Paper Reference

7 5 4 0 / 0 1

Surname

Initial(s)

Signature

London Examinations GCE

Physics

Ordinary Level

Paper 1

Thursday 10 May 2007 – Afternoon

Time: 1 hour 15 minutes

Materials required for examination	**Items included with question papers**
Four-figure mathematical tables may be issued to candidates requesting them	Nil

Instructions to Candidates

Answer ALL questions in the spaces provided.
In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.

Information for Candidates

Calculators may be used.
Where necessary, assume the acceleration of free fall, $g = 10$ 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

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1. The picture shows a red kite, a large bird, flying at a constant speed and height.

(a) Calculate the weight of a red kite of mass 1.4 kg.

....

(1)

(b) Add a labelled arrow to the picture to show the direction and line of action of the weight of this red kite.

(1)

(c) The red kite has very large wings for its weight. The wings of the red kite provide a lift force.

(i) What is the lift force when the red kite is flying at a constant height?

....

(1)

(ii) Add a labelled arrow to the picture to show the direction and line of action of the lift force.

(1)

(d) Small birds flap their wings rapidly to fly at a constant height. Explain in terms of forces why the red kite is able to fly at a constant height with only slight movements of its wings.

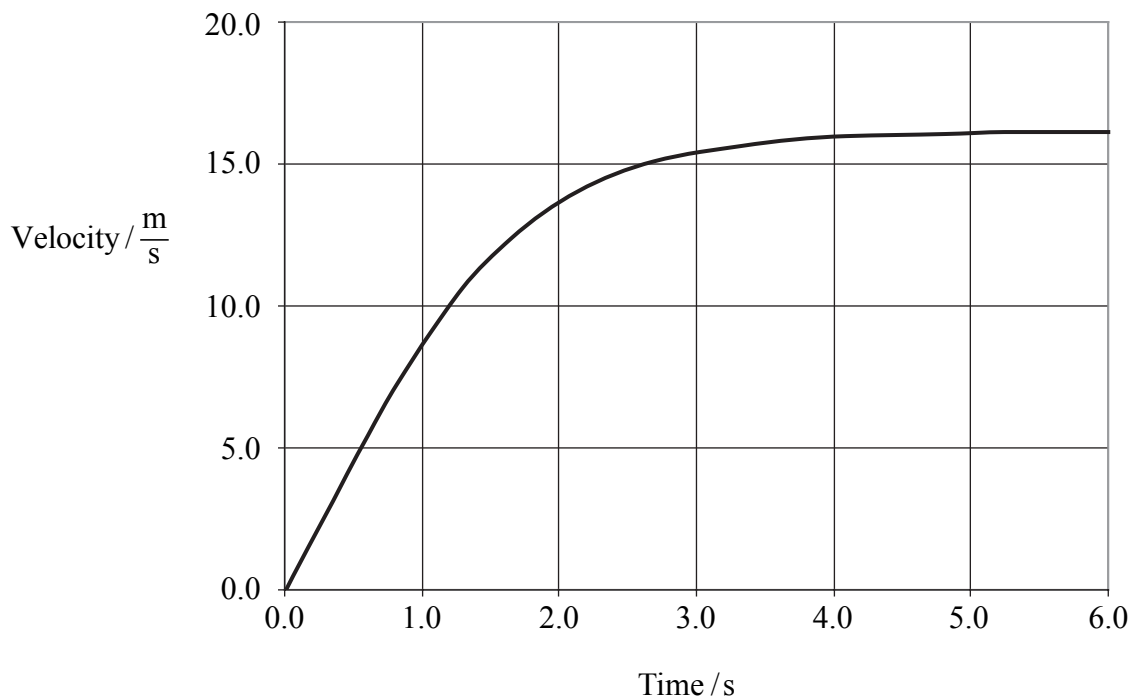...

....

(2)

Q1

(Total 6 marks)

2. (a) What is the acceleration of any object at the start of its fall to the ground?

....

(1)

(b) A small rubber ball is dropped from the top of a tall building and falls freely to the ground. The velocity–time graph shows the motion of the ball.

(i) What quantity is represented by the slope of a velocity–time graph?

