

First Variant Question Paper



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE
NAME

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--



PHYSICS

0625/31

Paper 3 Extended

October/November 2008

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 16 printed pages.



- 1 Fig. 1.1 shows apparatus used to find a relationship between the force applied to a trolley and the acceleration caused by the force.

For
Examiner's
Use

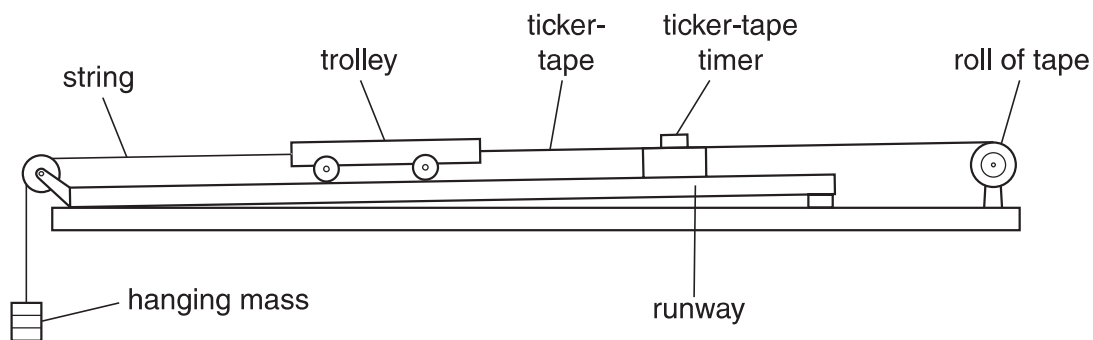


Fig. 1.1

For each mass, hung as shown, the acceleration of the trolley is determined from the tape. Some of the results are given in the table below.

weight of the hanging mass/N	acceleration of the trolley m/s^2
0.20	0.25
0.40	0.50
0.70	
0.80	1.0

- (a) (i) Explain why the trolley accelerates.

.....
 [2]

- (ii) Suggest why the runway has a slight slope as shown.

.....
 [1]

- (b) Calculate the mass of the trolley, assuming that the accelerating force is equal to the weight of the hanging mass.

mass = [2]

3

(c) Calculate the value missing from the table. Show your working.

For
Examiner's
Use

value = [2]

(d) In one experiment, the hanging mass has a weight of 0.4 N and the trolley starts from rest.

Use data from the table to calculate

(i) the speed of the trolley after 1.2 s,

speed = [2]

(ii) the distance travelled by the trolley in 1.2 s.

distance = [2]

[Total: 11]

2 Fig. 2.1 shows a circular metal disc of mass 200 g, freely pivoted at its centre.

For
Examiner's
Use

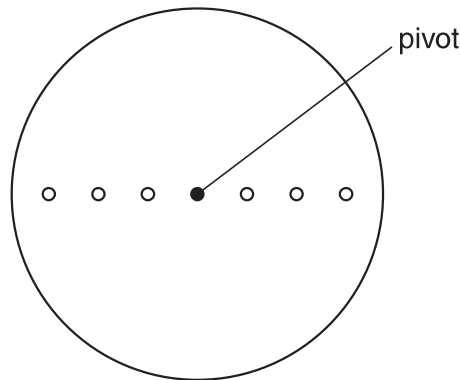


Fig. 2.1

Masses of 100 g, 200 g, 300 g, 400 g, 500 g and 600 g are available, but only one of each value. These may be hung with string from any of the holes. There are three small holes on each side of the centre, one at 4.0 cm from the pivot, one at 8.0 cm from the pivot and one at 12.0 cm from the pivot.

The apparatus is to be used to show that there is no net moment of force acting on a body when it is in equilibrium.

(a) On Fig. 2.1, draw in **two different** value masses hanging from appropriate holes. The values of the masses should be chosen so that there is no net moment. Alongside the masses chosen, write down their values. [2]

(b) Explain how you would test that your chosen masses give no net moment to the disc.

.....

.....

.....

..... [1]

(c) Calculate the moments about the pivot due to the two masses chosen.

moment due to first mass =

moment due to second mass =

[2]

5

- (d) Calculate the force on the pivot when the two masses chosen are hanging from the disc.

