Year 12 Physics

Mock Test

Time Allowed: 1 hour 30 minutes

Total Marks: 90

29 March 2026

Calculator Allowed

Full Name of Student: ……

1.

(a) Define *acceleration*.

.....

..... **[1]**

(b) State the **two** factors that affect the acceleration of an object.

.....

..... **[1]**

(c) Fig. 4.1 shows the variation of velocity v with time t for a small rocket.

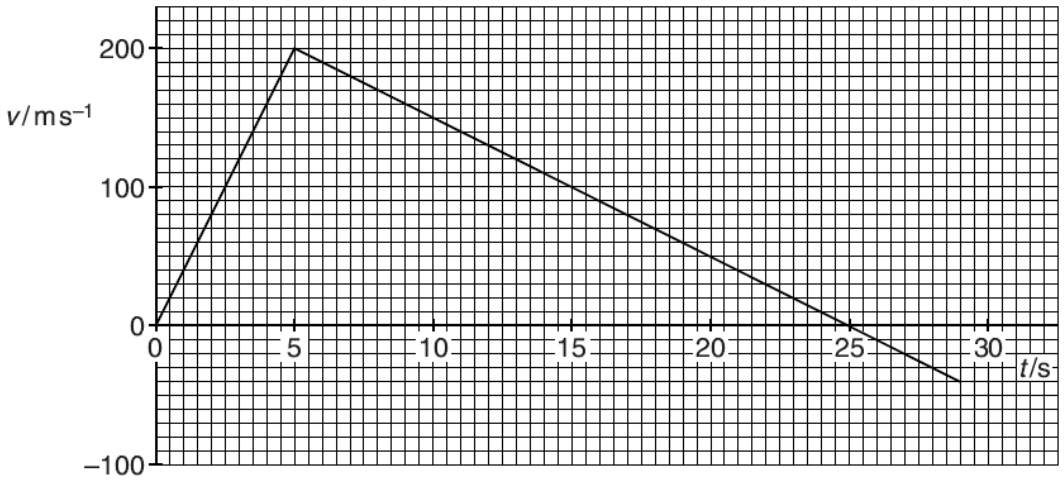

Fig. 4.1

The rocket is initially at rest and is fired vertically upwards from the ground. All the rocket fuel is burnt after a time of 5.0 s when the rocket has a vertical velocity of 200 $m s^{-1}$. Assume that air resistance has a negligible effect on the motion of the rocket.

(i) Without doing any calculations, describe the motion of the rocket

1 from $t = 0$ to $t = 5.0\,s$

.....

.....

2 from $t = 5.0\,s$ to $t = 25\,s$.

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..... **[3]**

(ii) Calculate the maximum height reached by the rocket.

height = ... m **[3]**

(iii) Explain why the rocket has a speed greater than $200\,m\,s^{-1}$ as it hits the ground.

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..... **[1]**

[Total for Question 1 = 9 marks]

2.

(a) Distinguish between scalar and vector quantities.

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.....[2]

(b) Fig. 1.1 lists a number of physical quantities. Put a (✓) in the box next to the quantities that are vectors.

acceleration	
density	
energy	
momentum	
power	
velocity	

Fig. 1.1

[3]

(c) Fig. 1.2 shows a force of 6.0 N acting at 30° to the horizontal.

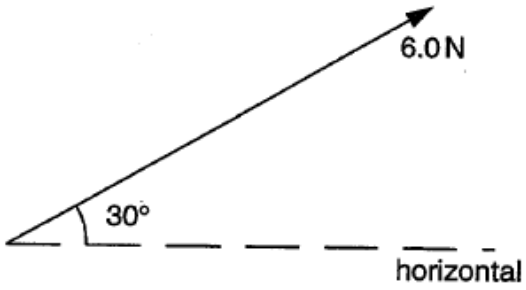

Fig. 1.2

Calculate the component of the force that acts

(i) horizontally,

horizontal component ..... N

(ii) vertically.

vertical component ..... N

[2]

(d) Fig. 1.3 shows two strings supporting an object of weight 12 N. The tension in one of the strings is 6.0 N. The tension in the other string is T.