....

(1)

(ii) Describe how the acceleration of the ball changes during the first six seconds of its fall.

....

....

....

(2)

(c) What quantity is represented by the area under a velocity–time graph?

....

(1)

(d) On the same axes, draw a graph to show the motion of a different ball of the same diameter but having a smaller mass.

(2)

(Total 7 marks)

3. The picture shows a forklift truck lifting a crate.

Crate

(a) The mass of the crate is 1200 kg and it is lifted at a steady speed of 0.20 m/s.

Calculate the kinetic energy of the crate as it is being lifted.

....

....

....

(2)

(b) The forklift truck lifts the crate 2.8 m vertically.

(i) Calculate the gravitational potential energy gained by the crate.

....

....

(2)

(ii) Calculate the time taken to lift the crate 2.8 m.

....

....

(2)

(iii) Calculate the output power of the forklift truck.

....

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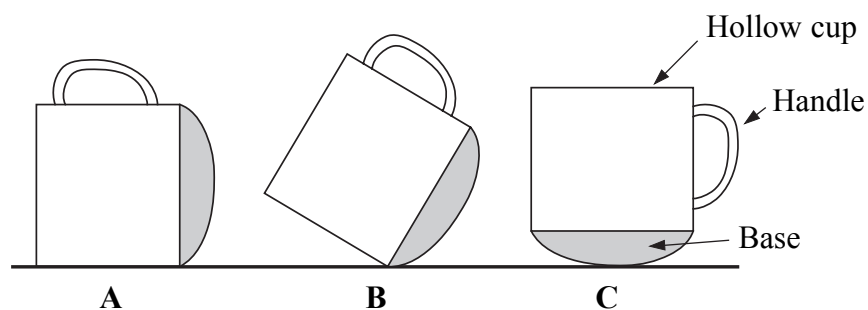
(2)

(Total 8 marks)

4. The diagrams **A**, **B** and **C** show a cup that always returns to an upright position when tipped on its side. The cup is intended for use by very young children.

Hollow cup

Handle

Base

A   **B**   **C**

(a) What is meant by the centre of gravity of the cup?

....

....

(2)

(b) On diagram **A**, mark with a letter **X** the likely position of the centre of gravity of the cup.

(1)

(c) Explain how the manufacturer of the cup ensures that the centre of gravity of the cup is at **X**.

....

....

(2)

(d) What is the disadvantage of this cup when used by very young children?

....

....

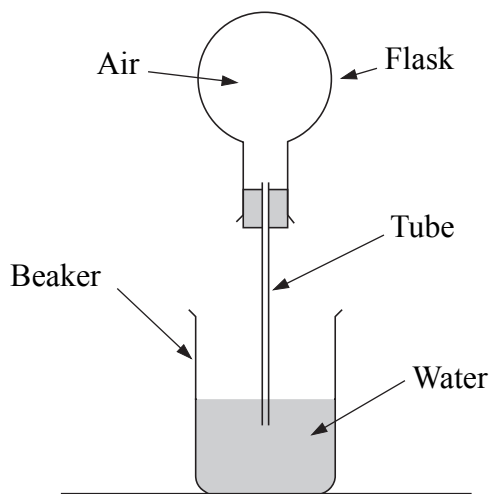**(2)**

(Total 7 marks)

Q4

5. A student sets up the apparatus shown in the diagram. He warms the flask by holding it in his hands. After a few seconds, bubbles of air are seen coming out of the lower end of the tube.

In his report the student writes, 'The air molecules in the flask expand and become less dense'.

(a) Identify two errors of physics in the student's statement.

1. ....

....

2. ....

....

(2)

(b) Describe two changes in the behaviour of the air molecules in the flask when they are heated.

....

....

