Name _____ ( ) Class _____

PRELIMINARY EXAMINATION
GENERAL CERTIFICATE OF EDUCATION ORDINARY LEVEL

PHYSICS **6091/02**

Paper 2 Theory **28 August 2025**

1 hour 45 minutes

READ THESE INSTRUCTIONS FIRST

Write your name and index number on all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams or graphs.
Do not use highlighters, correction fluid or correction tape.

Section A
Answer **all** questions.

Section B
Section B consist of two questions. Answer **only one** out of these two questions.

Students are reminded that **all** quantitative answers should include appropriate units.
The use of approved scientific calculator is expected, where appropriate.
Candidates are advised to show all their working in a clear and orderly manner, as more marks are awarded for sound use of Physics than for correct answers.

The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
Section A (70 Marks)	
Section B (10 Marks)	
Total (80 Marks)	

This document consists of **22** printed pages.

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[Turn over

Section A

Answer **all** questions.

1 A remote drone of mass 5.0 kg is launched from the surface of a planet.

Fig. 1.1 shows how the velocity of the drone varies with time until it lands back on the surface. After 1.7 s, the drone malfunctions and experiences a free fall.

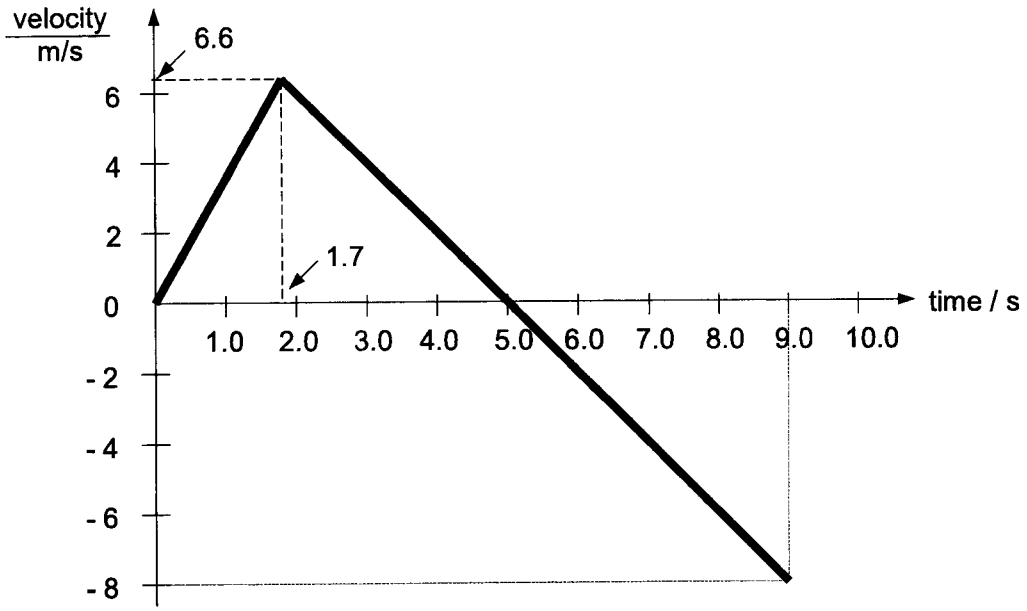


Fig. 1.1 *(not to scale)*

(a) Explain how Fig. 1.1, from 1.7 s onwards, shows that air resistance on the drone is insignificant.

.....

.....

.....[1]

(b) Describe, in terms of velocity, the motion of the drone from 1.7 s to 9.0 s.

.....

.....

.....

.....

.....[3]

(c) Calculate

(i) the maximum height the drone reaches,

maximum height = ...[2]

(ii) weight of the drone near the surface of the planet.

weight = ...[2]

[Total: 8]

2 Fig. 2.1 shows a drink can being lifted upwards by a helium-filled balloon. The mass of the drink can is 0.400 kg and the mass of the helium-filled balloon is negligible. Both the drink can and the balloon are rising upwards steadily with a constant speed.

Take gravitational field strength g to be 10 N/kg and assume air resistance to be negligible.

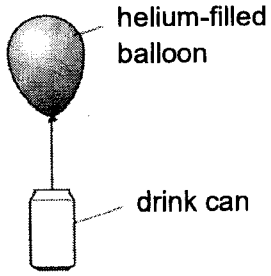


Fig. 2.1

(a) On Fig. 2.2, draw and label the force(s) that act on the drink can.

Fig. 2.2

[1]

(b) Determine the magnitude of the upward force exerted by the helium-filled balloon on the drink can.

upward force = ...[1]

(c) **(i)** State what is meant by *work done*.

.....

.....[1]

(ii) Describe, in terms of forces acting on the drink can, how this conservation of energy occurs.

.....

.....

.....

.....[2]

(d) When more helium is pumped into the balloon, both the drink can and balloon rise with an acceleration of 0.65 m/s^2.

Calculate the new upward force exerting on the can.

upward force = ...[2]

(e) As the balloon floats upwards, it pushes the air particles surrounding it. The force on these surrounding air particles is one half of an action-reaction pair of forces.

Describe the other half of this action-reaction pair.

.....

.....[1]

[Total: 8]

3 A bottle on the ground is given a gentle push and it rolls over to a new position.

Fig. 3.1 shows the rear view of the glass bottle on the ground at two different positions.

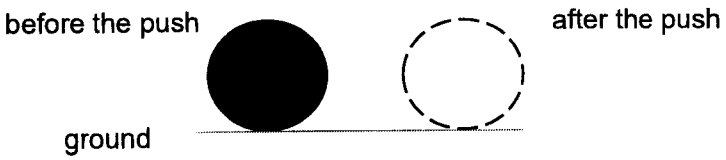


Fig 3.1

(a) State the type of equilibrium that the bottle is in.

.....[1]

Fig. 3.2 shows a side view of a glass bottle and a bottle holder in stationary position.

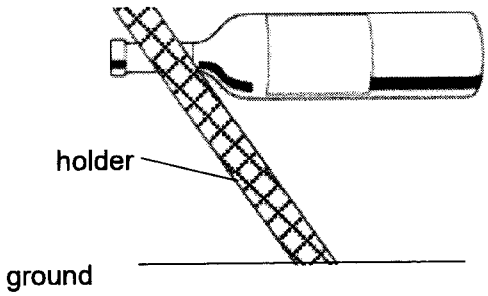


Fig 3.2

(b) **(i)** Draw on Fig. 3.2, using "X", the position of the centre of gravity of the setup which consists of the glass bottle and the bottle holder. [1]

(ii) Hence, explain how the bottle holder is able to support the bottle in this position without toppling.

.....

.....

.....

.....[2]

(c) Suggest a modification that can be made to the bottle holder to ensure that setup is more stable.

.....

