UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

8019038925

PHYSICS **0625/03**

Paper 3 Extended **October/November 2007**

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.

For Examiner's Use	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
Total	

This document consists of **14** printed pages and **2** blank pages.

1 A large plastic ball is dropped from the top of a tall building.

Fig. 1.1 shows the speed-time graph for the falling ball until it hits the ground.

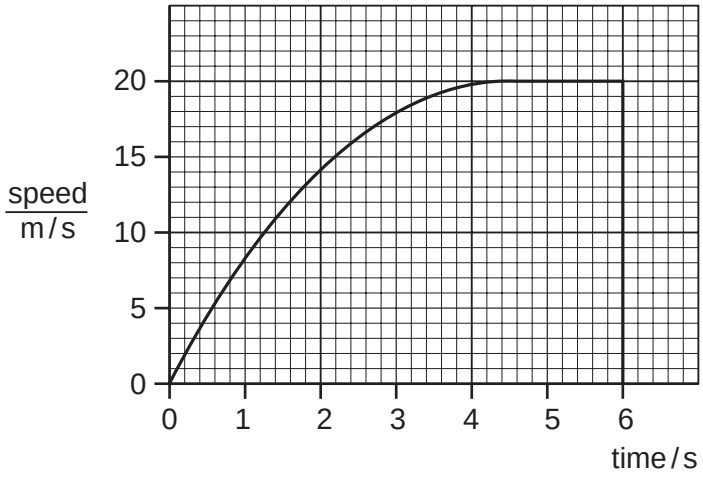


Fig. 1.1

(a) From the graph estimate,

(i) the time during which the ball is travelling with terminal velocity,

time = ... [1]

(ii) the time during which the ball is accelerating,

time = ... [1]

(iii) the distance fallen while the ball is travelling with terminal velocity,

distance = ... [2]

(iv) the height of the building.

height = ... [2]

(b) Explain, in terms of the forces acting on the ball, why

(i) the acceleration of the ball decreases,

.....

.....

.....

..... [3]

(ii) the ball reaches terminal velocity.

.....

..... [2]

[Total: 11]

2 Fig. 2.1 shows a track for a model car.

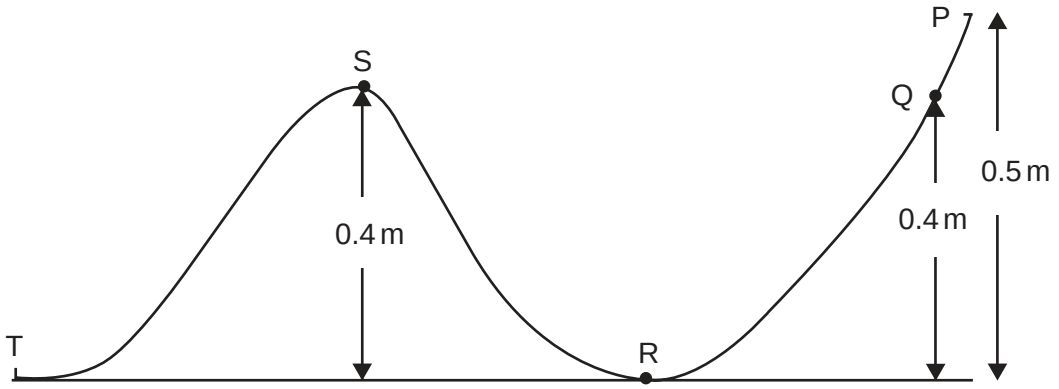


Fig. 2.1

The car has no power supply, but can run down a sloping track due to its weight.

(a) The car is released at Q. It comes to rest just before it reaches S and rolls back.

(i) Describe the motion of the car after it starts rolling back and until it eventually comes to rest.

.....

.....

..... [2]

(ii) Explain in terms of energy transformations why the car, starting at Q, cannot pass S.

.....

.....

..... [1]

(b) A second car, of mass 0.12 kg, is released from P. It continues until it runs off the track at T.

Calculate the maximum speed that the car could have at T assuming friction in the car is negligible.

speed = ... [3]

[Total: 6]

3 **(a)** A spring of original length 3.0 cm is extended to a total length of 5.0 cm by a force of 8.0 N.

Assuming the limit of proportionality of the spring has not been reached, calculate the force needed to extend it to a total length of 6.0 cm.

force = ... [3]

(b) Fig. 3.1 shows the arrangement for an experiment on moments.

