UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

PHYSICS **0625/31**

Paper 3 Extended **May/June 2010**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
You may lose marks if you do not show your working or if you do not use appropriate units.
Take the weight of 1 kg to be 10 N (i.e. acceleration of free fall = 10 m/s^2).

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **19** printed pages and **1** blank page.

DC (SHW 00380 1/09) 20284/4

1 Fig. 1.1 shows the speed/time graph for a car travelling along a straight road.

The graph shows how the speed of the car changes as the car passes through a small town.

For Examiner's Use

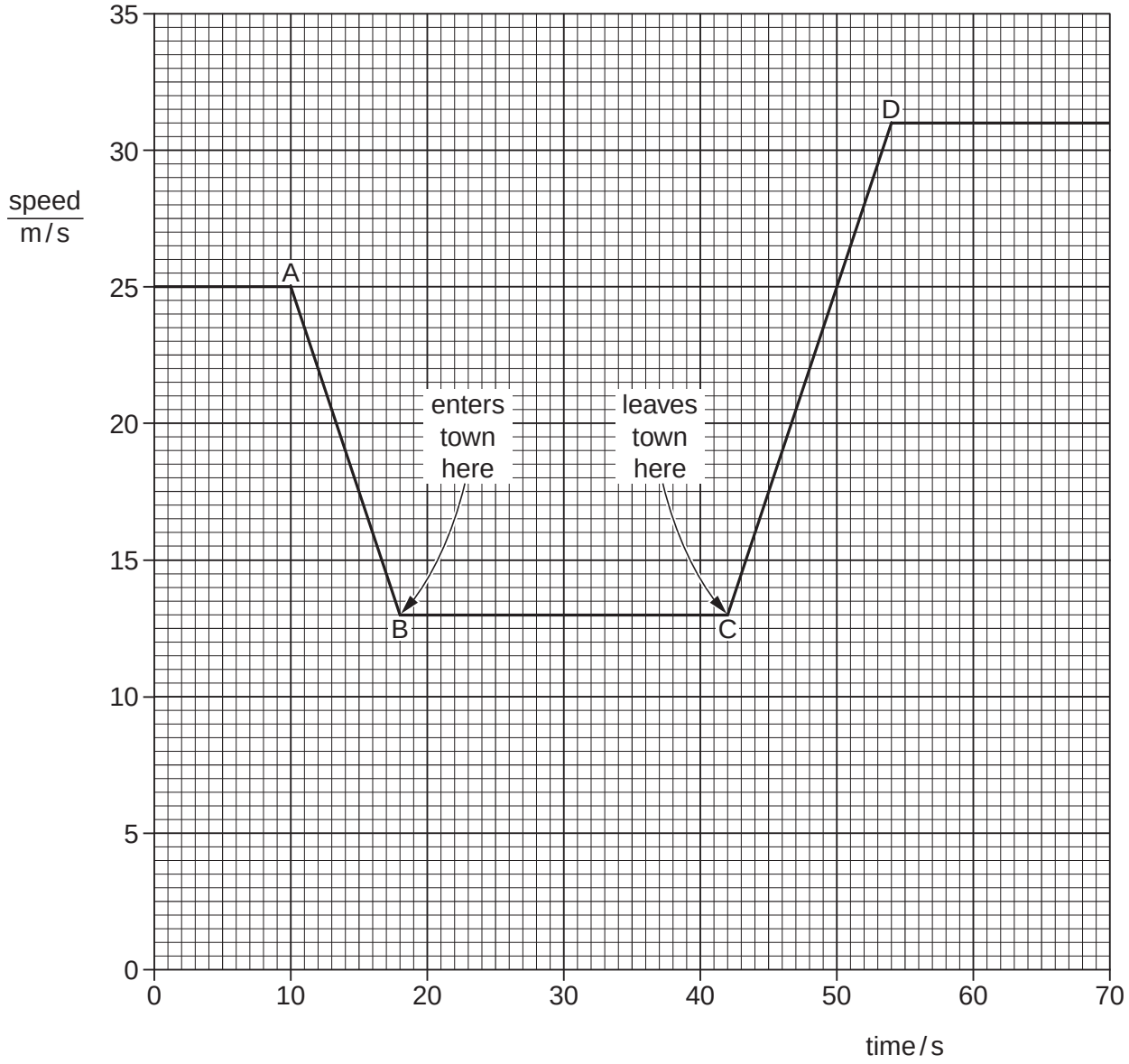

Fig. 1.1

(a) Describe what happens to the speed of the car

(i) between A and B, ...