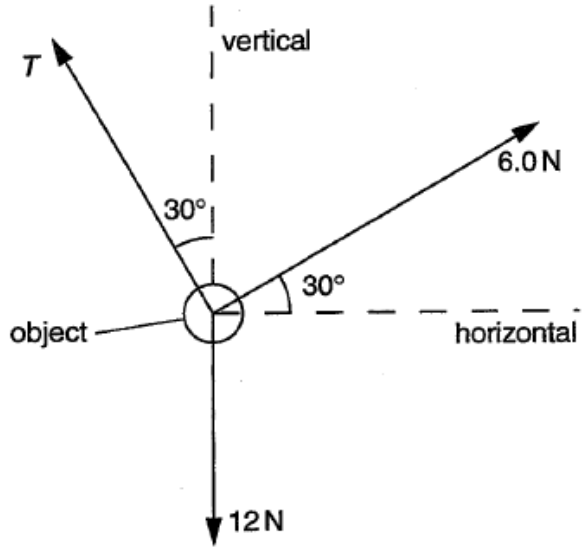

Fig. 1.3

(i) Calculate the magnitude of the vertical component of the tension T in order for the object to be in equilibrium.

vertical component ..... N [2]

(ii) Hence calculate the magnitude of T.

magnitude of T ..... N [2]

[Total for Question 2 = 11 marks]

3.

Fig. 2.1 shows the path of water from a hose pipe.

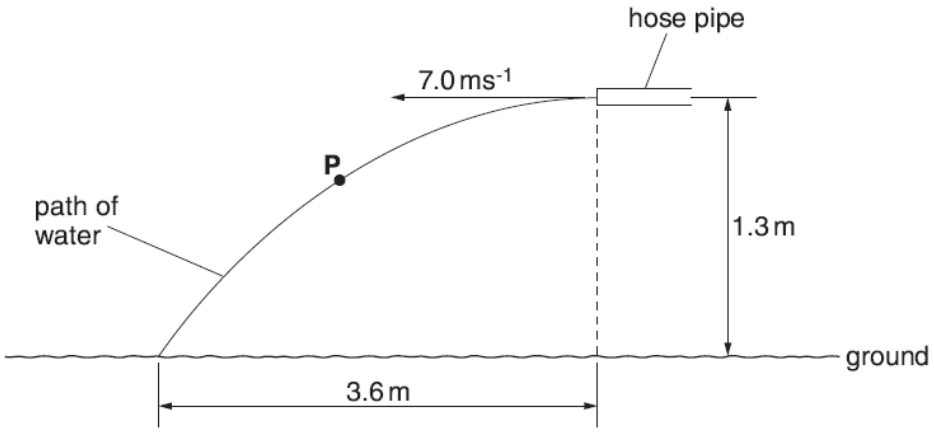

Fig. 2.1

The end of the horizontal hose pipe is at a height of 1.3 m from the ground. The initial horizontal velocity of the water is 7.0 m s^{-1}. The horizontal distance from the end of the hose pipe to the point where the water hits the ground is 3.6 m. You may assume that air resistance has negligible effect on the motion of the water jet.

(a) On Fig. 2.1, draw an arrow to show the direction of the acceleration of the water at point **P**. (Mark this arrow **A**). **[1]**

(b) Describe the energy conversion that takes place as the water travels from the end of the hose pipe to the ground.

In your answer, you should use appropriate technical terms, spelled correctly.

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..... **[2]**

(c) Explain why the horizontal component of the velocity remains constant at 7.0 m s^{-1}.

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..... **[1]**

(d) Show that the water takes about 0.5 s to travel from the end of the pipe to the ground.

[1]

(e) Show that the speed of the water when it hits the ground is 8.6 $m\,s^{-1}$.