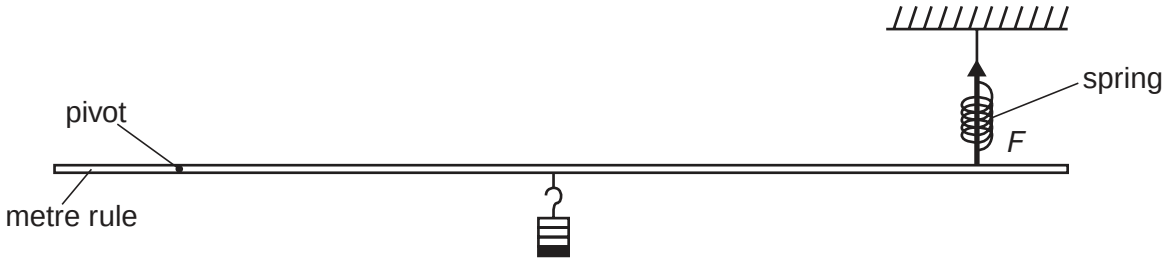


Fig. 3.1

The spring exerts a force *F* on the metre rule.

(i) On Fig. 3.1, mark another quantity which must be measured to find the moment of the force *F*. [1]

(ii) State how the moment of the force *F* is calculated.

.....

..... [1]

[Total: 5]

4 Fig. 4.1 shows a sealed steel cylinder filled with high pressure steam.

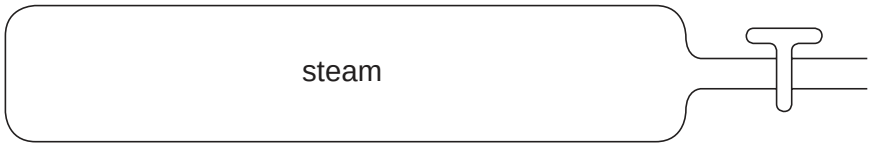


Fig. 4.1

Fig. 4.2 shows the same cylinder much later when all the steam has condensed.

Fig. 4.2

(a) (i) Describe the movement of the molecules in the high pressure steam.

.....

.....

..... [2]

(ii) Explain how the molecules in the steam exert a high pressure on the inside walls of the cylinder.

.....

.....

..... [2]

(b) Describe, in terms of particles, the process by which heat is transferred through the cylinder wall.

.....

.....

..... [2]

(c) When all the steam has condensed, 75 g of water is in the cylinder.

Under these high pressure conditions, the specific latent heat of vaporisation of steam is 3200 J / g.

Calculate the heat lost by the steam as it condenses.

heat = ... [2]

[Total: 8]

5 Fig. 5.1 shows some apparatus which is to be used to compare the emission of infra-red radiation from four differently painted surfaces.

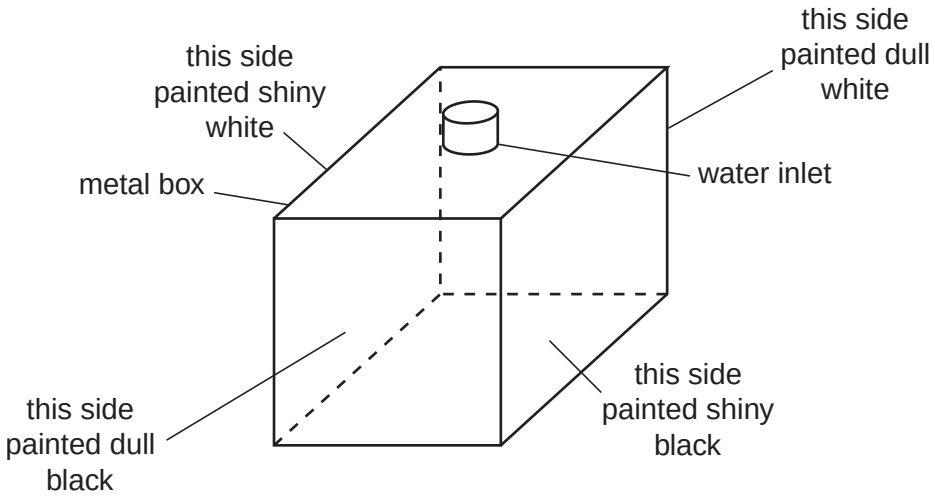


Fig. 5.1

Near the centre of each side is an infra-red detector. The four detectors are identical.

A supply of very hot water is available.

(a) Describe how you would use this apparatus to compare the infra-red radiation from the four surfaces.

.....

.....

..... [3]

(b) Suggest which surface will be the best emitter and which will be the worst emitter.

best emitter .....

worst emitter ..... [1]

(c) The infra-red detectors are made from thermocouples soldered to blackened metal plates. These are connected to galvanometers.

