UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

PHYSICS **0625/23**

Paper 2 Core **May/June 2013**

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 pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
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.

For Examiner's Use	
1	
2	
3	
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7	
8	
9	
10	
11	
12	
Total	

This document consists of **16** printed pages.

1 Small drops of water fall at regular intervals from a leaking tap (faucet).

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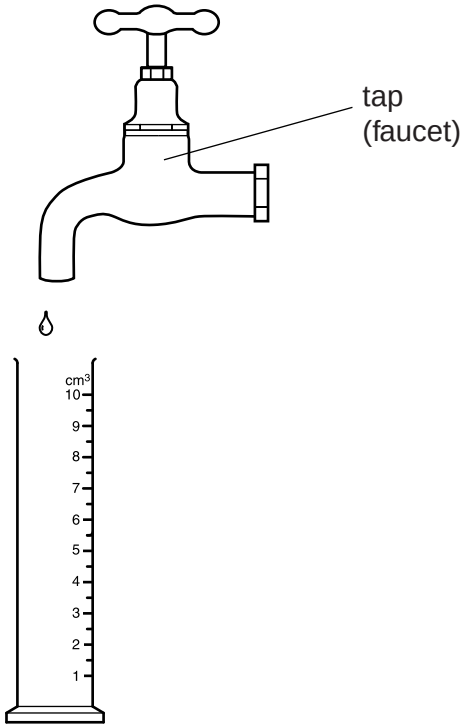

Fig. 1.1

Immediately after a drop has fallen, a student puts an empty measuring cylinder under the tap, to catch the drops.

At the same time, her friend starts a stopwatch.

After 50 drops have fallen, she stops the stopwatch.

Fig. 1.2 shows the reading on the stopwatch at the start and finish of this experiment.

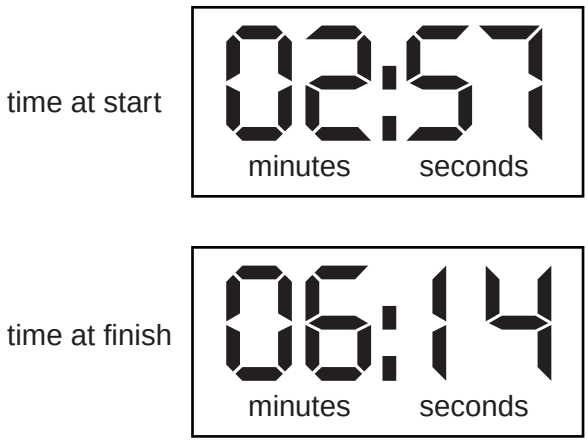

Fig. 1.2

Fig. 1.3 shows the measuring cylinder at the finish.

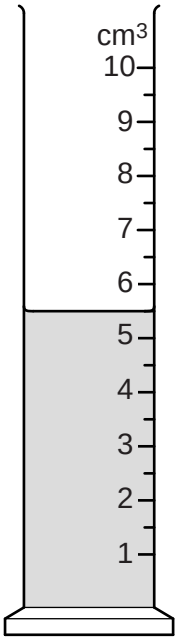

Fig. 1.3

(a) (i) For how many seconds did the girl catch drops from the tap?

number of seconds = ...[3]

(ii) Calculate the time interval between one drop and the next.

time interval = ... s [2]

(b) (i) What is the total volume of the 50 drops?

volume = ... cm^3

(ii) Calculate the volume of one drop.

volume = ... cm^3
[2]

[Total: 7]

2 Fig. 2.1 shows a simple barometer. The vertical tube is fixed in position.

For Examiner's Use

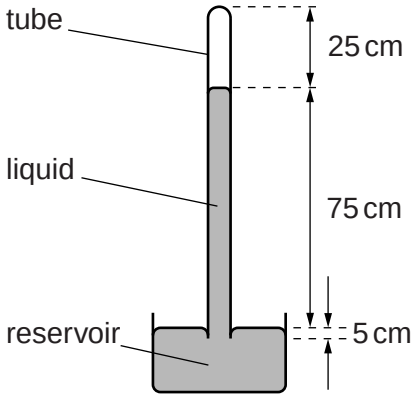

Fig. 2.1

(a) Suggest which liquid is contained in the barometer.

.....[1]

(b) What occupies the space in the tube, above the liquid?

.....[1]

(c) Three distances are marked on Fig. 2.1.

Which distance enables the atmospheric pressure to be deduced?

.....[1]

(d) The atmospheric pressure increases.