[3]

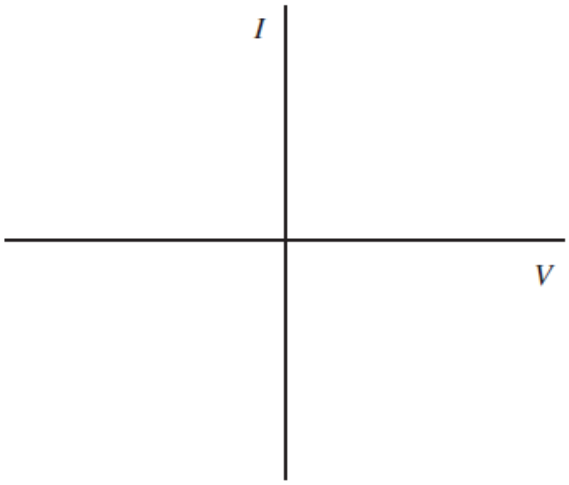
[Total for Question 3 = 8 marks]

4.

(a) Sketch, on **Figure 1**, the current–voltage (IV) characteristic for a filament lamp for currents up to its working power.

[2 marks]

Figure 1



(b) (i) State what happens to the resistance of the filament lamp as the current increases.

[1 mark]

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(b) (ii) State and explain whether a filament lamp is an ohmic or non-ohmic conductor up to its working power.

[1 mark]

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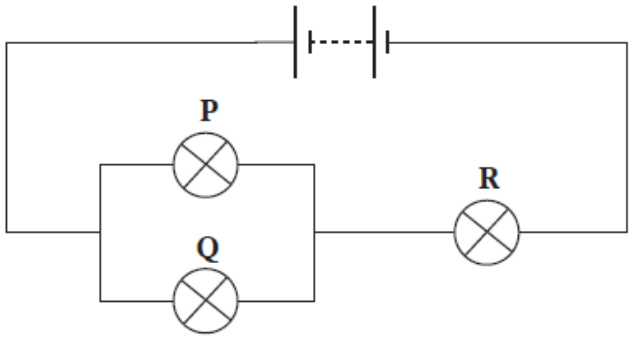
(c) Three identical filament lamps, **P**, **Q** and **R** are connected in the circuit shown in **Figure 2.**

Figure 2



The filament in lamp **Q** melts so that it no longer conducts. Explain why lamp **P** becomes brighter and lamp **R** becomes dimmer.

[2 marks]

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(d) A filament lamp, **X**, is rated at 60 W 230 V. Another type of lamp, **Y**, described as 'energy saving' has the same light intensity output but is rated at 11 W 230 V.

(d) (i) Calculate the electrical energy converted by each lamp if both are on for 4 hours a day for a period of 30 days.

[2 marks]

electrical energy converted by **X** = ... J

electrical energy converted by **Y** = ... J

[Total for Question 4 = 8 marks]

5.

Fig. 5.1 shows a potential divider circuit used to monitor the temperature of a greenhouse.

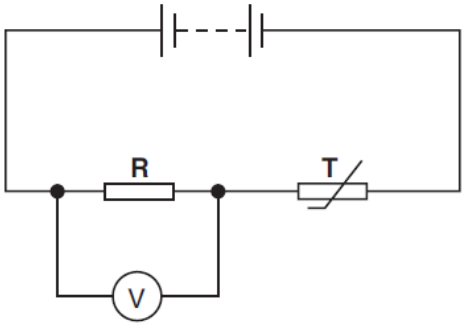

Fig. 5.1

The thermistor **T** is a negative temperature coefficient type. The voltmeter is placed across the resistor **R**. Describe and explain how the voltmeter reading changes as the temperature of the greenhouse **increases**.

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.....[4]

[Total for Question 5 = 4 marks]

6.

(a) State **two** properties which distinguish electromagnetic waves from other transverse waves.

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..... **[2]**

(b) **(i)** Describe what is meant by *a plane polarised wave*.

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..... **[2]**

(ii) Light from a filament lamp is viewed through two polarising filters, shown in Fig. 6.1. The arrow beside each filter indicates the transmission axis of that polarising filter.