(ii) between B and C, ...

(iii) between C and D. .....

[1]

(b) Calculate the distance between the start of the town and the end of the town.

For Examiner's Use

distance = ... [3]

(c) Calculate the acceleration of the car between C and D.

acceleration = ... [3]

(d) State how the graph shows that the deceleration of the car has the same numerical value as its acceleration.

.....

..... [1]

[Total: 8]

2 A car of mass 900 kg is travelling at a steady speed of 30 m / s against a resistive force of 2000 N, as illustrated in Fig. 2.1.

For Examiner's Use

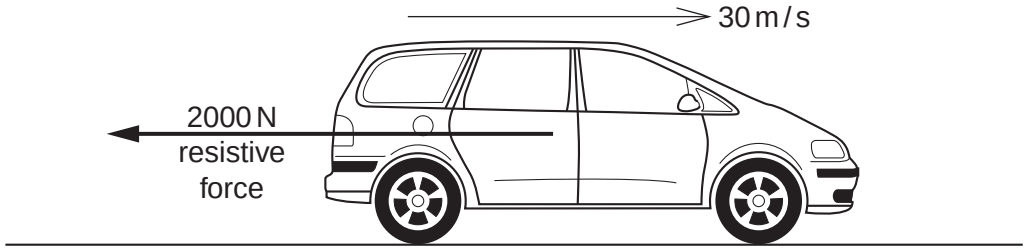

Fig. 2.1

(a) Calculate the kinetic energy of the car.

kinetic energy = ... [2]

(b) Calculate the energy used in 1.0 s against the resistive force.

energy = ... [2]

(c) What is the minimum power that the car engine has to deliver to the wheels?

minimum power = ... [1]

(d) What form of energy is in the fuel, used by the engine to drive the car?

..... [1]

For Examiner's Use

(e) State why the energy in the fuel is converted at a greater rate than you have calculated in **(c)**.

.....

..... [1]

[Total: 7]

3 Two students make the statements about acceleration that are given below.

For Examiner's Use

Student A: For a given mass the acceleration of an object is proportional to the resultant force applied to the object.

Student B: For a given force the acceleration of an object is proportional to the mass of the object.

(a) One statement is correct and one is incorrect.

Re-write the incorrect statement, making changes so that it is now correct.

For a given ..... the acceleration of an object is .....

..... [1]

(b) State the equation which links acceleration *a*, resultant force *F* and mass *m*.

[1]

(c) Describe what happens to the motion of a moving object when

(i) there is no resultant force acting on it,

..... [1]

(ii) a resultant force is applied to it in the opposite direction to the motion,

..... [1]

(iii) a resultant force is applied to it in a perpendicular direction to the motion.

..... [1]

[Total: 5]

For Examiner's Use

4 **(a)** Four identical metal plates, at the same temperature, are laid side by side on the ground. The rays from the Sun fall on the plates.

One plate has a matt black surface.

One plate has a shiny black surface.

One plate has a matt silver surface.

One plate has a shiny silver surface.

State which plate has the fastest-rising temperature when the sunlight first falls on the plates.

..... [1]

(b) The apparatus shown in Fig. 4.1 is known as Leslie's Differential Air Thermometer.