.....[1]

[Total: 5]

4 A manometer is connected to a gas pump on one end while the other end is open.

Fig. 4.1 shows that when the gas pump is turned on, the oil level on the left side rises by 1.6 m.

The atmospheric pressure is 1.0×10^5 Pa. The density of oil is 0.80 g/cm^3.

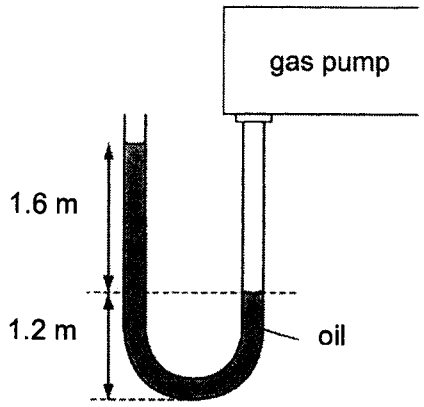


Fig. 4.1

(a) Define *pressure*.

.....[1]

(b) Calculate the pressure produced by the gas pump. Present your answer in the SI unit for pressure.

pressure = ...[3]

(c) A liquid with twice the density of oil is used in the manometer.

Describe how the levels in the manometer would be affected by the pressure of the gas pump. Explain your answer.

.....

.....

.....

.....

.....[2]

[Total: 6]

5 In a ripple tank experiment, water waves are produced by an elongated dipper of frequency 50 Hz.

Fig. 5.1 shows the wavefronts when viewed from the top of the ripple tank. The waves are produced in the deep section and move towards the shallow section as indicated by the direction of wave.

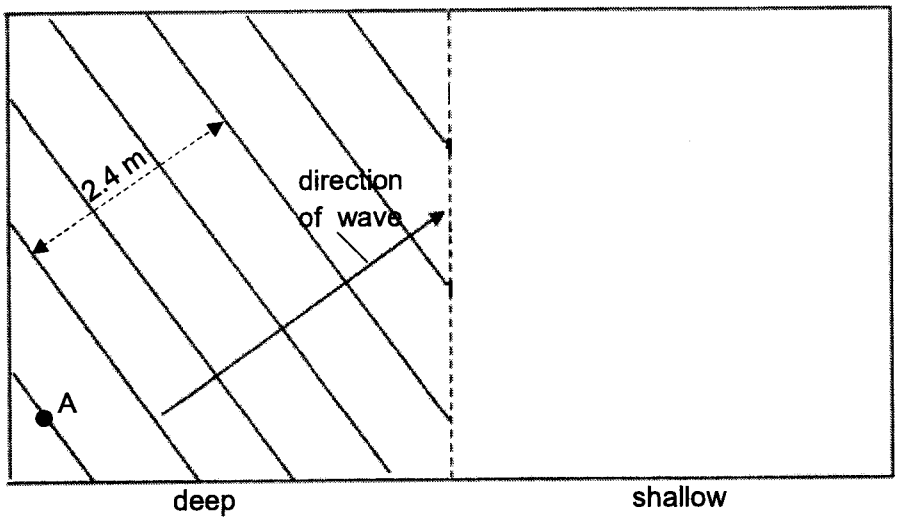


Fig. 5.1 *(not to scale)*

(a) State what is meant by *frequency of 50 Hz*.

.....

.....[1]

(b) Determine the wavelength of the wave in the deep section.

wavelength = ... [1]

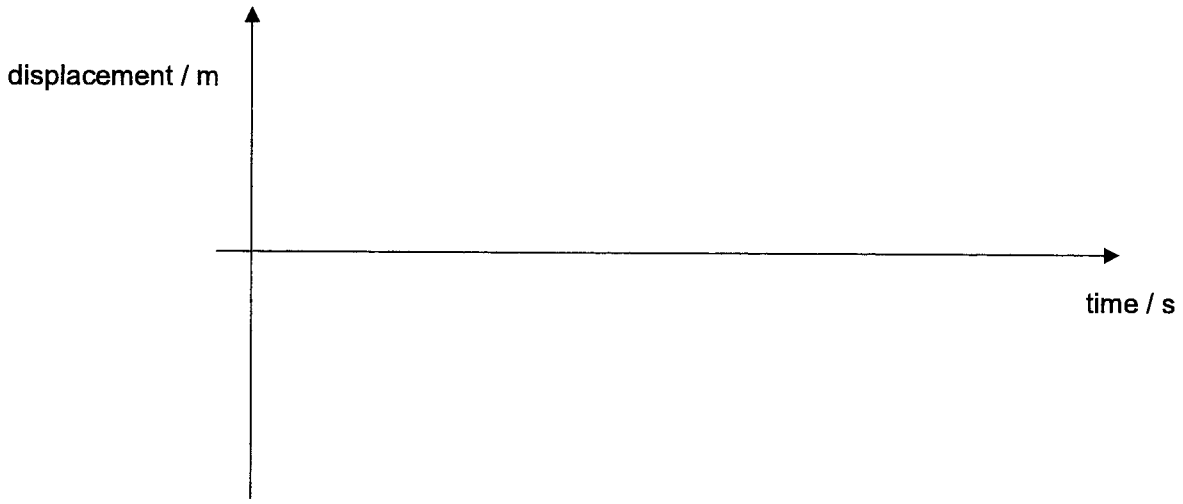
(c) Calculate the velocity of the wave in the deep section.

velocity = ... [1]

(d) On Fig 5.1, draw **three** wavefronts in the shallow section of the ripple tank. [2]

(e) At time $t = 0$ s, water particle A is at the crest of a water wave as shown in Fig. 5.1.

Sketch the displacement-time graph of particle A for next 0.04 s.



[1]

[Total: 6]

6 Fig. 6.1 shows a chart of the relative power of radiation emitted by objects at different temperatures against the wavelengths of the radiation.