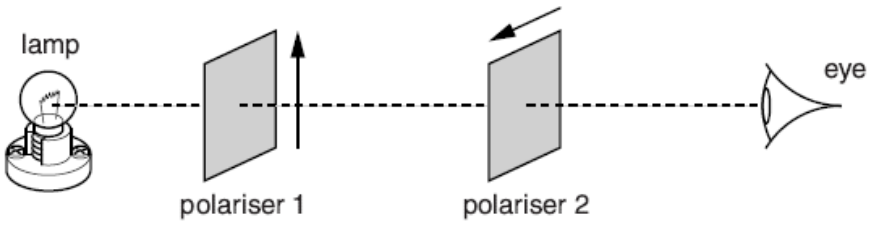

Fig. 6.1

Explain why the lamp cannot be seen by the eye.

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..... **[2]**

(iii) A third polarising filter is placed between the first two with its transmission axis at 45° to each of the others as shown in Fig. 6.2.

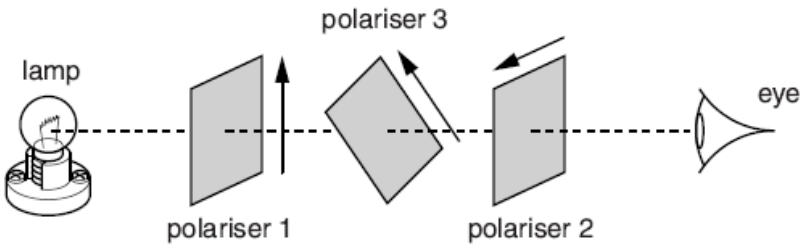

Fig. 6.2

Explain whether or not any light reaches the eye through the three filters.

In your answer you should state clearly the condition for light to be transmitted by a polarising filter.

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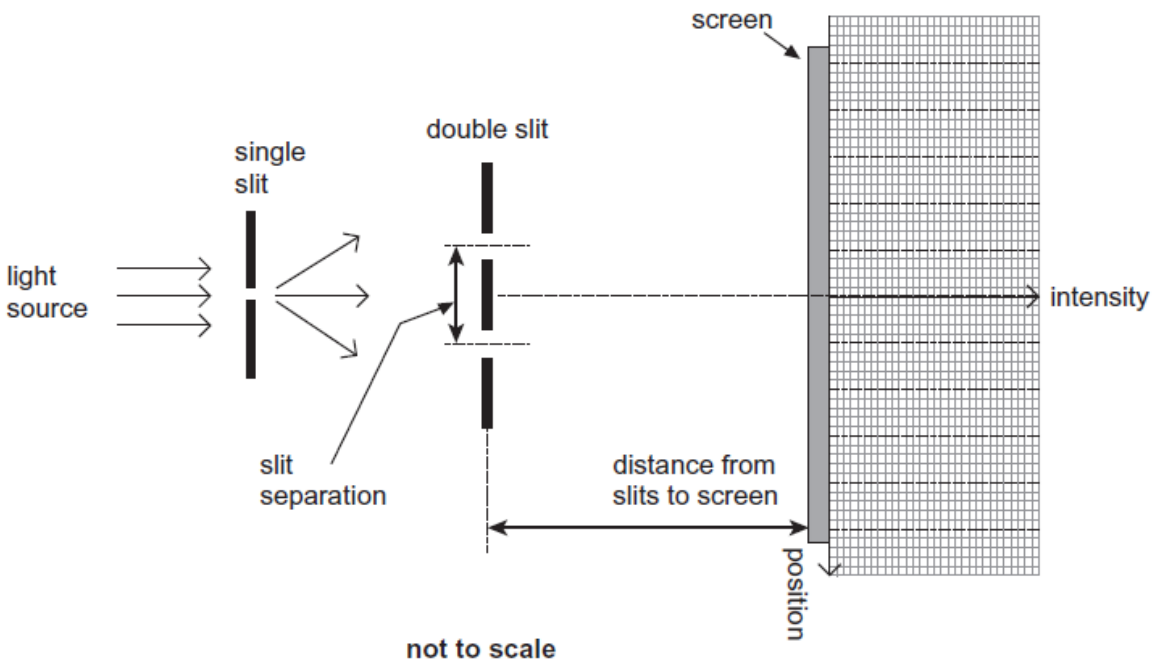
..... **[3]**

[Total for Question 6 = 9 marks]

7.