....
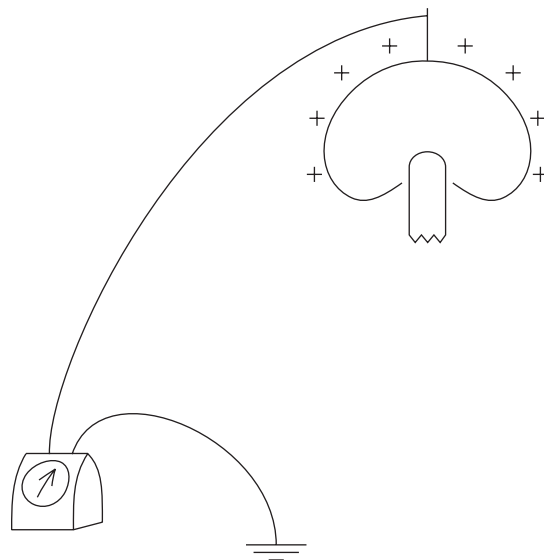
(2)

(Total 4 marks)

Q5

6. (a) The diagram shows part of a high voltage generator.

The generator is connected to earth through an ammeter by using two wires. The ammeter records a steady reading.

Draw arrows on the diagram to show the direction of electron flow in each of the wires. Explain your answer.

....

....

....

(3)

(b) The voltage produced by the generator is 20 000 V. The ammeter records a current of 0.0005 A for 3.0 seconds. Calculate:

(i) the charge flowing in this time;

....

....

(2)

(ii) the electrical energy transferred during this time.

....

....

(2)

(Total 7 marks)

Q6

7. The diagram shows a component **X** connected in series with a 12 V d.c. supply, a switch and two resistors **Y** and **Z**.

Power supply terminals
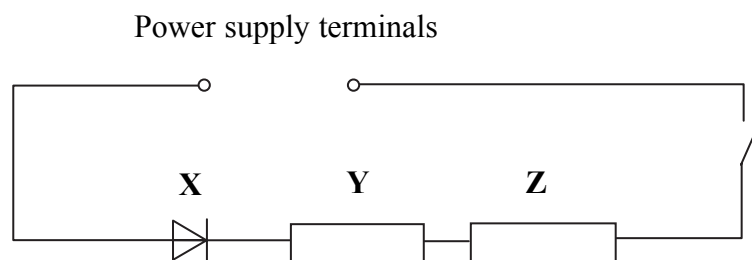
(a) Name component **X**.

....

(1)

(b) When the switch is closed there is a current in the circuit. Label each terminal of the power supply with either + or –.

(1)

(c) The potential difference across **Y** is 4 V. What is the potential difference across **Z**? (Assume that the resistance of **X** is negligible.)

....

(1)

(d) The resistance of **Y** is 20 Ω. Explain why the resistance of **Z** is 40 Ω.

....

....

(1)

(e) Another 40 Ω resistor is connected as shown below
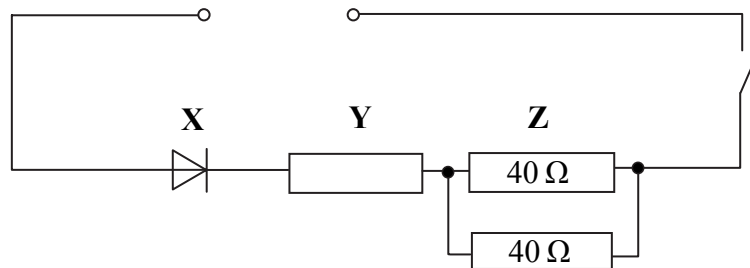
Calculate:

(i) the combined resistance of the two 40 Ω resistors in parallel;

....

....

(1)

(ii) the new potential difference across **Y**.

....

(1)

(f) (i) Add a voltmeter to the circuit diagram in (e) to measure the potential difference across the parallel arrangement of resistors.

(1)

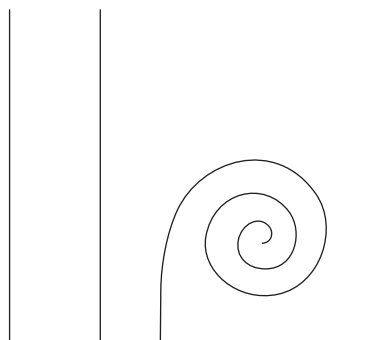(ii) Explain why the addition of the voltmeter does not further affect the value of the potential difference across **Y**.

....

....

(1)

(Total 8 marks)

8. (a) The diagram shows the paths of subatomic particles.

