Paper Reference(s)

7540/01

London Examinations GCE

Physics

Ordinary Level

Paper 1

Friday 8 May 2009 – Afternoon

Time: 1 hour 15 minutes

Materials required for examination
Nil

Items included with question papers
Nil

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.
Check that you have the correct question paper.
Answer ALL the questions. Write your answers in the spaces provided in this question paper.
Some questions must be answered with a cross in a box (☒). If you change your mind about an answer, put a line through the box (☒) and then mark your new answer with a cross (☒).

Information for Candidates

Calculators may be used.
Where necessary, assume the acceleration of free fall, $g = 10 \text{ m/s}^2$.
The total mark for this paper is 70. The marks for parts of questions are shown in round brackets:
e.g. **(2)**.
This paper has 11 questions. All blank pages are indicated.

Advice to Candidates

Write your answers neatly and in good English.
In calculations, show **all** the steps in your working.
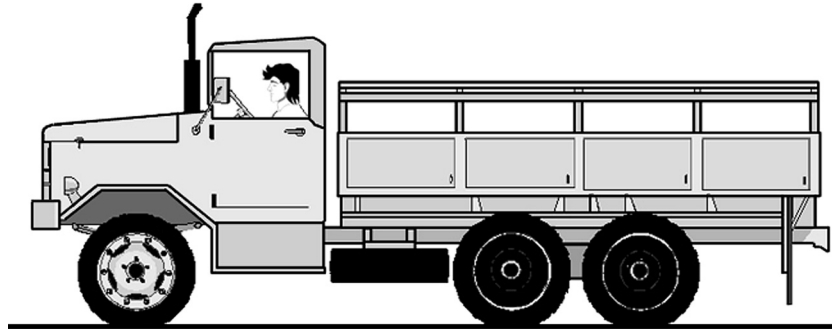
Turn over

Answer ALL the questions.

1. The diagram shows a lorry of mass 30 000 kg travelling at a steady speed of 25 m/s on a horizontal road.

    (a) Calculate the weight of this lorry.

    ....
    (1)

    (b) A car travelling in the same direction and in front of the lorry brakes sharply and comes to a halt 20 m in front of the lorry.

        (i) The lorry driver has a reaction time of 0.60 s before applying the brakes. Show, by calculation, that the lorry does not collide with the car during this 0.60 s.

        ....

        ....

        ....
        (3)

        (ii) Name the type of force that stops the car.

        Type of force ....
        (1)

(c) When a driver applies the brakes, the distance travelled during braking is the braking distance. The mass of the lorry is thirty times the mass of the car. The lorry and the car have the same speed.

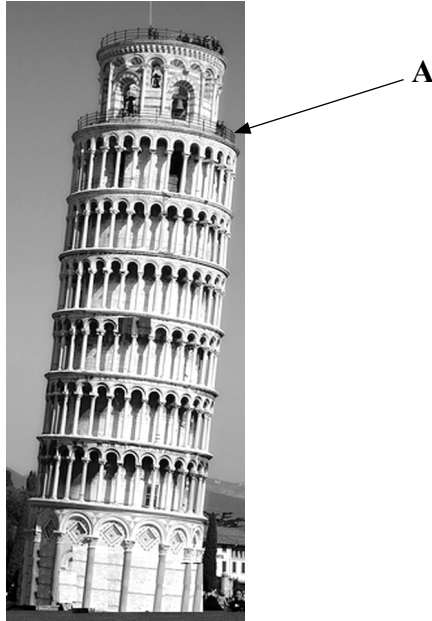Explain why they both can have the same braking distance.

....

....

....

....

(2)

(Total 7 marks)

Q1

N 3 1 3 8 1 A 0 3 1 6

2. The photograph shows the Leaning Tower of Pisa in Italy.

A

(a) In the 16th century Galileo Galilei is said to have experimented by dropping different size cannonballs from the top of the tower. People thought that a heavier cannonball would fall more quickly than a lighter one.

What did Galileo's experiment show?

....

(1)

(b) When such an experiment is carried out using modern timing equipment it is found that a heavier cannonball reaches the ground slightly sooner than a lighter one. Explain why this happens.