State **one** of the three marked distances that decreases.

.....[1]

(e) The tube is accidentally knocked at the top, so that a small crack is caused at the top of the tube. Air leaks in through the crack.

Describe what effect, if any, this has on the level of the liquid in the tube.

.....

.....

.....[2]

[Total: 6]

3 The arrows on Fig. 3.1 indicate the changes between the three states of matter.

For Examiner's Use

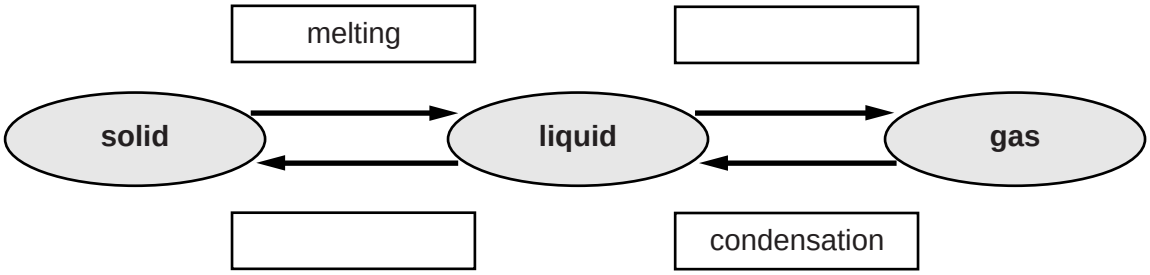

Fig. 3.1

(a) On Fig. 3.1, two of the changes have been labelled. In the empty boxes, label the other two changes. [2]

(b) In terms of molecules and temperatures, describe what happens during melting.

.....

.....

.....

.....[3]

(c) Pure water turns from liquid to solid at 0 °C.

(i) What name do we give to this temperature?

.....

(ii) At what temperature does solid water (ice) turn back to liquid water?

.....
[2]

[Total: 7]

4 **(a)** Explain why metals are able to conduct electricity well, whereas insulators, like plastic, are very poor conductors.

.....

.....

.....

.....

.....

.....[4]

(b) A plastic rod is rubbed with a dry cloth, as shown in Fig. 4.1.

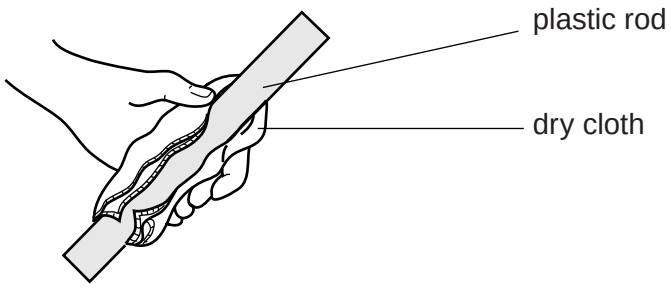

Fig. 4.1

After this, the rod is held close to a girl's long hair. The hair is attracted to the rod.

Suggest why this happens.

.....

.....

.....[2]

[Total: 6]

5 Fig. 5.1 shows a circuit with two ammeters, X and Y.

For Examiner's Use

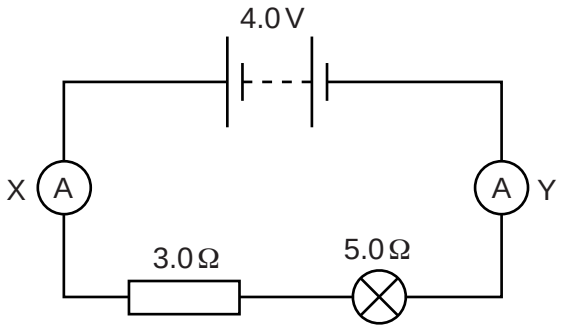

Fig. 5.1

(a) Name the component that has 5.0 Ω resistance.

.....[1]

(b) **(i)** Calculate the current in the circuit. Your answer must include the unit.

current = ...[5]

(ii) State the reading on

1. ammeter X, ...

2. ammeter Y. .....

[1]

(c) **(i)** On Fig. 5.1 show a voltmeter connected to record the potential difference across the resistor. Use the standard symbol for a voltmeter. [2]

(ii) Calculate the reading on the voltmeter.

reading = ... V [1]

[Total: 10]

For Examiner's Use

6 **(a)** A technician has an unmagnetised steel rod.

Describe how the technician can permanently magnetise the steel rod.

.....

.....