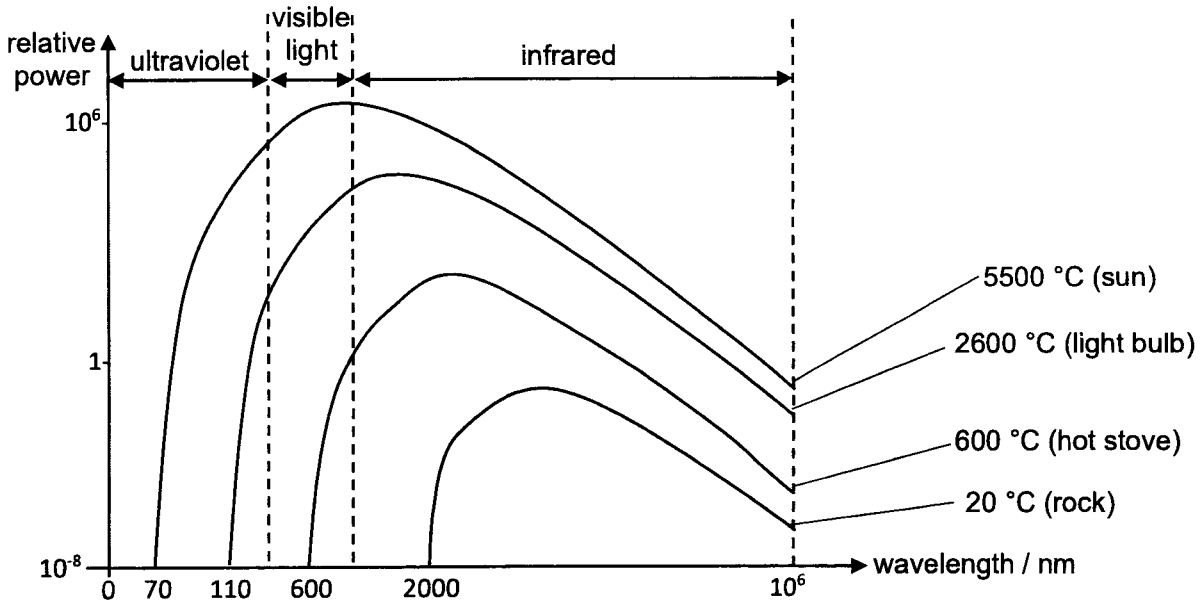


Fig 6.1

(a) Both the hot stove and the rock emit radiation.

Explain why the hot stove appears red to an observer but not the rock.

.....

.....

.....

.....[2]

(b) State **two** properties that are common to the three types of radiations shown in Fig. 6.1.

1.....

.....

2.....

.....[2]

[Total: 4]

7 Two identical metal spheres S and T are placed near to each other. Sphere T is neutral while sphere S is positively-charged as shown in Fig. 7.1.

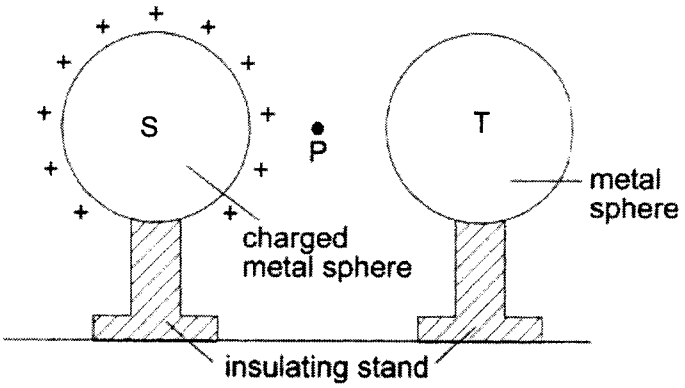


Fig 7.1

(a) On Fig. 7.1, draw **one** arrow on point P, to show the direction of the electric field at P. [1]

(b) The right side of sphere T is then touched with a finger.

State and explain what happens to the charges on sphere T.

.....

.....

.....[2]

(c) When the metal sphere T is touched, a charge of 2.1 nC flows within a period of 500 ms.

Calculate the average current during this time.

average current = ...[1]

[Total: 4]

8 Structures such as buildings or bridges sometimes develop cracks. Such cracks may widen over time and pose dangers. Fig. 8.1 shows a circuit constructed to determine if the crack of any structure widens over time.

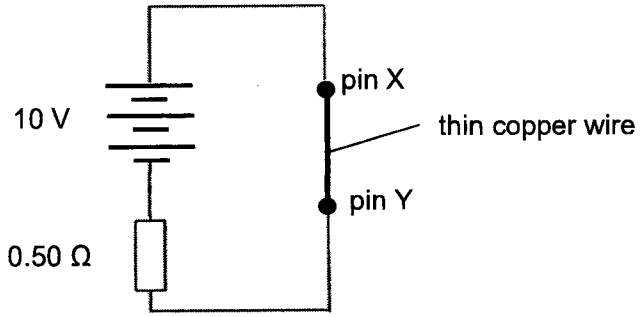


Fig. 8.1

To detect the crack, a thin copper wire of length 1.0 cm is placed perpendicular to the crack. The ends of the thin copper wire are connected to the two pins.

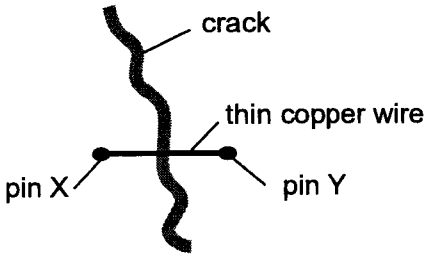


Fig. 8.2

(a) Z is a component that is used to measure current.

In Fig. 8.1, draw the electrical symbol of component Z to show how it may be included in the circuit. [1]

(b) The thin copper wire has a cross-sectional area of 2.0×10^{-9} m^2 and a resistivity of 1.7×10^{-8} Ωm.

Calculate the resistance of the copper wire.

resistance = ...[2]

(c) State and explain how the current will vary when the crack widens.

.....

.....

.....

.....[3]

[Total: 6]

9 Fig. 9.1 shows a prototype circuit breaker designed by a student.

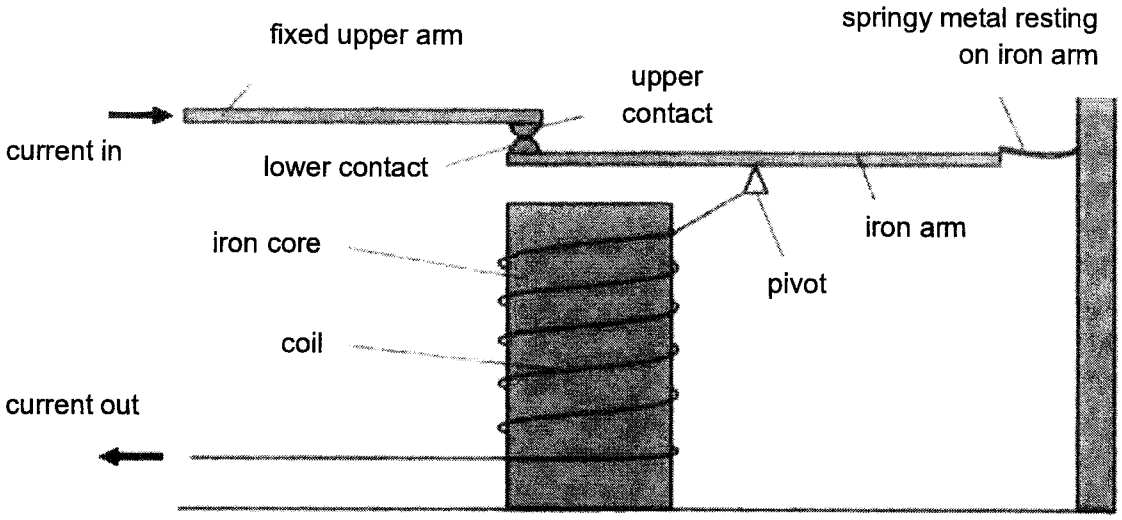


Fig. 9.1

(a) Describe how the circuit breaker might work when there is an excessive current flowing through the circuit.