....

....

....

(2)

(c) A heavy cannonball is dropped from point **A** and takes 3.2 s to reach the ground. Calculate the height of **A** above the ground.

....

....

....

....

....

(2)

(d) Calculate the speed of this heavy cannonball as it hits the ground.

....

....

....

....

(2)

(Total 7 marks)

Q2

3. The diagrams show a water manometer connected to a laboratory gas supply. The first diagram shows the water levels in the two arms when the gas tap was closed, the second when the gas tap had been opened.
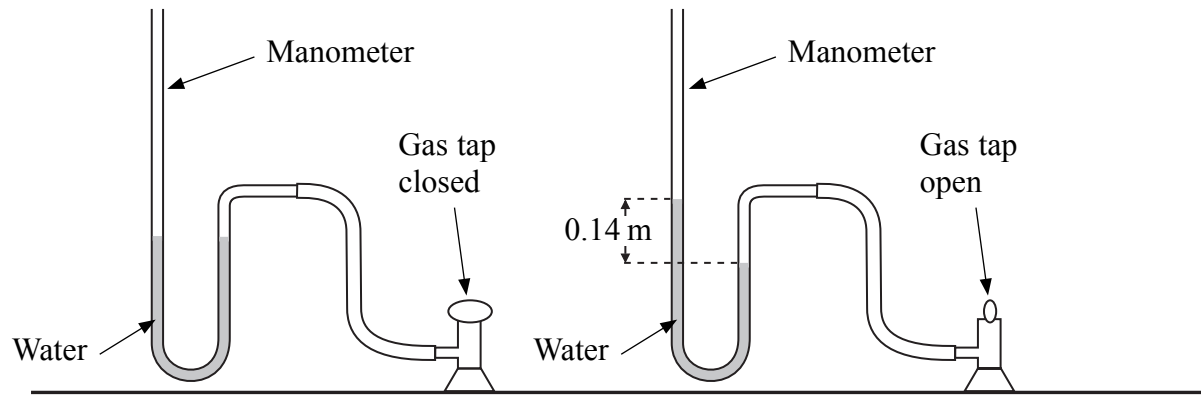
(a) Why were the water levels the same in both arms when the gas tap was closed?

....

....

(1)

(b) When the gas tap was opened the levels of the water changed until there was a final difference of 0.14 m as shown.

(i) Explain why the water levels changed when the gas tap was opened.

....

....

(1)

(ii) Explain why the water levels stopped changing when the difference reached 0.14 m even though the gas tap was still open.

....

....

....

(2)

(c) Calculate the pressure difference due to a column of water 0.14 m high.
[Density of water = 1000 kg/m³]

....

....

....

(2)

(d) Give a reason why this water manometer would be unsuitable for measuring a gas pressure of 150 000 Pa.

....

....

....

(1)

(e) What practical change could be made to this manometer to allow it to be used to measure a pressure of 150 000 Pa?

....

....

....

(1) Q3

(Total 8 marks)

4. The photograph shows a wind turbine that generates electricity.

(a) The overall energy transfer that takes place is:

.... energy to .... energy

(1)

(b) When the power available from the wind is 150 MW, the wind turbine produces 60 MW of electrical power. Calculate the efficiency of this wind turbine.

....

....

....

(2)

(c) A disadvantage of using wind turbines is that they are expensive to build. Give one advantage of using wind turbines to generate electricity.

....

....

(1)

Q4

(Total 4 marks)