In the space below, draw a labelled diagram of a thermocouple. [2]

[Total: 6]

6 Virtual images may be formed by both plane mirrors and by convex lenses.

Fig. 6.1 shows a plane mirror and a convex lens.

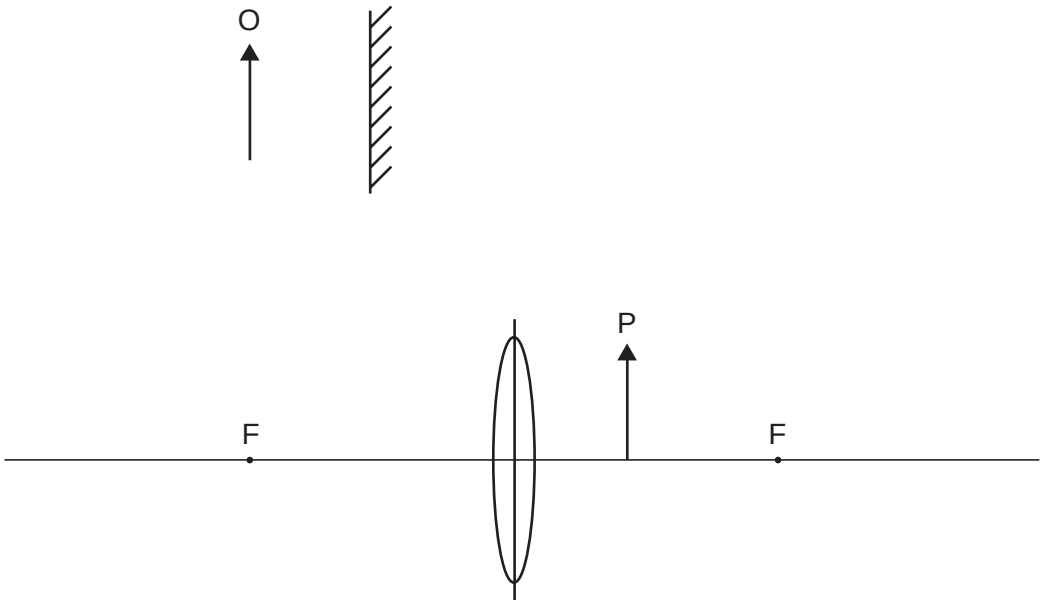


Fig. 6.1

(a) On Fig. 6.1, draw rays to locate the approximate positions of the images of the tops of the two arrow objects O and P.
Label the images. [5]

(b) Both images are virtual.

(i) What is meant by a *virtual image*?

..... [1]

(ii) State **one** other similarity between the two images.

..... [1]

(iii) State **one** difference between the two images.

..... [1]

[Total: 8]

7 **(a)** In the space below, draw a diagram to represent a sound wave.

On your diagram, mark and label

(i) **two** consecutive compressions and **two** consecutive rarefactions,

(ii) the wavelength of the wave.

[3]

(b) Fig. 7.1 shows part of the electromagnetic spectrum.

X-RAYS	INFRA– RED

Fig. 7.1

(i) On Fig. 7.1, label the positions of γ-rays, visible light waves and radio waves. [1]

(ii) State which of the three types of wave in **(i)** has the lowest frequency.

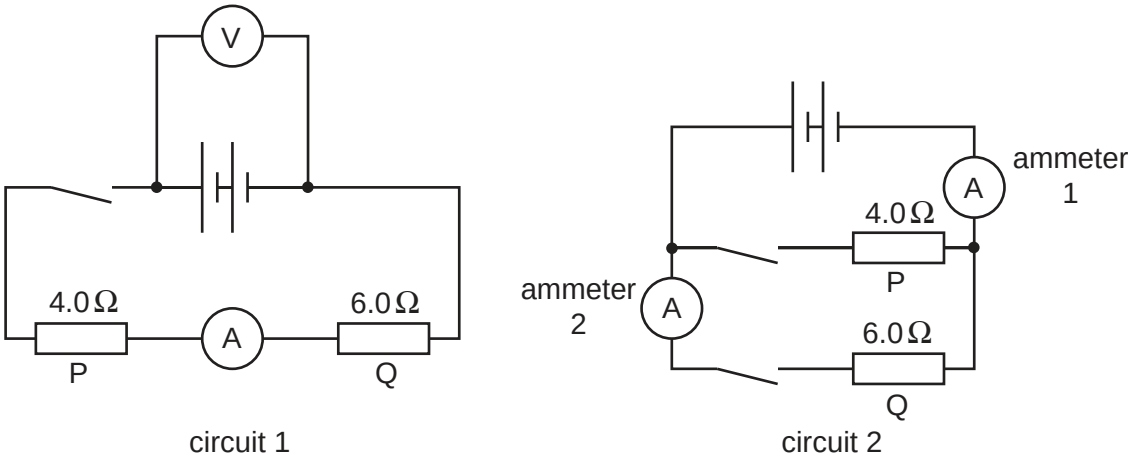
..... [1]

(iii) State the approximate value of the speed in air of radio waves.