Figure 7 shows Young's double-slit experiment performed with a tungsten filament lamp as the light source.

Figure 7



(a) On the axes in **Figure 7**, sketch a graph to show how the intensity varies with position for a **monochromatic** light source.

[2 marks]

(b) (i) For an interference pattern to be observed the light has to be emitted by two **coherent sources**.
Explain what is meant by coherent sources.

[1 mark]

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(b) (ii) Explain how the use of the single slit in the arrangement in **Figure 7** makes the light from the two slits sufficiently coherent for fringes to be observed.

[1 mark]

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(b) (iii) In this experiment light behaves as a wave.
Explain how the bright fringes are formed.

[3 marks]

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(c) (i) A scientist carries out the Young double-slit experiment using a laser that emits violet light of wavelength $405\ \text{nm}$. The separation of the slits is $5.00 \times 10^{-5}\ \text{m}$.

Using a metre ruler the scientist measures the separation of two adjacent bright fringes in the central region of the pattern to be $4\ \text{mm}$.

Calculate the distance between the double slits and the screen.

[2 marks]

distance = ... m

(c) (ii) Describe the change to the pattern seen on the screen when the violet laser is replaced by a green laser. Assume the brightness of the central maximum is the same for both lasers.

[1 mark]

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[Total for Question 7 = 10 marks]

Question 8 is on the next page.

8.

(a) Explain the term *centre of gravity* of an object.

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.....[2]

(b) Fig. 2.1 shows a lawn mower which is carried by two people.

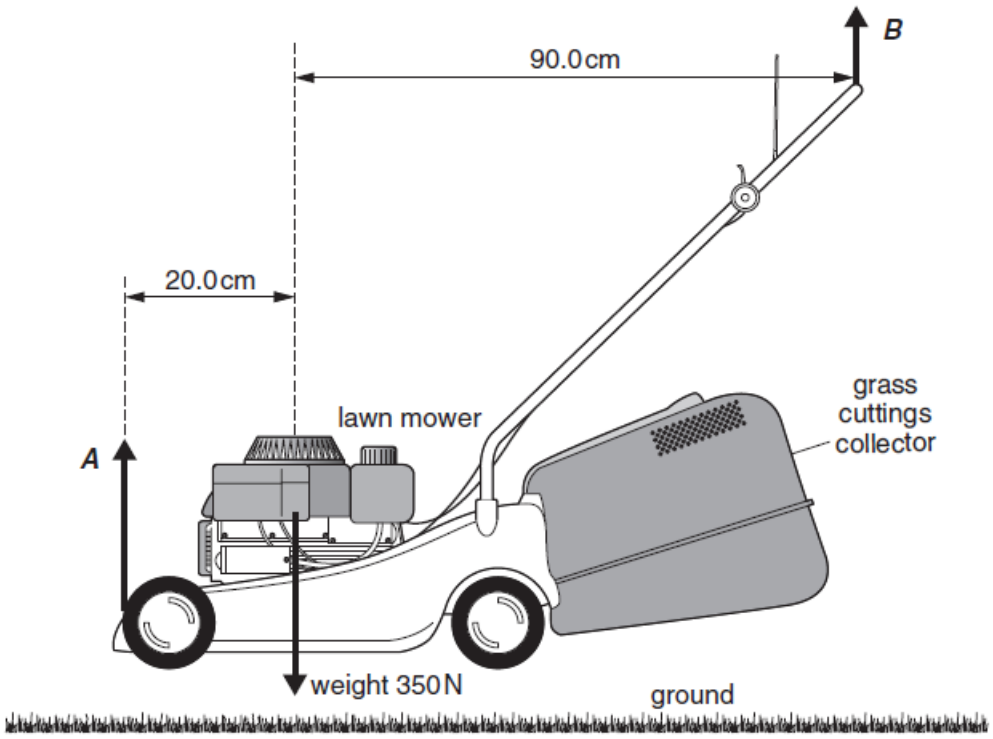

Fig. 2.1

(i) The two people apply forces ***A*** and ***B*** at each end of the lawn mower. The weight of the lawn mower is 350 N.