5. The diagram shows an arrangement that can be used to investigate how the pressure of dry air depends on temperature. The initial temperature of the water in the beaker and the reading on the pressure gauge are recorded and then the Bunsen burner is turned on. A number of sets of measurements are recorded.
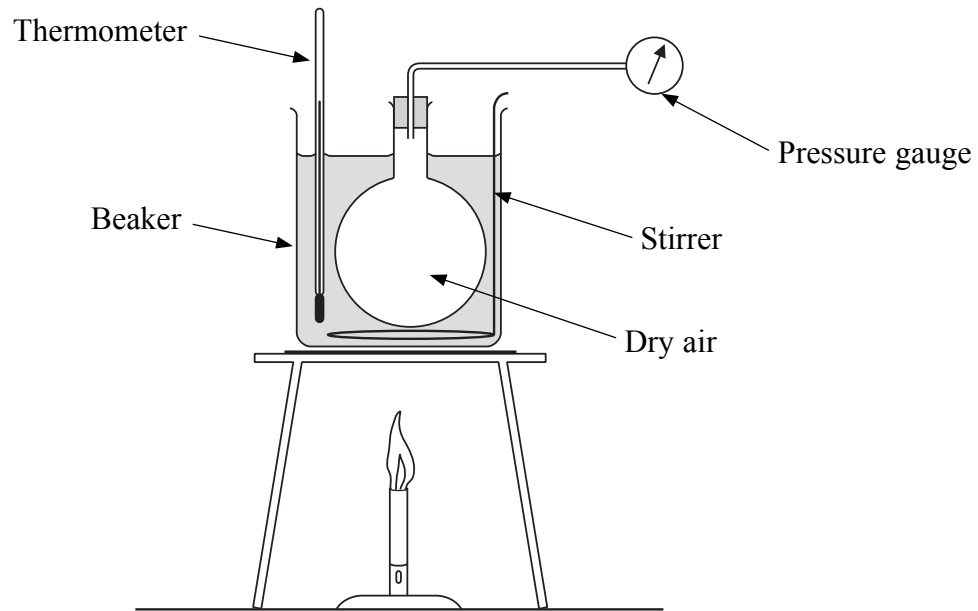
(a) Give **two** precautions which should be taken before recording each set of readings.

1 ....

....

2 ....

....

(2)

(b) The initial temperature and pressure of the dry air were 27 °C and 102 kPa. Calculate the pressure when the temperature is 77 °C.

....

....

....

....

(3)

(c) At what temperature would the pressure of the dry air become zero?

....

(1)

(Total 6 marks)

Q5

6. (a) A generator supplies current to a filament lamp.

    (i) The transfer of energy within the generator is

       .... energy to .... energy

       (1)

    (ii) A transfer of energy within the filament lamp is

       .... energy to .... energy

       (1)

(b) The diagram shows a current–time graph
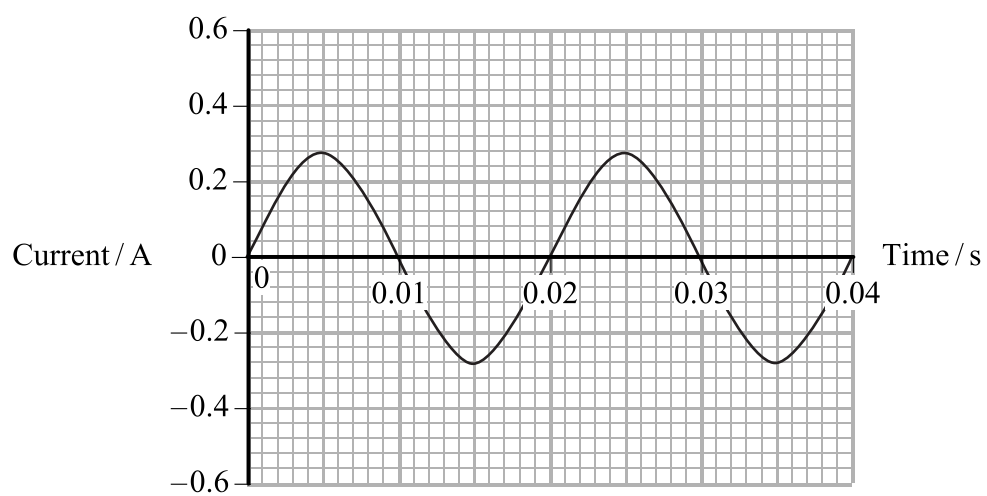
Use the graph to determine

(i) the peak value of the current

       ....

       (1)

(ii) the frequency of the current

    ....

    ....

       (2)

(c) On the diagram draw the current–time graph for a current with the same peak value and half the frequency of the current shown above.