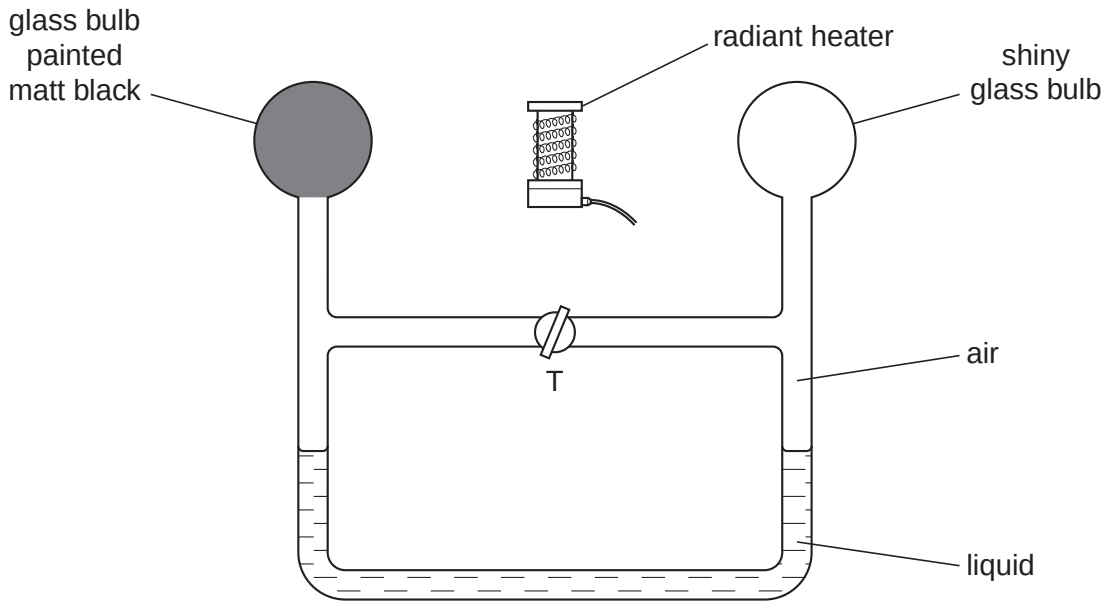

Fig. 4.1

The heater is switched off. Tap T is opened so that the air on the two sides of T has the same pressure. Tap T is then closed.

(i) The heater is switched on. On Fig. 4.1, mark clearly where the two liquid levels might be a short time later. [1]

(ii) Explain your answer to **(b)(i)**.

.....

.....

..... [2]

[Total: 4]

5 A certain substance is in the solid state at a temperature of –36 °C. It is heated at a constant rate for 32 minutes. The record of its temperature is given in Fig. 5.1.

For Examiner's Use

time / min	0	1	2	6	10	14	18	22	24	26	28	30	32
temperature / °C	–36	–16	–9	–9	–9	–9	32	75	101	121	121	121	121

Fig. 5.1

(a) State what is meant by the term *latent heat*.

.....

..... [2]

(b) State a time at which the energy is being supplied as latent heat of fusion.

..... [1]

(c) Explain the energy changes undergone by the molecules of a substance during the period when latent heat of vaporisation is being supplied.

.....

.....

..... [2]

(d) **(i)** The rate of heating is 2.0 kW.

Calculate how much energy is supplied to the substance during the period 18 – 22 minutes.

energy supplied = ... [2]

(ii) The specific heat capacity of the substance is 1760 J / (kg °C).

Use the information in the table for the period 18 – 22 minutes to calculate the mass of the substance being heated.

For Examiner's Use

mass heated = ... [3]

[Total: 10]

6 Some plane waves travel on the surface of water in a tank. They pass from a region of deep water into a region of shallow water. Fig. 6.1 shows what the waves look like from above.

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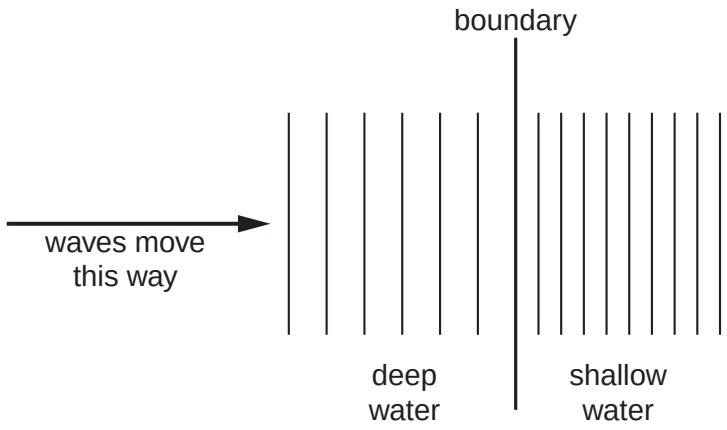

Fig. 6.1

(a) State what happens at the boundary, if anything, to

(i) the frequency of the waves,

..... [1]

(ii) the speed of the waves,

..... [1]

(iii) the wavelength of the waves.