1 Explain why the weight of the lawn mower does not act in the middle of the lawn mower, that is 55 cm from each end.

.....

.....[1]

2 Use the principle of moments to show that the force ***B*** is 64 N.

[2]

3 Determine the force ***A***.

A = ...N [1]

(ii) State and explain what happens to the forces ***A*** and ***B*** if the person that applies force ***B*** moves his hands along the handle towards the middle of the lawn mower.

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.....[2]

[Total for Question 8 = 8 marks]

9.

Fig. 3.1 shows a helicopter that has a cable hanging from it to the sea below.

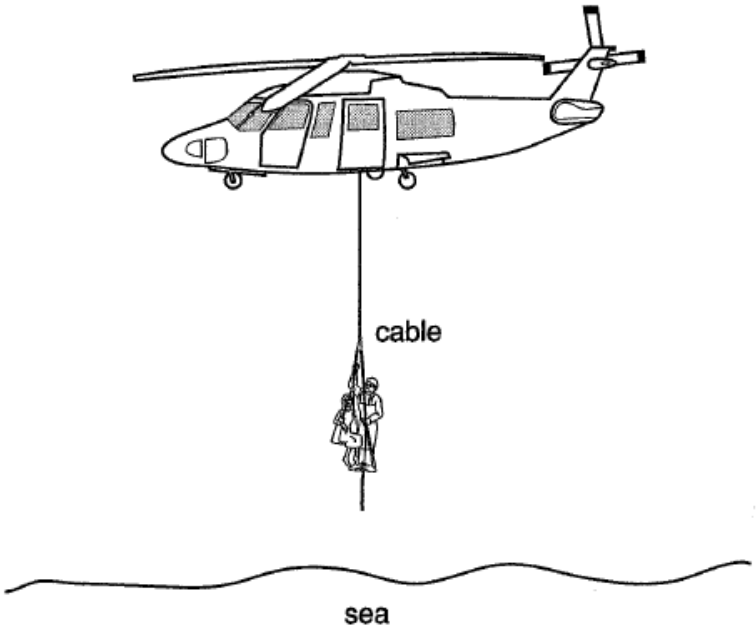


Fig. 3.1

A girl of mass 55 kg is rescued by a man of mass 75 kg. The two are attached to the cable and are lifted from the sea to the helicopter. The lifting process consists of an initial acceleration followed by a period of constant velocity and completed by a final deceleration.

(a) Name the **two** main forces acting on the two people being lifted.

.....

..... [2]

(b) Calculate the combined weight of the man and girl.

weight = ... N [1]

(c) Calculate the tension in the cable during

(i) the initial acceleration of 0.55 m s^{-2}

tension = ... N [2]

(ii) the period of constant velocity.

tension = ... N [2]

(d) Calculate the final deceleration if the tension in the cable is 1240 N.

deceleration = ... $m\,s^{-2}$ [2]

[Total for Question 9 = 9 marks]

10.

Fig. 3.1 shows a cell of e.m.f. E and internal resistance r connected to a variable resistor.