       (2)

       (Total 7 marks)

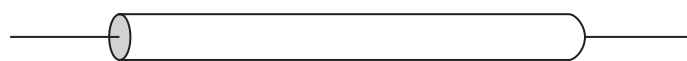7. The diagram shows a dry cell and a metal conductor.
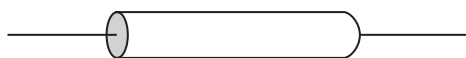
(a) Using the above symbols and others, complete the circuit diagram to show how the resistance of the metal conductor could be determined.

(2)

(b) The potential difference across the metal conductor is 1.4 V and the current is 0.0020 A. Calculate the resistance of the metal conductor.

....

....

....

(2)

(c) The same potential difference is applied to a metal conductor of double the length.

What will be the new current?   .... A

(1)

(d) Apart from length, state **two** other variables that would affect the resistance of a metal conductor.

1 ....

2 ....
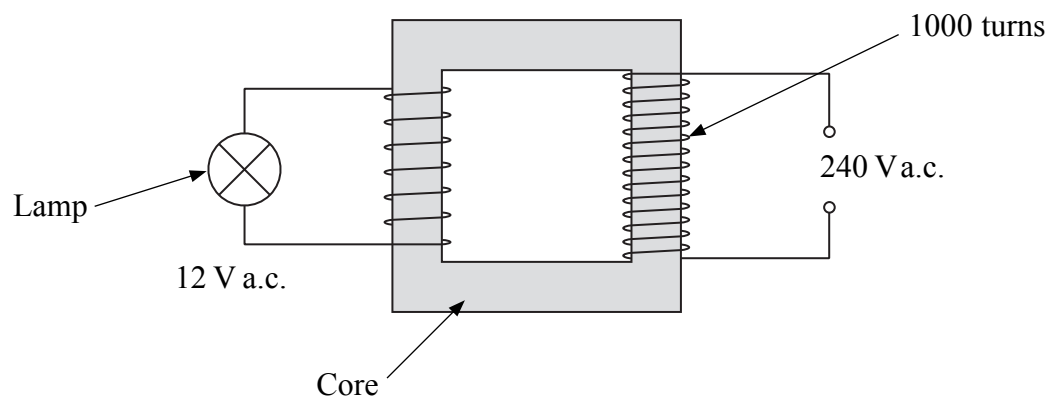
(2)

(Total 7 marks)

Q7

8. The diagram shows a transformer which provides power for a lamp. The transformer consists of two coils wrapped around a metal core.

(a) Is this transformer a step-up or a step-down transformer?

....

(1)

(b) The right coil has 1000 turns. Calculate the number of turns on the left hand coil.

....

....

....

(2)

(c) The core is made from magnetically soft material.

(i) Name a magnetically soft material.

....

(1)

(ii) State why the core is made from magnetically soft material.

....

....

....

(1)

Q8

(Total 5 marks)

9. (a) Name a source of background radiation.

....
(1)

(b) The diagram shows a radioactive source with a detector placed a distance *d* from it.

Ratemeter

Source

Detector

d
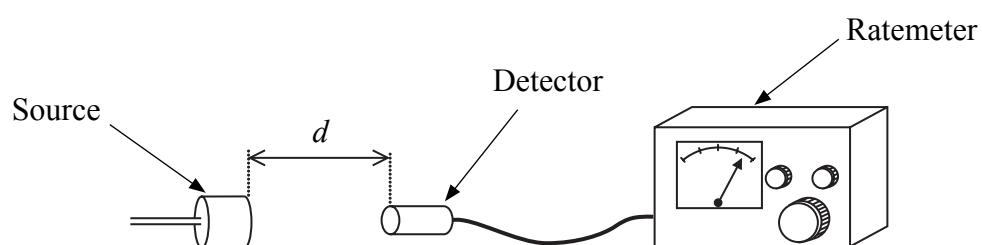
In an experiment *d* was varied and the count rate in counts per minute (cpm) was recorded. The results are shown below.

Count rate/cpm	1000	250	110	7	12	9
Distance *d* /cm	2	4	6	8	10	12

(i) Explain why the source must be an alpha emitter.