For
Examiner's
Use

force = [2]

[Total: 7]

6

- 3 (a) A submarine descends to a depth of 70 m below the surface of water.

The density of the water is 1050 kg/m^3 . Atmospheric pressure is $1.0 \times 10^5 \text{ Pa}$.

Calculate

- (i) the increase in pressure as it descends from the surface to a depth of 70 m,

increase in pressure = [2]

- (ii) the total pressure on the submarine at a depth of 70 m.

total pressure = [1]

- (b) On another dive, the submarine experiences a total pressure of $6.5 \times 10^5 \text{ Pa}$. A hatch cover on the submarine has an area of 2.5 m^2 .

Calculate the force on the outside of the cover.

force = [2]

- (c) The submarine undergoes tests in fresh water of density 1000 kg/m^3 .

Explain why the pressure on the submarine is less at the same depth.

.....

..... [1]

[Total: 6]

For
Examiner's
Use

- 4 The whole of a sealed, empty, dusty room is kept at a constant temperature of 15°C . Light shines into the room through a small outside window.

For
Examiner's
Use

An observer points a TV camera with a magnifying lens into the room through a second small window, set in an inside wall at right angles to the outside wall.

Dust particles in the room show up on the TV monitor screen as tiny specks of light.

- (a) In the space below draw a diagram to show the motion of one of the specks of light over a short period of time.

[1]

- (b) After a period of one hour the specks are still observed, showing that the dust particles have not fallen to the floor.

Explain why the dust particles have not fallen to the floor. You may draw a labelled diagram to help your explanation.

.....

.....

.....

..... [2]

- (c) On another day, the temperature of the room is only 5°C . All other conditions are the same and the specks of light are again observed.

Suggest any differences that you would expect in the movement of the specks when the temperature is 5°C , compared to before.

.....

.....

..... [1]

[Total: 4]

- 5 Fig. 5.1 shows apparatus that could be used to determine the specific latent heat of fusion of ice.