..... [1]

[Total: 6]

8 Fig. 8.1 shows two electrical circuits.



The batteries in circuit 1 and circuit 2 are identical.

Fig. 8.1

(a) Put ticks in the table below to describe the connections of the two resistors P and Q.

	series	parallel
circuit 1		
circuit 2		

[1]

(b) The resistors P and Q are used as small electrical heaters.

State two advantages of connecting them as shown in circuit 2.

advantage 1 .....

advantage 2 ..... [2]

(c) In circuit 1, the ammeter reads 1.2 A when the switch is closed.

Calculate the reading of the voltmeter in this circuit.

voltmeter reading = ... [2]

(d) The two switches in circuit 2 are closed. Calculate the combined resistance of the two resistors in this circuit.

combined resistance = ... [2]

(e) When the switches are closed in circuit 2, ammeter 1 reads 5 A and ammeter 2 reads 2 A.

Calculate

(i) the current in resistor P,

current = ... [1]

(ii) the power supplied to resistor Q,

power = ... [1]

(iii) the energy transformed in resistor Q in 300 s.

energy = ... [1]

[Total: 10]

9 Electromagnetic induction may be demonstrated using a magnet, a solenoid and other necessary apparatus.

(a) Explain what is meant by *electromagnetic induction*.

.....

.....

.....

..... [2]

(b) In the space below, draw a labelled diagram of the apparatus set up so that electromagnetic induction may be demonstrated. [2]

(c) Describe how you would use the apparatus to demonstrate electromagnetic induction.

.....

.....

.....

..... [2]

(d) State two ways of increasing the magnitude of the induced e.m.f. in this experiment.

1. .....

.....

2. .....

..... [2]

[Total: 8]

10 **(a)** Fig. 10.1 shows an AND gate with two inputs A and B and one output.

Fig. 10.1

State the output when

(i) A is high and B is low,

..... [1]

(ii) both A and B are low.

..... [1]

(b) An electrical thermometer in a greenhouse gives a low output if the temperature is too low.

A humidity sensor in the same greenhouse gives a high output if the humidity in the greenhouse is too high.

An alarm sounds when both the temperature is too low and the humidity is too high.

(i) Complete the diagram below to show how a NOT gate and an AND gate may be used to provide the required output to the alarm. [2]

(ii) On your diagram, use either 'high' or 'low' to indicate the level of the inputs and outputs of both gates when the alarm sounds. [2]

[Total: 6]

11 Fig. 11.1 shows an experiment to test the absorption of β-particles by thin sheets of aluminium. Ten sheets are available, each 0.5 mm thick.

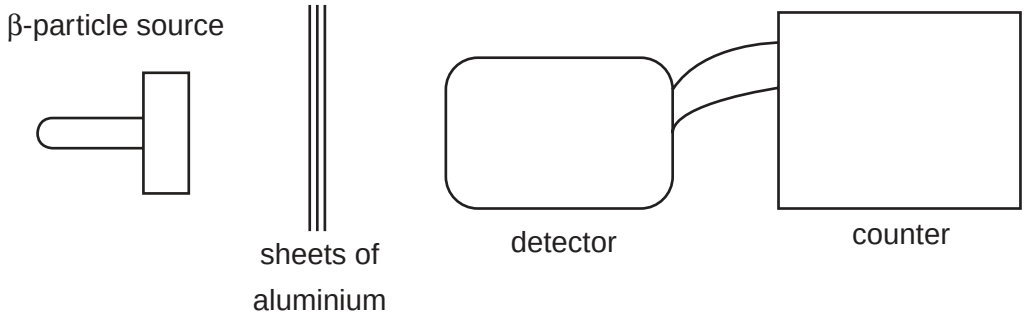


Fig. 11.1

(a) Describe how the experiment is carried out, stating the readings that should be taken.

.....

.....

.....

.....

..... [4]

(b) State the results that you would expect to obtain.

.....

.....

.....

..... [2]

[Total: 6]

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