.....

.....

.....

.....

.....

.....[2]

(b) Describe what will happen if the excessive current persists for a long period of time.

.....

.....

.....

.....

.....[2]

[Total: 4]

10 Lux is a unit for measuring the intensity of light. The greater the lux level, the higher the light intensity.

Fig. 10.1 shows the circuit consisting of a switch, a battery of electromotive force (e.m.f.) of 12 V, a fixed resistor and a light-dependent resistor (LDR).

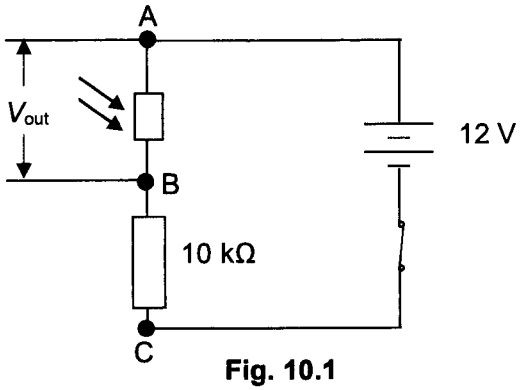


Fig. 10.1

Fig. 10.2 shows how the resistance of the LDR varies with light intensity.

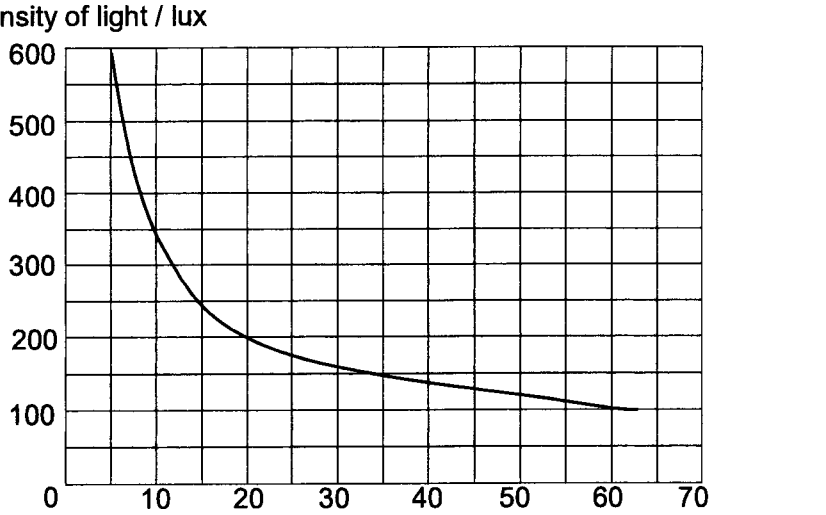


Fig. 10.2

(a) Explain what is meant by

(i) *e.m.f.*,

.....

.....[1]

(ii) *resistance*.

.....

.....[1]

(b) Table 10.3 shows an incomplete table relating the intensity of the light falling on the LDR, the resistance of LDR and the potential difference, V_{AB}, across points A and B on the circuit.

Using Fig. 10.1 and Fig. 10.2, complete Table 10.3.

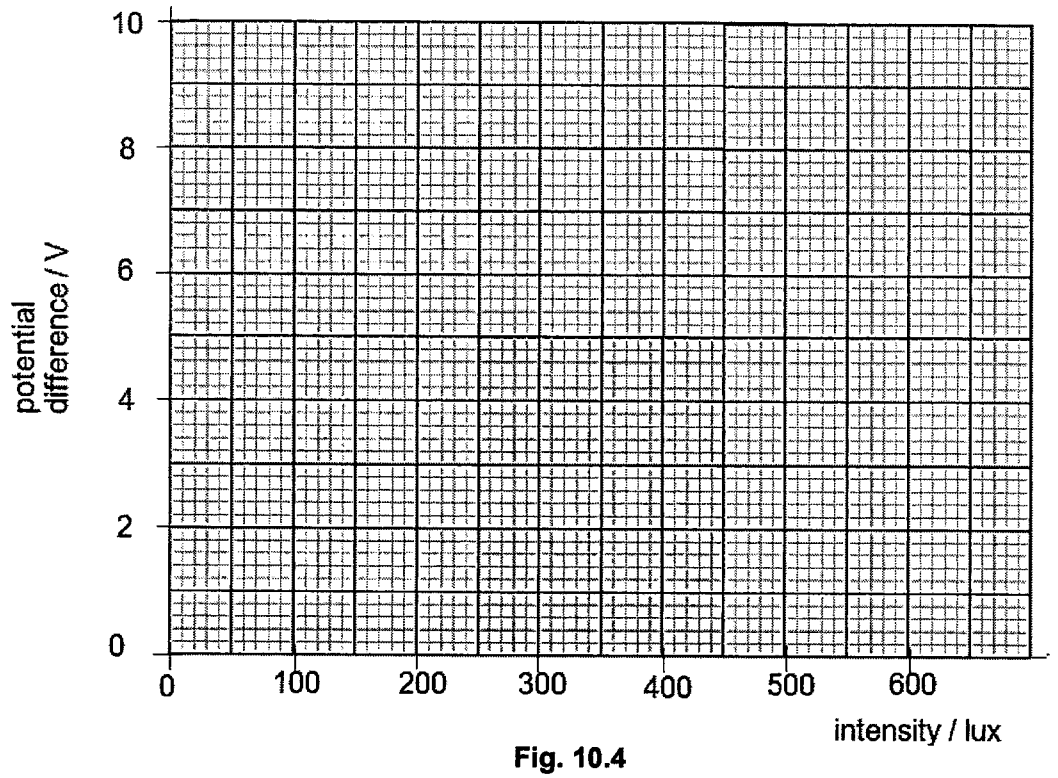
Table 10.3

Intensity/ lux	resistance of LDR / kΩ	V_{AB}/ V
600		4
350		
200	20	8
		10

[2]

(c) On Fig. 10.4,

- sketch the graph of potential difference against intensity using values from **(b)**. Label this graph V_{AB}.
- hence sketch the graph of potential difference between point B and C, V_{BC} against intensity. Label this graph V_{BC}.



[3]

Fig. 10.4

(d) The output voltage V_{out} is connected to an electronic switch and lamp. The lamp switches on when V_{out} is larger than 8.0 V.

Describe and explain the changes in the brightness of the lamp as the light intensity decreases.

.....

.....

.....