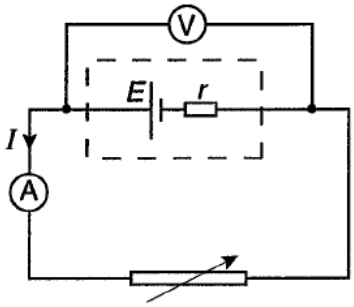


Fig. 3.1

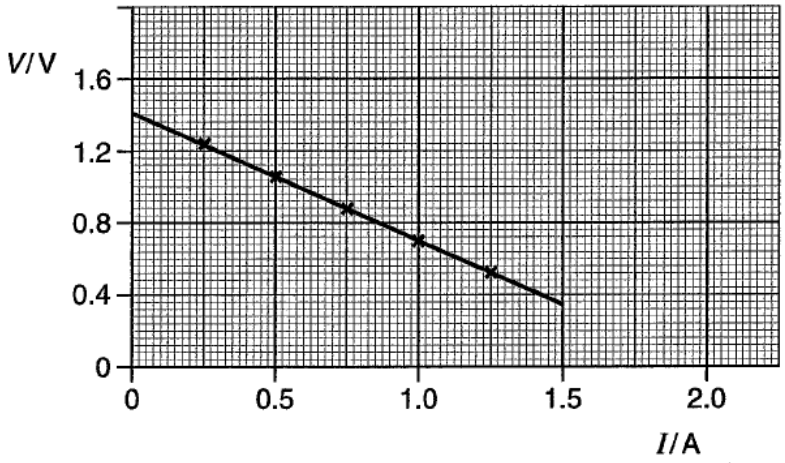


Fig. 3.2

Fig. 3.2 shows the variation of the p.d. V across the terminals of the cell with the current I drawn from the cell.

(a) Explain how Fig. 3.2 shows that the e.m.f. E is 1.4 V.

.....

..... [1]

(b) **(i)** Use Fig. 3.2 to determine the maximum possible current that can be drawn from the cell.

current = ... A [1]

(ii) Calculate the internal resistance r of the cell.

r = ... Ω [2]

(iii) Suggest why it may not be advisable to maintain the current determined in **(b)(i)** for a long time.

.....

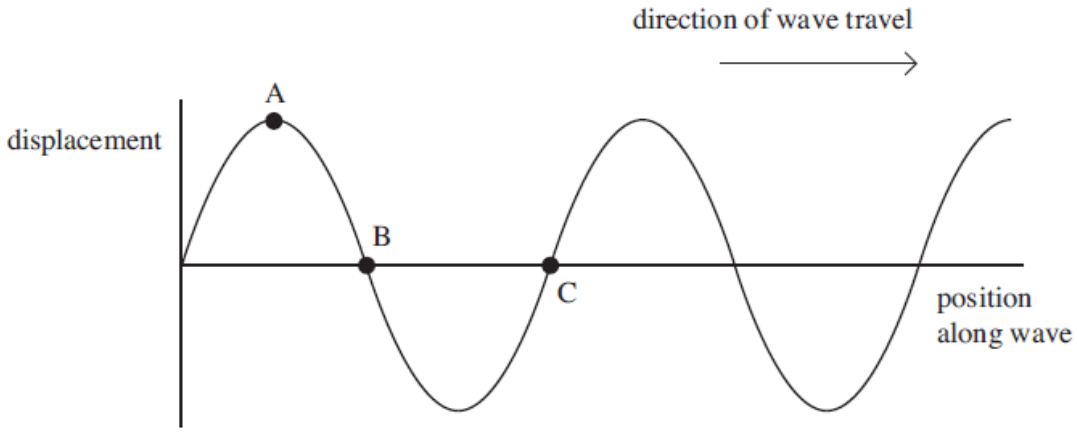
..... [1]

[Total for Question 10 = 5 marks]

11.

Earthquakes produce transverse and longitudinal seismic waves that travel through rock. **Figure 8** shows the displacement of the particles of rock at a given instant, for different positions along a transverse wave.

Figure 8



(a) State the phase difference between

(a) (i) points **A** and **B** on the wave .....

(a) (ii) points **A** and **C** on the wave. .....

(2 marks)

(b) Describe the motion of the rock particle at point **B** during the passage of the next complete cycle.

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(2 marks)

(c) A scientist detects a seismic wave that is polarised. State and explain what the scientist can deduce from this information.

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(2 marks)

(d) The *frequency* of the seismic wave is measured to be 6.0 Hz.

(d) (i) Define the frequency of a progressive wave.

.....

.....

(1 mark)

(d) (ii) Calculate the wavelength of the wave if its speed is $4.5 \times 10^3 \text{ m s}^{-1}$.

wavelength ..... m

(2 marks)

[Total for Question 11 = 9 marks]

- End of Test -