The particles are moving in a magnetic field.

Most of the particles are travelling in straight lines towards the top of the page. One particle is following a curved path. This particle carries a positive charge.

(i) In which direction is the magnetic field acting?

....

....

(1)

(ii) State a property of a particle that would cause it to travel in a straight line in this magnetic field.

....

(1)

(b) State a direction in which the magnetic field could act so that all the particles travel in a straight line.

....

(1)

(c) The diagram above shows the particle with the curved path spiralling inwards. Suggest one reason why this path might spiral inwards.

....

(1)

(Total 4 marks)

Q8

9. (a) Tin has several stable isotopes.
Explain the meaning of the following terms:

(i) stable

....

(1)

(ii) isotope

....

....

(2)

(b) Another isotope of tin (Sn-121) decays by beta emission to antimony (Sb) with a half-life of 27 hours.

(i) Complete the decay equation below.

$$^{121}_{50}\text{Sn} \longrightarrow \, ^{......}_{......}\beta \, + \, ^{......}_{......}\text{Sb}$$

(2)

(ii) What difference, if any, would it make to the decay equation if the half-life was 27 000 years?

....

....
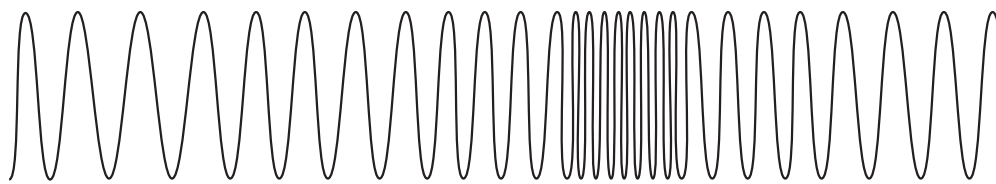
(1)

(Total 6 marks)

10. (a) The diagram shows a type of wave travelling along a metal spring (slinky).

State the type of wave shown.

....

(1)

(b) A tuning fork has a frequency of 384 Hz.
Calculate the wavelength of the sound waves emitted by this tuning fork.
(The speed of sound is 336 m/s.)

....

....

(2)

(c) When the stem of the vibrating tuning fork touches the end of a stretched wire, a small piece of paper at the centre of the wire jumps off.
This is an example of resonance.

(i) Explain what is meant by resonance in this case.

....

....

....

(3)

(ii) State and explain one adjustment you could make to the wire to stop the paper jumping off when the tuning fork touches the wire.
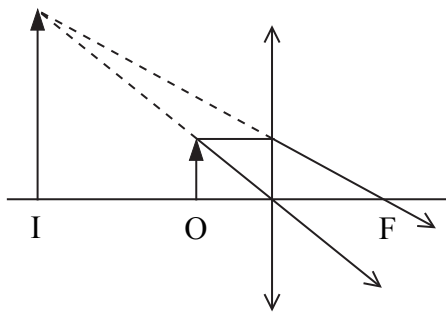
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(2) Q10

(Total 8 marks)
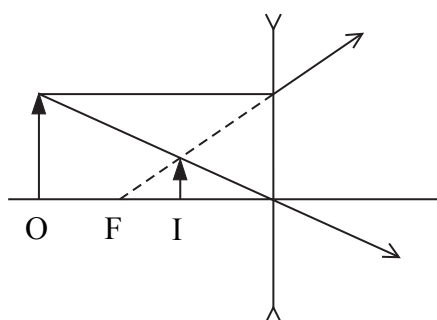
11. The diagrams show the formation of an image using a converging lens and a diverging lens.

Converging lens   **Diverging lens**

(a) In the table below, circle the correct description of the size and nature of the image formed.

	Converging lens	**Diverging lens**
Size	Magnified / diminished / same size	Magnified / diminished / same size
Nature	Real / virtual	Real / virtual

(2)

(b) For each of the diagrams above, describe the effect on the image of doubling the distance between the object and the lens.

(i) Converging lens

Nature of image ....

(1)

(ii) Diverging lens

1. Size of image ....

2. Nature of image ....

(2)

(Total 5 marks)

TOTAL FOR PAPER: 70 MARKS

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