.....[2]

[Total: 9]

11 Protactinium-234 ($^{234}_{91}\mathrm{Pa}$) is a radioactive isotope of protactinium that decays to uranium-234 ($^{234}_{92}\mathrm{U}$).

(a) State the number of protons present in **one** neutral atom of protactinium-234.

number of protons = ... [1]

(b) Compare the nuclide notation $^{234}_{91}\mathrm{Pa}$ with the nuclide notation $^{234}_{92}\mathrm{U}$ and deduce what this shows about the type of radiation emitted from a nucleus of protactinium-234 as it decays to uranium-234.

Place a tick (✓) in the appropriate boxes of Table 11.1 to show what is deduced from comparing the nuclide notations.

Table 11.1

	yes	no	not possible to tell
an alpha-particle is emitted			
a beta-particle is emitted			
a gamma radiation is emitted			

[2]

(c) The most abundant isotope of protactinium is protactinium-231 ($^{231}_{91}\mathrm{Pa}$).

Explain, by referring to their nuclear compositions, why protactinium-231 and protactinium-234 are different isotopes of the same element.

.....

.....[1]

(d) A teacher places a radiation detector on a bench in a school laboratory and switches it on.

(i) The teacher measures and records the background radiation count rate.

Describe what is meant by *background radiation*.

.....

.....[1]

(ii) The count rate is measured every 20 s with the sample present, and then corrected for background radiation.

Fig. 11.2 shows a graph of the corrected count rate against time for the protactinium-234 sample.

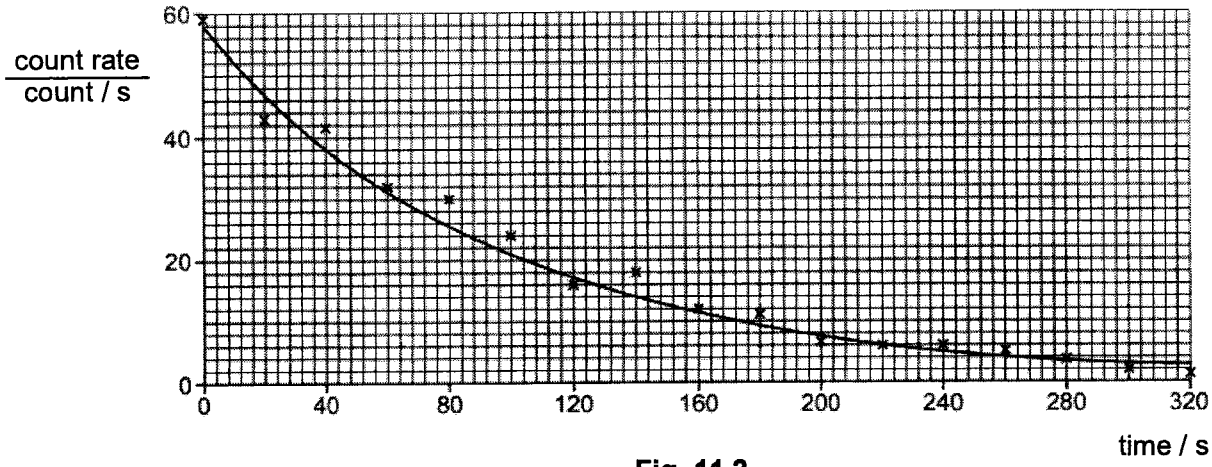


Fig. 11.2

The curve is the best-fit line.

Explain why many of the crosses do not lie on the curve.

.....

.....[1]

(iii) Using Fig. 11.2, determine the half-life of protactinium-234. Show your working clearly.

half-life = ... [2]

(iv) The uranium-234 formed from the protactinium-234 is also radioactive. Its half-life is many thousands of years.

Explain why the radiation from uranium-234 does not affect the count rates measured in this experiment.

.....

.....

.....[2]

[Total: 10]

Section B

Answer **one** question from this section

Answer either **Question 12** or **Question 13**

12 Fig. 12.1 shows an experimental setup used to measure the specific latent heat of vaporisation of water. Water in a beaker is kept boiling by a heater which is connected to the mains supply.

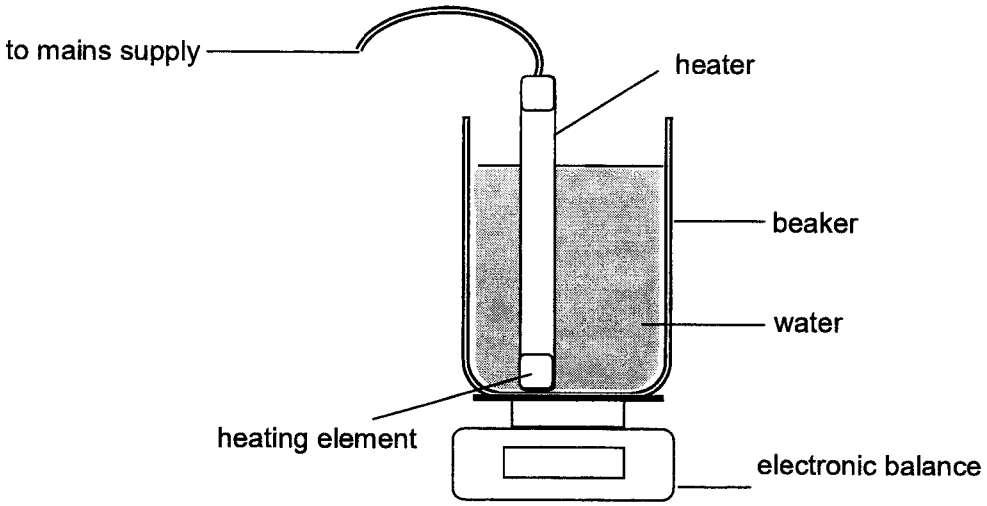


Fig. 12.1

Fig. 12.2 shows the data obtained from the experiment during a part of the boiling phase.

energy used by the heater	0.120 kWh
initial reading of the electronic balance	0.746 kg
final reading of the electronic balance	0.604 kg

Fig. 12.2

(a) Describe **one** main process by which the water heats up quickly.

.....

.....

.....[2]

(b) With reference to Fig.12.2, calculate the specific latent heat of vaporisation of water.

specific latent heat of vaporisation = ...[2]

(c) During the process of boiling, explain why the temperature of water remains constant at 100 °C even though the heating element continues to transfer energy to water.

.....

.....

.....[2]

(d) In practice, before water starts to boil, the reading of the electronic balance decreases slowly with time.

Explain, in terms of the motion of molecules, why there is a decrease in the reading of the balance.

.....

.....

.....[2]

(e) To obtain a more accurate value of time, a student suggests placing a layer of thermal insulation around the beaker.

For the same change in mass, would the duration in which the heater is switched on increase, decrease or remain the same? Explain your answer.