..... [1]

(b) The waves have a speed of 0.12 m / s in the deep water. Wave crests are 0.08 m apart in the deep water.

Calculate the frequency of the source producing the waves. State the equation that you use.

frequency = ... [3]

(c) Fig. 6.2 shows identical waves moving towards the boundary at an angle.

For Examiner's Use

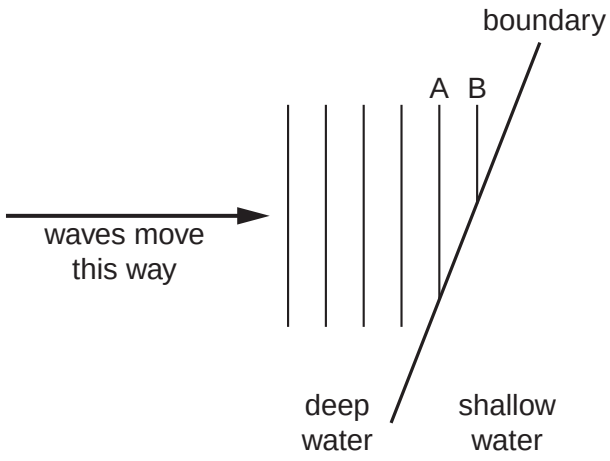

Fig. 6.2

On Fig. 6.2, draw carefully the remainder of waves A and B, plus the two previous waves which reached the shallow water. You will need to use your ruler to do this. [3]

[Total: 9]

7 During a thunderstorm, thunder and lightning are produced at the same time.

For Examiner's Use

(a) A person is some distance away from the storm.

Explain why the person sees the lightning before hearing the thunder.

.....

.....

..... [1]

(b) A scientist in a laboratory made the following measurements during a thunderstorm.

time from start of storm / minutes	0.0	2.0	4.0	6.0	8.0	10.0
time between seeing lightning and hearing thunder / s	3.6	2.4	1.6	2.4	3.5	4.4

Fig. 7.1

(i) How many minutes after the storm started did it reach its closest point to the laboratory?

..... [1]

(ii) How can you tell that the storm was never immediately over the laboratory?

..... [1]

(iii) When the storm started, it was immediately above a village 1200 m from the laboratory.

Using this information and information from Fig. 7.1, calculate the speed of sound.

speed of sound = ... [2]

(iv) State the assumption you made when you calculated your answer to **(b)(iii)**.

..... [1]

(c) Some waves are longitudinal; some waves are transverse.

Some waves are electromagnetic; some waves are mechanical.

Put ticks (✓) in the table below to indicate which of these descriptions apply to the light waves of the lightning and the sound waves of the thunder.

	light waves	sound waves
longitudinal		
transverse		
electromagnetic		
mechanical		

[3]

[Total: 9]

For Examiner's Use

8 **(a)** The transformer in Fig. 8.1 is used to convert 240V a.c. to 6V a.c.

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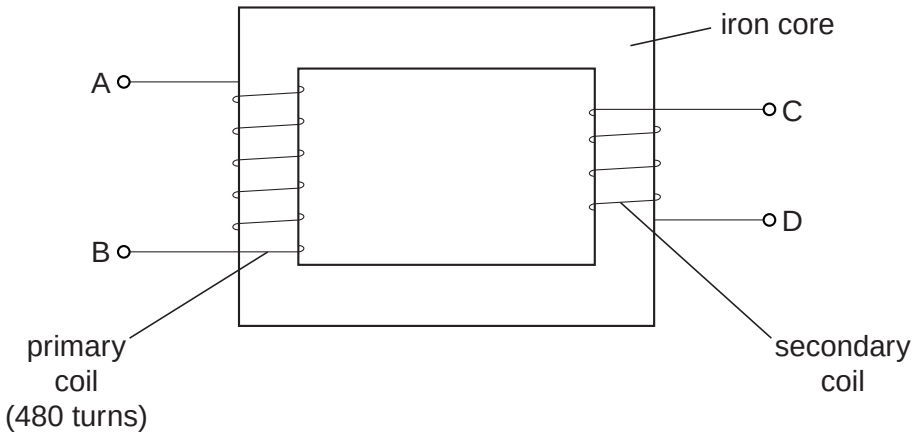