.....

.....

.....[2]

(b) The technician places two magnets on a bench, in the positions shown in Fig. 6.1.

Fig. 6.1

Which of the following describes the magnetic force between the magnets? Tick one box.

attractive ☐

repulsive ☐

no force ☐ [1]

(c) The technician now places an unmagnetised iron rod between the magnets, as shown in Fig. 6.2.

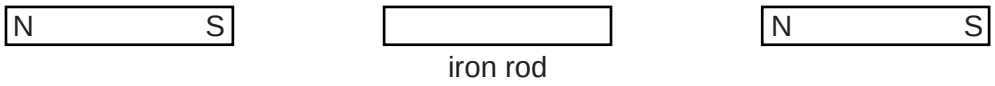

Fig. 6.2

On Fig. 6.2, label the N pole and the S pole induced on the iron rod. [1]

(d) Finally, the technician places one magnet and a charged plastic rod on the bench, as shown in Fig. 6.3.

For Examiner's Use

Fig. 6.3

Which of the following describes the magnetic force between the magnet and the rod? Tick one box.

attractive ☐

repulsive ☐

no force ☐ [1]

[Total: 5]

7 Waves are either transverse or longitudinal.

Write either “transverse” or “longitudinal” in the space alongside each of the following descriptions.

description	type of wave
This type of wave has vibrations at right angles to the direction in which the wave energy is travelling.	
This type of wave has vibrations along the direction in which the wave energy is travelling.	
A sound wave is an example of this type of wave.	
A ripple on the surface of water is an example of this type of wave.	

[3]

[Total: 3]

8 **(a)** An electric bell hangs from flexible wires inside a glass bell-jar, as shown in Fig. 8.1.

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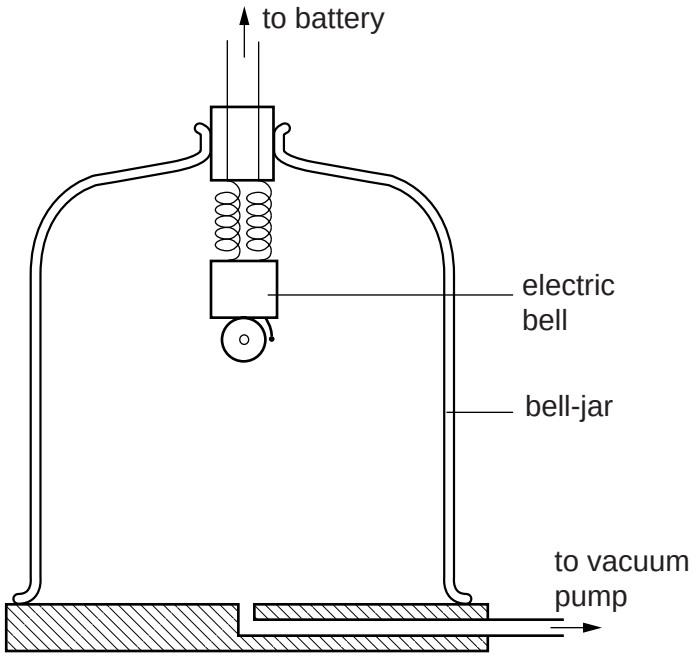

Fig. 8.1

(i) When air is present in the bell-jar, the electric bell can be heard ringing clearly.

What properties of sound does this observation illustrate? Tick the box alongside any appropriate answer.

sound travels through air	☐
sound travels through glass	☐
sound travels faster than light	☐
sound travels infinitely fast	☐

[2]

(ii) As the vacuum pump removes the air from the bell-jar, the sound becomes quieter. Eventually the sound cannot be heard at all, even though the bell can still be seen to be working.

Suggest what property of sound this observation demonstrates.

.....

.....[1]

(b) Fig. 8.2 illustrates a quarry where rock blasting is being carried out.