.....

.....

.....[2]

[Total: 10]

13 Fig. 13.1 shows a coil ABCD in a magnetic field. The ends X and Y of the coil are connected directly to a d.c. power supply. The coil ABCD is able to rotate about the axle.

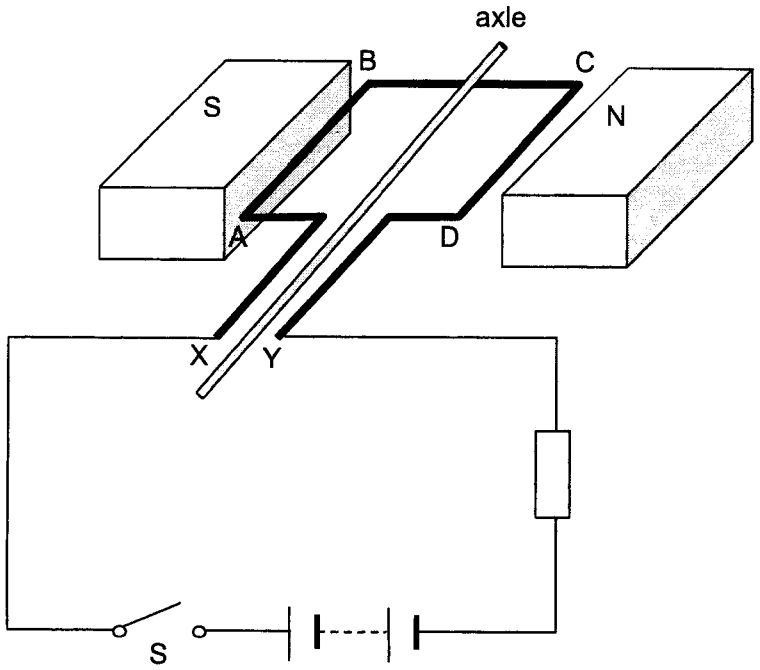


Fig. 13.1

(a) Switch S is closed.

On Fig. 13.1, draw and label arrows to show the directions of

(i) the current in the coil. Label it as *I*;

(ii) the force acting on the side of the coil AB. Label it as *F*.

[2]

(b) Explain why the coil experiences a turning effect when switch S is closed.

.....

.....

.....

.....

.....

.....[3]

(c) The current in the coil causes a force of 2.0 N on each side of the coil and the moment is a maximum when the coil is in the position shown in Fig. 13.1. The distances between AB to the axle and CD to the axle are both 0.10 m.

(i) Calculate the value of the maximum moment acting on the coil.

moment = ...[3]

(ii) Explain why the moment is a maximum when the coil is in the position shown in Fig. 13.1.

.....

.....

.....[1]

(d) Suggest **one** change that can be made to the setup in Fig. 13.1 so that the coil will experience a larger turning effect.

.....

.....[1]

[Total: 10]

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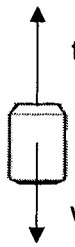
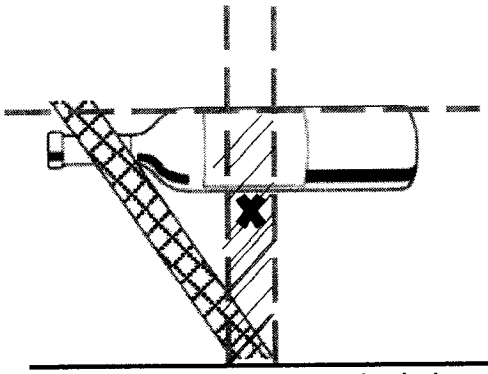
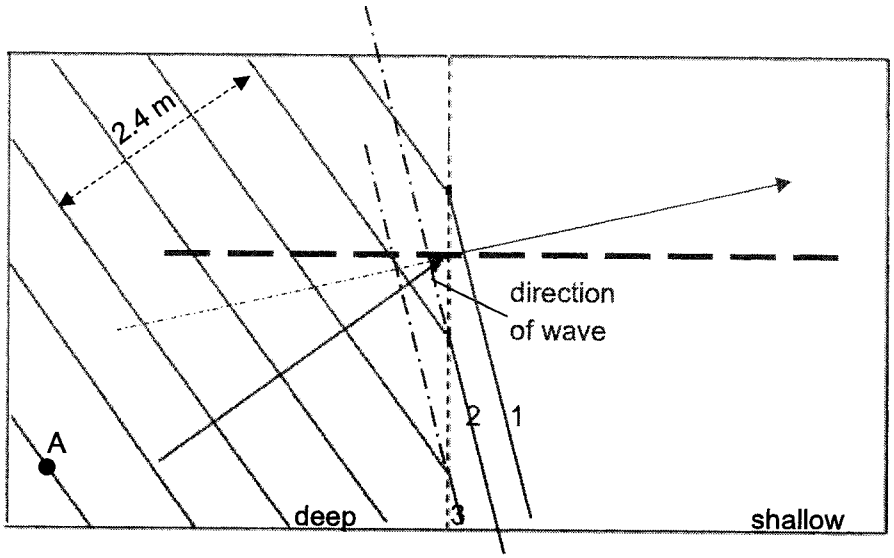
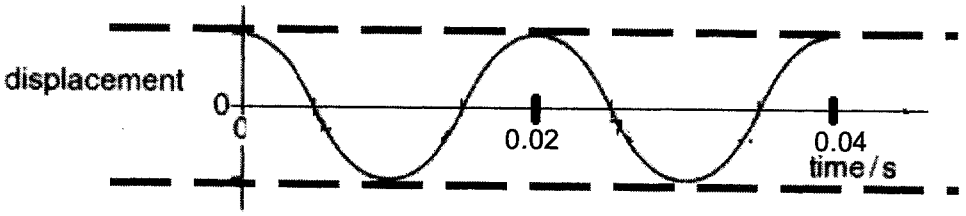
Ans Scheme