Fig. 8.1

(i) Using the information above, calculate the number of turns on the secondary coil.

number of turns = ... [2]

(ii) Describe how the transformer works.

.....

.....

.....

.....

..... [3]

(iii) State one way in which energy is lost from the transformer, and from which part it is lost.

..... [1]

(b) Fig. 8.2 shows a device labelled “IGCSE Transformer”.

For Examiner's Use

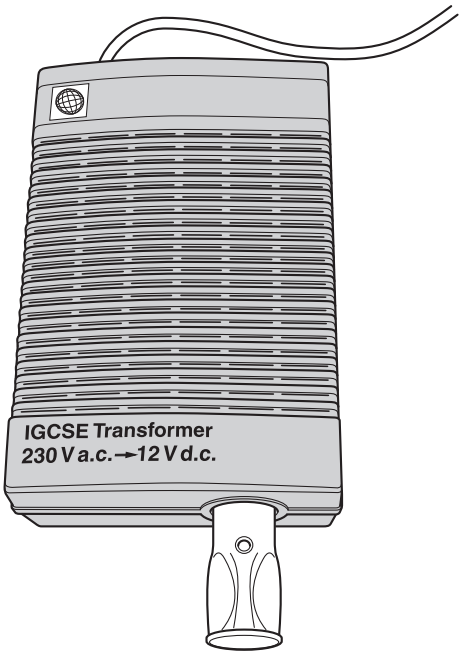

Fig. 8.2

Study the label on the case of the IGCSE Transformer.

(i) What is the output of the device? ..... [1]

(ii) From the information on the case, deduce what other electrical component must be included within the case of the IGCSE Transformer, apart from a transformer.

..... [1]

(c) A transformer supplying electrical energy to a factory changes the 11 000 V a.c. supply to 440 V a.c. for use in the factory. The current in the secondary coil is 200 A.

Calculate the current in the primary coil, assuming no losses from the transformer.

current = ... [2]

[Total: 10]

9 **(a)** Fig. 9.1 illustrates the left hand rule, which helps when describing the force on a current-carrying conductor in a magnetic field.