....

....
(1)

(ii) Explain why the recorded count rate was greater at a distance of 10 cm than at a distance of 8 cm from the source.

....

....

....

....
(2)

(c) Thorium-232 decays by alpha emission to radium.

Complete the decay equation below.

$$^{232}_{90}\text{Th} \rightarrow {}^{\text{...........}}_{\text{...........}}\text{Ra} + {}^{\text{...........}}_{\text{...........}}\alpha$$

(2)

(Total 6 marks)

Q9

10. During a thunderstorm a student calculates that if she is at a distance of 1000 m from the storm she should hear the thunder 2.90 s later than seeing the lightning flash.

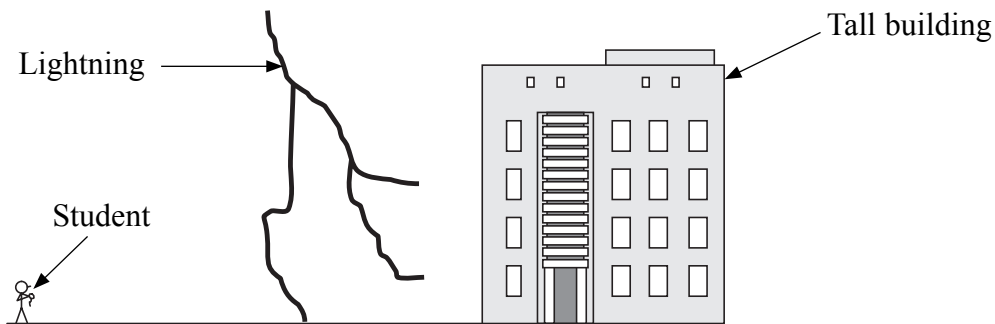(a) (i) Calculate the value of the speed of sound that she used in her calculation.

....

....
(2)

(ii) Explain why there is a big time difference between seeing the lightning and hearing the thunder.

....

....
(2)

(b) The diagram shows the relative positions of the student and a tall building during a thunderstorm.

Using a stopwatch she records a time of 2.95 s between seeing the lightning and hearing the thunder.

(i) Give **two** reasons for her recorded time being longer than her calculated time of 2.90 s.

1 ....

....

2 ....

....
(2)

(ii) She also hears a second quieter sound. Explain why she hears this second sound.

....
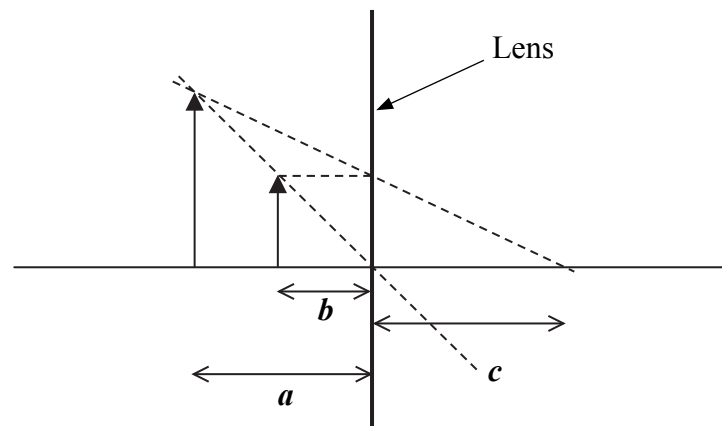**(1)**

(Total 7 marks)

11. The diagram shows the tracks of the rays in the formation of an image by a magnifying glass.

(a) State whether:

(i) the lens is converging or diverging,

....

(1)

(ii) the image formed is real or virtual.

....

(1)

(b) Put a cross (☒) in the appropriate box to identify the following:

(i) focal length,

a ☒   *b* ☒   *c* ☒

(1)

(ii) image distance,

a ☒   *b* ☒   *c* ☒

(1)

(iii) object distance,

a ☒   *b* ☒   *c* ☒

(1)

(iv) magnification.

a/b ☒   *a/c* ☒   *b/a* ☒

(1)

Q11

(Total 6 marks)

TOTAL FOR PAPER: 70 MARKS

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