For Examiner's Use

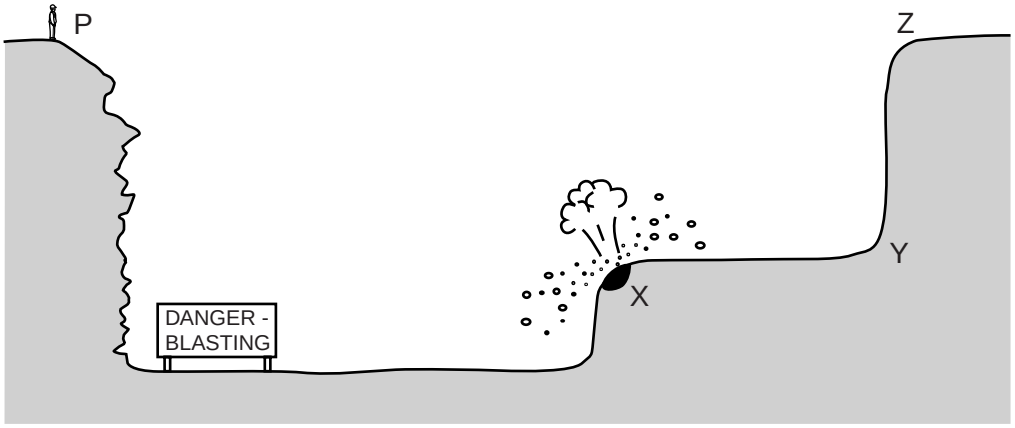

Fig. 8.2

An engineer at P sees the blast of an explosion at X, and after a short delay he hears two bangs separated by a very short interval.

(i) Explain why the engineer hears two bangs.

.....

.....

.....

.....[3]

(ii) The distance PX is 195 m and the short delay between seeing the blast and hearing the first bang is 0.60 s.

Calculate the speed of sound.

speed = ... m/s [3]

[Total: 9]

For Examiner's Use

9 **(a)** The transformer in Fig. 9.1 is being used in an attempt to light a lamp using a 120V a.c. mains supply. The lamp is designed for use in a country where the mains supply is 240V a.c.

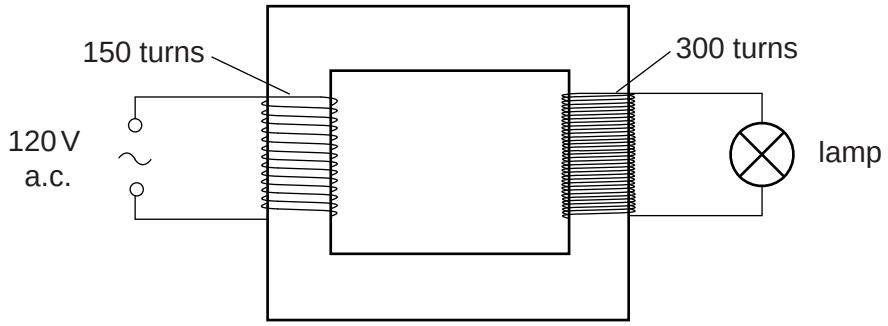

Fig. 9.1

(i) **1.** Calculate the voltage across the lamp in this arrangement.

voltage = ... V [3]

2. Comment on the brightness of the lamp in this arrangement.

.....

.....

.....[2]

(ii) The transformer is reversed, so that the 300 turn coil is connected to the 120V a.c. supply and the 150 turn coil is connected to the lamp.

Comment on the brightness of the lamp in this arrangement. Explain your answer.

.....

.....

.....[2]

(b) In the National Grid system of electrical energy transmission, a transformer links the power station to the transmission cables, as shown in Fig. 9.2.

For Examiner's Use

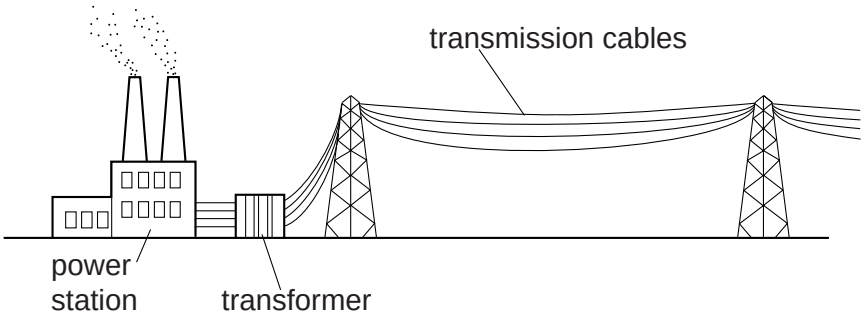

Fig. 9.2

(i) Why is a transformer used here?

.....

.....[1]

(ii) What has to be done at the other end of the transmission cables, before connection is made to a factory in a town?

.....