For Examiner's Use

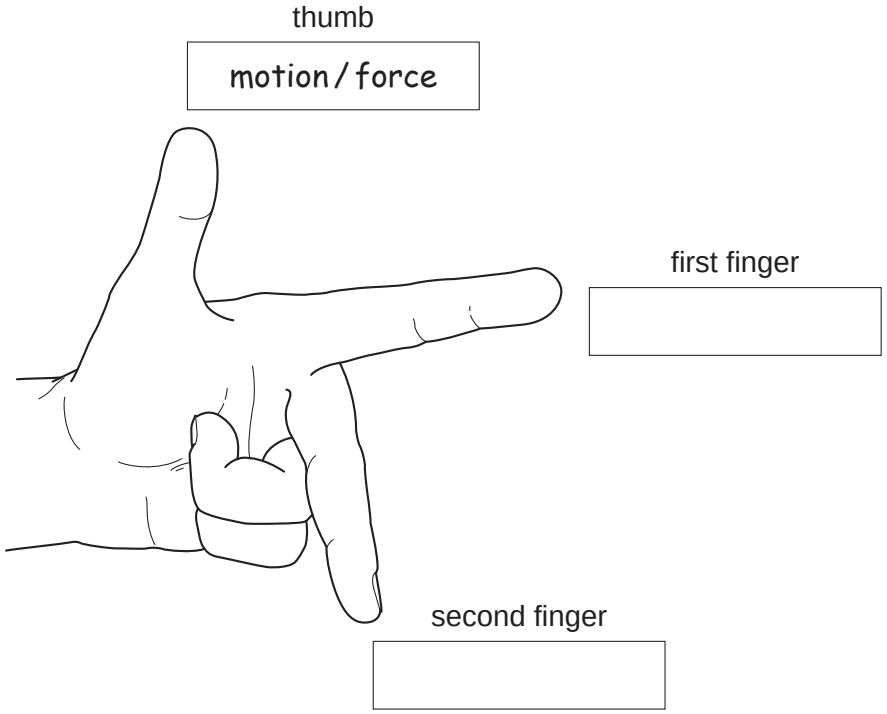

Fig. 9.1

One direction has been labelled for you.

In each of the other two boxes, write the name of the quantity that direction represents. [1]

(b) Fig. 9.2 shows a simple d.c. motor connected to a battery and a switch.

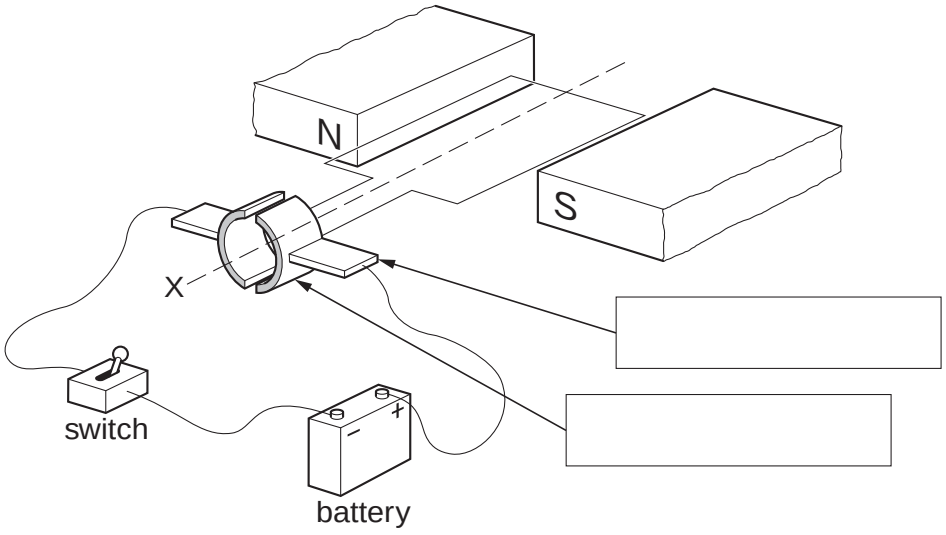

Fig. 9.2

(i) On Fig. 9.2, write in each of the boxes the name of the part of the motor to which the arrow is pointing. [2]

For Examiner's Use

(ii) State which way the coil of the motor will rotate when the switch is closed, when viewed from the position X.

..... [1]

(iii) State two things which could be done to increase the speed of rotation of the coil.

1. .....

2. ..... [2]

[Total: 6]

10 A certain element is known to exist as two different isotopes.

For Examiner's Use

(a) State one thing that is the same for atoms of both isotopes.

..... [1]

(b) State one thing that is different between atoms of these two isotopes.

..... [1]

(c) An atom of one of these isotopes is unstable and decays into a different element by emitting a β-particle.

(i) State one thing about the atom that remains the same during this decay.

..... [1]

(ii) State one thing about the atom that changes as a result of this decay.

..... [1]

[Total: 4]

11 **(a)** A coil of wire is connected into a circuit containing a variable resistor and a battery.

The variable resistor is adjusted until the potential difference across the coil is 1.8 V.

In this condition, the current in the circuit is 0.45 A.

Calculate

(i) the resistance of the coil,

resistance = ... [1]

(ii) the thermal energy released from this coil in 9 minutes.

energy released = ... [3]

(b) The coil in part **(a)** is replaced by one made of wire which has half the diameter of that in **(a)**.

When the potential difference across the coil is again adjusted to 1.8 V, the current is only 0.30 A.

Calculate how the length of wire in the second coil compares with the length of wire in the first coil.

length of wire in second coil is …… the length of wire in first coil [4]

[Total: 8]

For Examiner's Use

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