For
Examiner's
Use

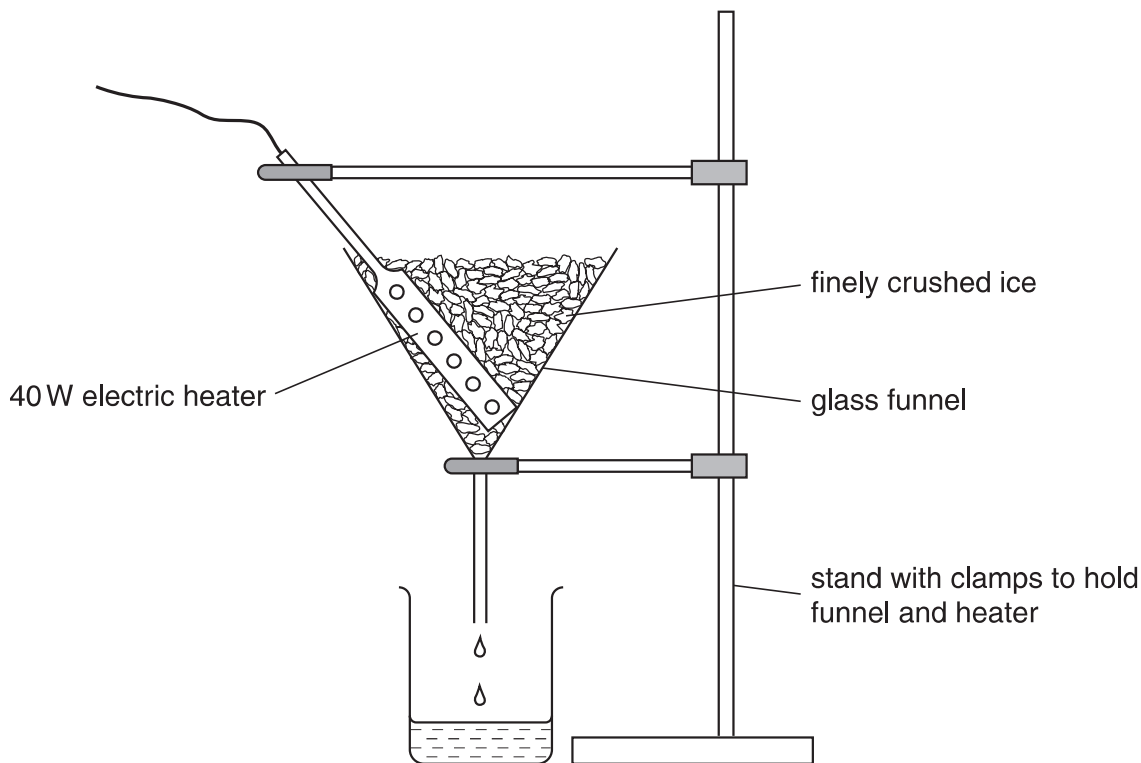


Fig. 5.1

- (a) In order to obtain as accurate a result as possible, state why it is necessary to
- (i) wait until water is dripping into the beaker at a constant rate before taking readings,

 [1]
 - (ii) use finely crushed ice rather than large pieces.

 [1]
- (b) The power of the heater and the time for which water is collected are known. Write down all the other readings that are needed to obtain a value for the specific latent heat of fusion of ice.

 [2]

9

- (c) Using a 40W heater, 16.3 g of ice is melted in 2.0 minutes. The heater is then switched off. In a further 2.0 minutes, 2.1 g of ice is melted.

For
Examiner's
Use

Calculate the value of the specific latent heat of fusion of ice from these results.

specific latent heat of fusion of ice = [4]

[Total: 8]

- 6 Fig. 6.1 shows two rays of monochromatic light, one entering the prism along the normal DE and the second one along PQ.

For
Examiner's
Use

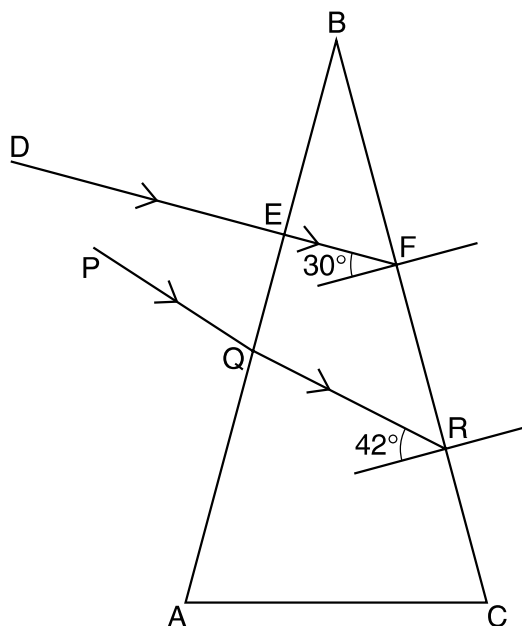


Fig. 6.1

- (a) State what is meant by *monochromatic* light.
 [1]
- (b) The refractive index of the glass of the prism is 1.49. The ray EF is refracted at F. Use information from Fig. 6.1 to calculate the angle of refraction at F.
 angle of refraction = [3]
- (c) On Fig. 6.1, draw in the refracted ray, starting from F. [1]
- (d) State how the refraction, starting at F, would be different if the monochromatic ray were replaced by a ray of white light.
 [1]
- (e) The critical angle for the glass of the prism is just over 42° . State the approximate angle of refraction for the ray striking BC at R.
 [1]
- (f) Another monochromatic ray, not shown in Fig. 6.1, passes through the prism and strikes BC at an angle of incidence of 50° . State what happens to this ray at the point where it strikes BC.
 [1]

[Total: 8]