.....[1]

[Total: 9]

10 Fig. 10.1 illustrates the energy into and out of a machine.

For Examiner's Use

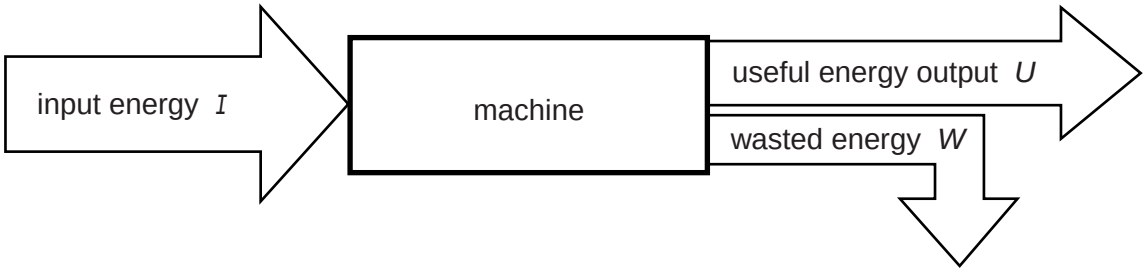

Fig. 10.1

(a) Write an equation that links *I*, *U* and *W*.

[1]

(b) Which of these three quantities needs to be as low as possible in order to keep the efficiency of the machine as high as possible?

.....[1]

(c) The machine gets older and parts of it become worn.

Suggest what is likely to happen, for the same input energy *I*, to

(i) the useful energy output *U*, ...

(ii) the wasted energy *W*, ...

(iii) the efficiency of the machine. .....

[3]

[Total: 5]

11 **(a)** The α-particle source in Fig. 11.1 is placed 1 cm from a radiation detector connected to a ratemeter. The ratemeter gives a count-rate reading of 600 counts / min.

For Examiner's Use

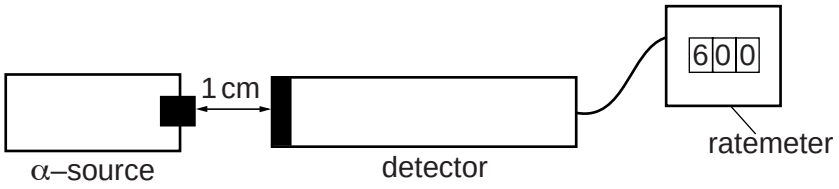

Fig. 11.1

The source is then moved to a distance of 50 cm from the detector and the count-rate reading on the ratemeter becomes 25 counts / min.

Predict what the count-rate will be when the source is moved to a distance of 100 cm from the detector. Explain your answer.

count-rate = ... counts / min

explanation .....

.....[2]

(b) Fig. 11.2 shows aluminium being rolled into a thin sheet suitable for cooking foil. β-particles are being used to monitor and control the thickness of the foil.

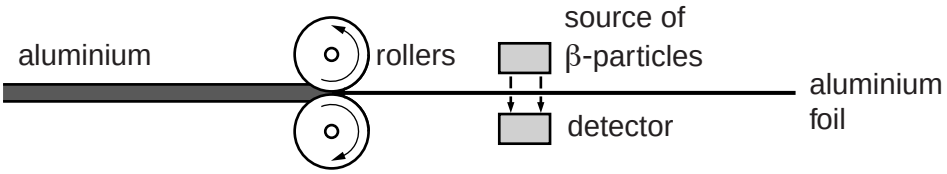

Fig. 11.2

(i) An adjustment to the rollers is made and the foil becomes thicker.

What happens to the rate at which β-particles are detected?

.....[1]

(ii) Assuming that all suitable safety precautions are taken, explain

1. why α-particles would not be suitable in this application,

.....

.....

2. why γ-rays would not be suitable in this application.

.....

.....
[2]

[Total: 5]

For Examiner's Use

12 The nucleus of uranium-238 is represented in nuclide notation as $^{238}_{92}U$.

(a) (i) State the meaning of the *nucleon number* of a nuclide.

.....

.....

(ii) State the value of the nucleon number of $^{238}_{92}U$.

.....

[2]

(b) A nucleus of $^{238}_{92}U$ decays by emitting an α-particle. It becomes a nucleus of thorium (Th).

(i) State

1. the nucleon number of an α-particle, ...

2. the proton number of an α-particle. .....

[2]

(ii) In nuclide notation, the thorium nucleus formed is written as $^{X}_{Y}Th$.

State the values of

1. X ..... ,

2. Y ..... .

[2]

(c) (i) How many electrons are to be found in a neutral atom of $^{238}_{92}U$? .....

(ii) Where in the atom are these electrons to be found?

.....

[2]

[Total: 8]