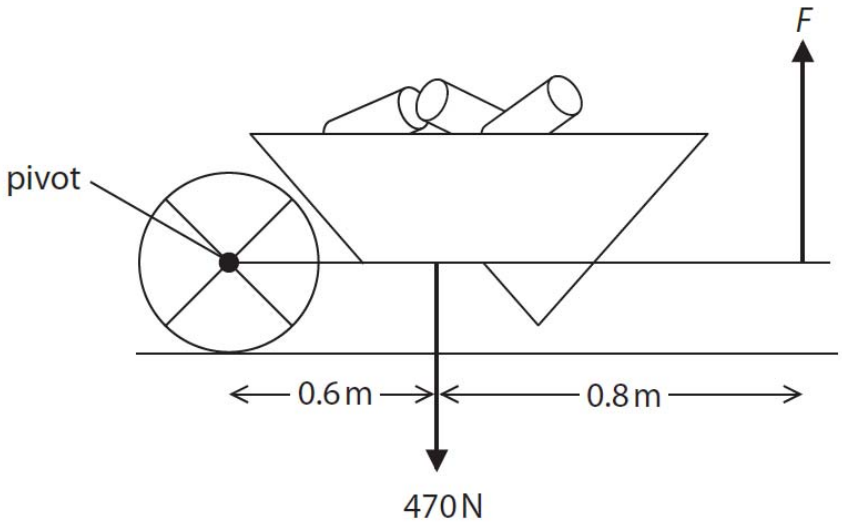
(Total for Question 8 = 11 marks)

Total for Section A = 75 marks

SECTION B (Physics)

9 A person uses a wheelbarrow to carry some logs along a flat path.

The person stops and holds the wheelbarrow horizontally, as shown.



The person exerts a total upward force of *F* N.
The weight of the loaded wheelbarrow is 470N.

(a)

(i) State the equation linking moment, force and perpendicular distance from the pivot.

(1)

(ii) Calculate the force *F*.

(4)

force *F* = ... N

(Total for Question 9 = 5 marks)

10 Heavy water is a compound of oxygen and an isotope of hydogen called deuterium.

Deuterium is formed by the fusion of protons.

(a) State the meaning of the term **isotope.**

(2)

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(b) Explain the difference between nuclear fission and nuclear fusion.

(2)

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(c) State a location where nuclear fusion takes place.

(1)

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(d) Explain why fusion cannot take place at low temperature or low pressure.

(2)

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(Total for Question 10 = 7 marks)

11 The photograph shows a step-down transformer.

(a) Explain why step-down transformers are used in the transmission of electricity in the National Grid.

(2)

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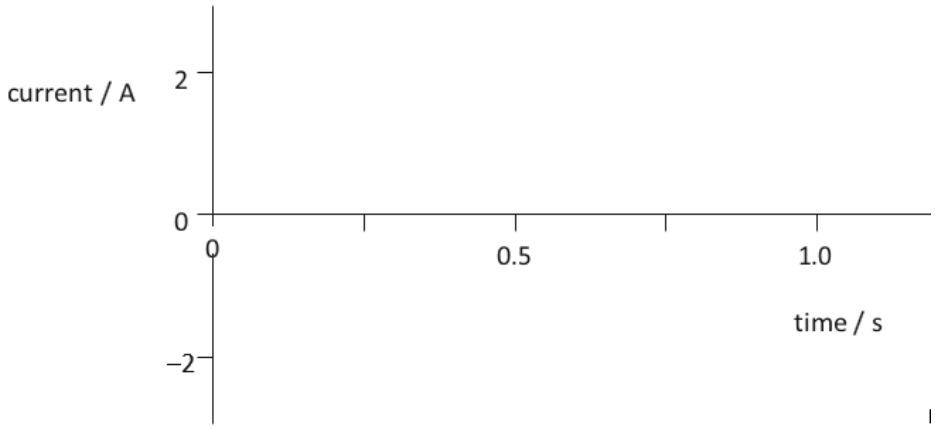
(b) Transformers need alternating current to work properly.

Sketch a graph of an alternating current with a frequency of 2 Hz.

(2)



(c) A transformer has 2400 turns on the primary coil and 100 turns on the secondary coil.

There is a potential difference of 12 V across the primary coil.

Calculate the potential difference across the secondary coil.

(3)

potential difference = ... V

(Total for Question 11 = 7 marks)

12 (a) State the name of the force that keeps the Moon in orbit around the Earth.

(1)

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(b) Explain why the distance between the Earth and Jupiter changes a lot but the distance between the Earth and the Moon stays almost the same.

(2)

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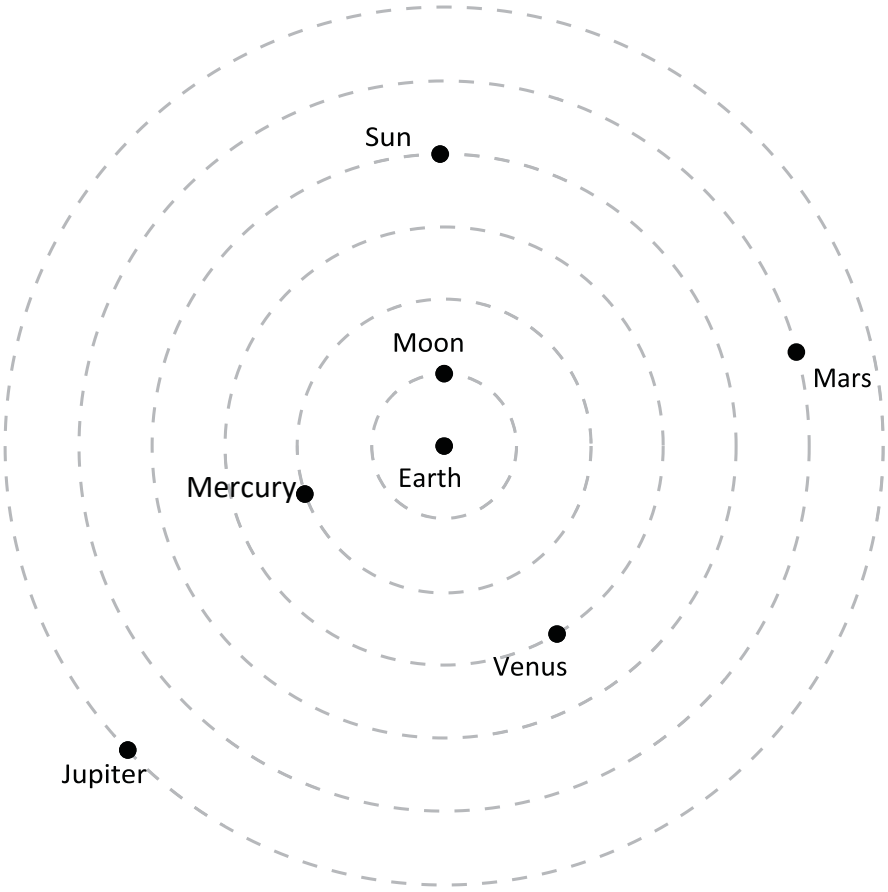
(c) The diagram shows how people used to think the Solar System was arranged.

The dashed circles represent orbits.



(i) State **one** way that this model agrees with the currently accepted model of the Solar System.

(1)

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(ii) State **two** ways this diagram could be changed to make it more like the currently accepted model of the Solar System.

(2)

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(Total for Question 12 = 6 marks)

Total for Section B = 25 marks

TOTAL FOR PAPER = 100 MARKS

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