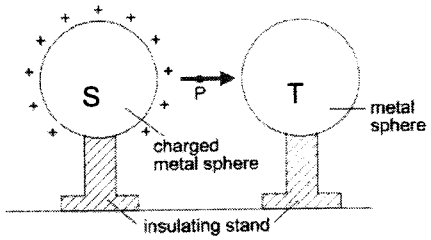
1	a		(From 1.7 s onwards) If there is air resistance, the gradient of the (velocity time) graph should not be a constant.	B1
	b	i	• **From t = 1.7 to 5.0 s**, the drone is travelling upwards (/ away from surface of planet) with (magnitude of) velocity that decreases at a uniform rate. • **At t = 5.0 s**, the drone is temporarily/momentarily at rest • **From 5.0 s to 9.0 s**, the drone is moving downwards (/ towards surface of planet) with (magnitude of) velocity increasing at a uniform rate. No mention of direction -1 (overall) BOD for +ve velocity, -ve velocity for attempt to state direction Not accepted (when "rate" is missing): constant increasing / constant decreasing velocity / velocity increasing/ velocity decreasing if pointer 1 and 3 has "acceleration/ deceleration" minus 1m out of the 2m Point 1 and point 3 has 2 component each (i.e. total 4 component, any 2 component award 1m)	B1 B1 B1
	c	i	Maximum height = area under v-t graph = ½ x 6.6 x 5.0 = 16.5 m = 17 m (2sf but allow 3sf)	C1 A1
		ii	a = [6.6 – (-8.0)]/(1.7 – 9.0) = – 2.0 ms^{-2} (coordinates used to calculate a maybe diff as long as they are obtained from the graph; students can used the positive portion of graph to calc.) W = (5.0) x 2.0 = 10 N (2sf but allow 3sf) ignore -ve sign	M1 A1
2	a		 tension weight / gravitational force (visibly in centre of can)	B1
	b		Constant speed implies zero net force, hence weight = tension. tension = mg	

			= 0.400 x 10 = 4.00 N or 4.0 N (2sf /3sf)	B1
	c	i	Work done is the product of force (applied on object) and the distance moved in the direction of the force.	B1
		ii	Work done by the tension (pulled over a distance /as height is increased) is transferred to the gravitational potential store of the can. Or The gain/ increase in GP store is due to work done provided by the tension (pulled over a distance/height increased) Or Energy/ Work done is transferred mechanically by the tension (as height is increased) to the GP store of the can Gain/ increase/ transferred 1 m Identification of forces and store 1m	B1 B1
	d		Net force = tension – weight = ma tension = ma + mg = (0.400 x 0.65) + (0.400 x 10) = 4.26 N = 4.3 N (2sf but allow 3sf)	M1 A1
	e		The air particles exert a force/ push on the balloon (upwards)	B1
3	a		neutral	B1
	b	i	 Accept X anywhere in blue shaded region	B1
		ii	Line of action of weight is within the base of the bottle holder (which act as the pivot). OR cg is directly above/ within the base/ pivot OR The perpendicular distance, d between the line of action of weight to the pivot (base of the holder) is 0 m. **AND** resultant moment due to the weight and setup about its pivot is 0 Nm/ the structure does not rotate. OR As Mom due to weight = Fxd = 0 OR	B1 B1

			Acw of the setup is equal to the cw of the set up Do not accept :topple (given in question)	
	c		The base of the holder where it is touching the ground should be made with material that is denser/greater weight (since with greater weight/ density at the bottom, the CG will be lowered) OR The bottle holder could be shortened, (the entire CG of the structure will be lowered) OR Make the base area larger (A larger base will allow the cg line of action to fall within the base area even with a greater angle of tilt)	B1
4	a		Pressure is the force applied per unit area.	B1
	b		P (liquid) =pgh = 800 x 10 x 1.6 = 12800 Pa P(gas pump) = P liquid + atm P = 12 800 + 100 000 = 112 800 Pa = 113 000 Pa = 110 000 Pa (2sf/ 3sf has the same final ans) (if 0.80g/cm3 is not converted, -1 mark from total mark awarded) If they convert P(liquid) wrongly, but they add the rest of the working is correct overall, award 1m for method	 M1 C1 A1
	c		The level on left side would be only 0.8 m higher than the level on the right side. AND This is because when the liquid density is doubled, a column with half the original height is needed to produce the same pressure. OR Since P (liquid) =pgh , as the pressure difference and g remains the same, When p is double, height will be halved.	A1 B1
5	a		50 (complete) oscillation by a point on the wave is made per second if they say oscillate give them BOD	B1
	b		wavelength = 2.4 /3 = 0.80 m (2sf but allow 3sf)	A1
	c		velocity	

			= f x λ = 50 x 0.80 = 40 m/s (2sf but allow 3sf) allow ecf from 5(b)	A1

	d		The wavefronts drawn are (looks) parallel to each other The wavefronts drawn are bending downwards with shorter wavelength  The ans (line 1 2 3) depends on how bent the refracted direction of wave in the shallow region. (construction lines not needed for awarding of marks)	A1 M1
	e		 Check amplitude abt the same AND 2 cos waves (not sin)	B1
6	a		Part of the wavelength of the radiation from the hot stove falls within the visible range (so it can be observed as red) whereas the entire wavelength of the radiation from the rock are outside the visible range / within the infrared range (so it can't be observed as red.)	B1 B1
	b		• Travels at 3.0×10^8 m/s in vacuum/air (must state the magnitude of the speed) • Transverse waves • Can travel through vaccum/doesn't need a medium to travel • follow laws of reflection and refraction Any 2	B1 B1

7	a	i	 (give BOD, arrow need not touch the dot P)	B1
	b		(More) electrons from the ground will flow up through the finger to sphere T. (allow the word "negative charge" in place of electron) Sphere T will be negative in charge / negatively charged.	B1 B1
	c		Q = It $2.1 \times 10^{-9} = I\ (500 \times 10^{-3})$ $I = 4.2 \times 10^{-9}$ A (2sf but allow 3sf)	 A1
8	a		Ammeter	B1
	b	i	$R = [(1.7 \times 10^{-8}) \times 0.010]/(2.0 \times 10^{-9})$ = 0.085 Ω (2sf but allow 3sf)	M1 A1
		ii	When the crack widens, the thin wire will be stretched longer and its cross-sectional area becomes smaller, resulting in an increase in its resistance due to R = ρL/A and hence a decrease in the ammeter reading due to I = V/R.	B1 B1 B1
9	a		When there is excess current, the coil (and the iron core) will becomes a **stronger** electromagnet which causes the lower contact of the iron arm to be attracted and swing downward about the pivot. Once contact (upper and lower) is broken, current will stop flowing / circuit is open	B1 B1
	b		Once the circuit is open, solenoid with iron core is no longer an electromagnet (the springy metal will cause) the iron arm to swing back anticlockwise and the two contact point will touch again, allowing the excessive current to flow. The circuit will switch on and off **repeatedly** (iron arm swings up and down repeatedly) as long as the excessive current persists	B1 B1
10	a	i	Emf is the work done by a source in driving a unit charge round a complete circuit.	B1
		ii	Resistance is the ratio of the potential difference across a component to the current flowing through it.	B1

b

intensity / lux	resistance of LDR / kΩ	V_{AB} / V
600	5	4
350	10	6
200	20	8
125 or 120	50	10

Read from graph

Potential divider rule

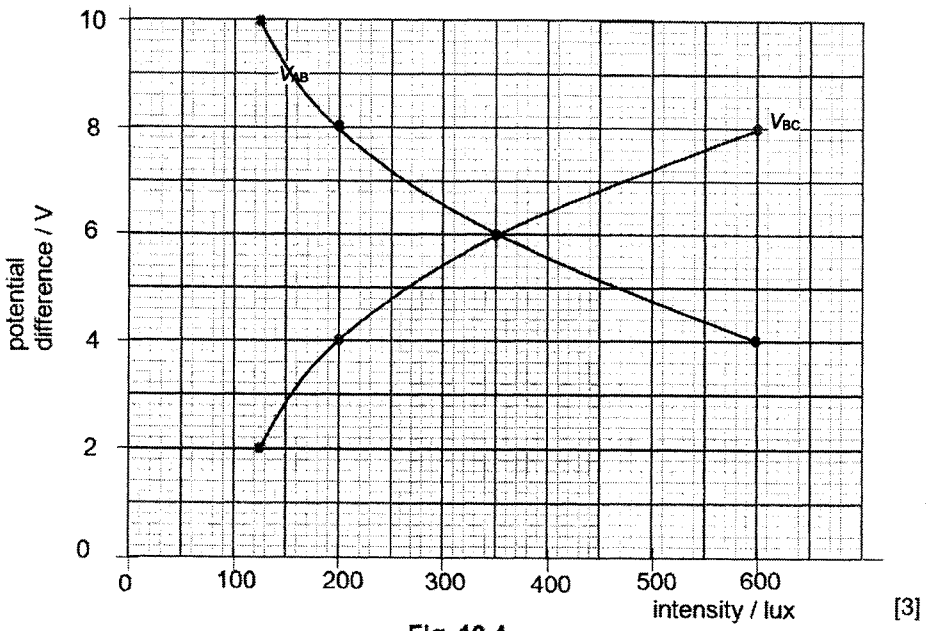
Repeated step

Every 2 boxes correct 1 m

Allow 1sf

B1
B1
B1

c



[3]

Fig. 10.4

1 mark for the curve V_{AB} (allow ecf from table)
AND
1 mark for ensuring **ANY** 2 data points of V_{BC} and V_{AB} such that $V_{BC} + V_{AB} = 12$ V
AND
1 mark the the curve V_{BC} (allow ecf from 1st curve)
if student draw 2 lines that crosses (bad fit), but always add to 12 V, award 2 m? OK

d

As light intensity decreases, the resistance of LDR increases,
this causes the potential across AB to increase.
Since $P = V^2/R$, the power of the bulb increases and — B1

it becomes brighter — B1

<table>
<tr><td>11</td><td>a</td><td></td><td>91</td><td>B1</td></tr>
<tr><td></td><td>b</td><td></td><td>
<table>
<tr><th></th><th>yes</th><th>no</th><th>not possible to tell</th></tr>
<tr><td>an alpha-particle is emitted</td><td></td><td>✓</td><td></td></tr>
<tr><td>a beta-particle is emitted</td><td>✓</td><td></td><td></td></tr>
<tr><td>a gamma ray is emitted</td><td></td><td></td><td>✓</td></tr>
</table>
2 correct – award 1m
3 correct – award 2m</td><td>B2</td></tr>
<tr><td></td><td>c</td><td></td><td>Since both have the same number of protons (91) while protactinium-231 and protactinium-234 have different number of neutrons (140 neutrons and 143 neutrons) respectively.</td><td>B1</td></tr>
<tr><td></td><td>d</td><td>i</td><td>It refers to nuclear radiation in an environment where no radioactive source are deliberately introduced

accept:
radiation naturally occuring in the environment in the absence of other radioactive source.</td><td>B1</td></tr>
<tr><td></td><td></td><td>ii</td><td>radioactive emission is a random process / occurs at random intervals /measurements fluctuate (about an average value)</td><td>B1</td></tr>
<tr><td></td><td></td><td>iii</td><td>count is 40 at 36s
count is 20 at 104s (68s later)
OR
count is 20 at 104s
count is 10 at 172s (68s later)

OR

count is 60 at 0s
count is 30 at 64s (64s later)
OR
count is 30 at 64s
count is 15 at 132s (68s later)

accept 64 s ≤half life ≤ 68 s

indicate on your graph the values (show your working clearly)</td><td>M1
A1</td></tr>
<tr><td></td><td></td><td>iv</td><td>U-234 has very long half-life means it has very slow rate of decay

radiation / count rate due to U-234 insignificant / very much less than that of Pa-234 or (nearly) all of measured radiation / count rate due to Pa-234</td><td>B1

B1</td></tr>
<tr><td>12</td><td>a</td><td></td><td>Water at the bottom heats up, expands, become less dense and rise,</td><td>B1</td></tr>
</table>

			Cooler water at the top being denser sinks. Convection current is set up	B1
	b		$Pt = \Delta m\ L$ $0.120 \times 1000 \times 1 \times 60 \times 60 = [0.746-0.604]L$ Hence, $L = 3.04 \times 10^6$ $= 3.0 \times 10^6$ J/kg (2 s.f.) allow 3sf student forgot LHS need to change to Joules, they left it as 0.120 kWh , -1 m for order?	B1 B1
	c		The energy transferred is used to break(/weaken) the intermolecular bonds holding the particles together. Thus there is an increase in energy in potential store of the particles. As there is no increase in temperature, the kinetic store of the particles did not change.	B1 B1
	d		When the temperature of the water increases, the more energetic water particles are able to break away from the strong forces of attraction exerted by the rest of the water particles Evaporation takes place/ Molecules/ Particles escape/exist as water vapour and hence the mass drop. Evaporation this words is optional okie? as long as particles break away/ escape is mentioned Students may answer this question thinking the water is boiling, in this case 0m straight away: YES	M1 A1
	e		Decrease. Less energy will be transferred from the internal store of water to the surrounding air (/environment)	B1 B1
			OR	
13	a	i	Arrow pointing from A to B or B to C or C to D (arrow must be at the coil not at the external circuit)	B1
		ii	Arrow up on AB side	B1
	b		Using to Fleming Left Hand rule, the magnetic field (point from right to left), will exert an upward force on the wire AB (as current flow from A to B). **AND** Similarly a downward force is exerted in wire CD as current flows in the opposite direction. OR The directions of the electromagnetic force on both sides of the coil are opposite to each other.	B1 B1

			AND Since there are forces on both sides of the coil about the axle, the coil will rotate OR Since moment = f x d, the force will cause a turning effect	B1
	c	i	Moment due to EM force on one side = F x d = 2.0 x 0.10 = 0.20 Nm Total moment = 2 x 0.20 = 0.40 Nm	M1 M1 A1
		ii	At this position, the perpendicular distance between the line of action of the forces (exerted on wire AB and CD) and pivot is the greatest.	B1
	d		Increase the e.m.f of the d.c. supply OR use stronger magnets.OR place soft iron in the middle Do not accept increase the current (as there is not direct action mention to the set up)	B1