7 Fig. 7.1 shows a scale drawing of plane waves approaching a gap in a barrier.

For
Examiner's
Use

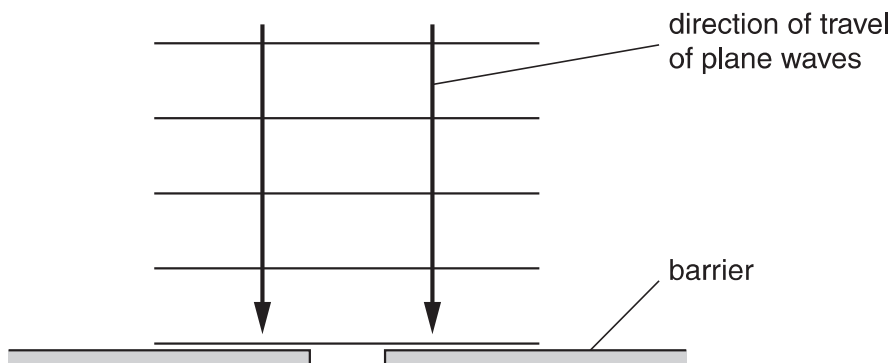


Fig. 7.1

- (a) On Fig. 7.1, draw in the pattern of the waves after they have passed the gap. [3]
- (b) The waves approaching the barrier have a wavelength of 2.5 cm and a speed of 20 cm/s. Calculate the frequency of the waves.

frequency = [2]

- (c) State the frequency of the diffracted waves.
..... [1]

[Total: 6]

8 Fig. 8.1 shows a car battery being charged from a 200V a.c. mains supply.

For
Examiner's
Use

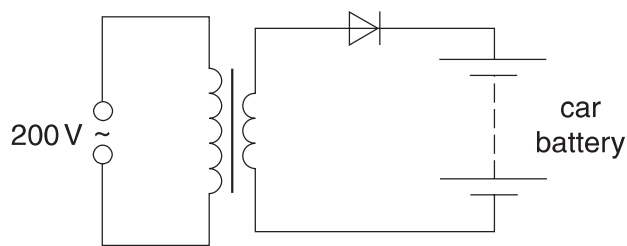


Fig. 8.1

(a) State the function of the diode.

.....
 [1]

(b) The average charging current is 2.0A and the battery takes 12 hours to charge fully.
 Calculate the charge that the battery stores when fully charged.

charge stored [2]

(c) The battery has an electromotive force (e.m.f.) of 12V and, when connected to a circuit, supplies energy to the circuit components.

State what is meant by an *electromotive force of 12V*.

.....

 [2]

13

- (d) (i) In the space below, draw a circuit diagram to show how two 6.0V lamps should be connected to a 12V battery so that both lamps glow with normal brightness. [1]

For
Examiner's
Use

- (ii) The power of each lamp is 8.0W. Calculate the current in the circuit.

current = [2]

- (iii) Calculate the energy used by the two lamps when both are lit for one hour.

energy = [2]

[Total: 10]

9 Fig. 9.1 is a block diagram of an electrical energy supply system, using the output of a coal-fired power station.

For
Examiner's
Use

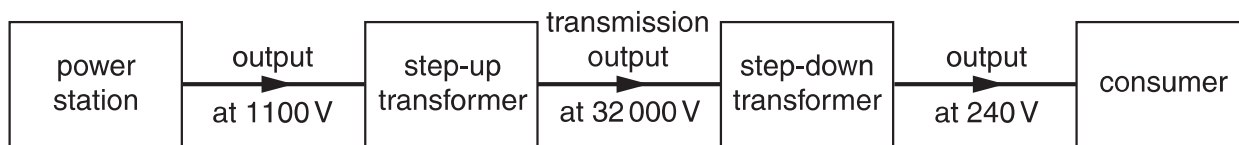


Fig. 9.1

(a) Suggest **one** possible way of storing surplus energy when the demand from the consumers falls below the output of the power station.

.....
 [1]

(b) State why electrical energy is transmitted at high voltage.

..... [1]

(c) A transmission cable of resistance R carries a current I . Write down a formula that gives the power loss in the cable in terms of R and I .

..... [1]

(d) The step-up transformer has 1200 turns on the primary coil. Using the values in Fig. 9.1, calculate the number of turns on its secondary coil. Assume that the transformer has no energy losses.

number of turns = [2]

(e) The input to the step-up transformer is 800 kW.

Using the values in Fig. 9.1, calculate the current in the transmission cables, assuming that the transformer is 100% efficient.

current = [3]

[Total: 8]

10 Fig. 10.1 shows a circuit for a warning lamp that comes on when the external light intensity falls below a pre-set level.

For
Examiner's
Use

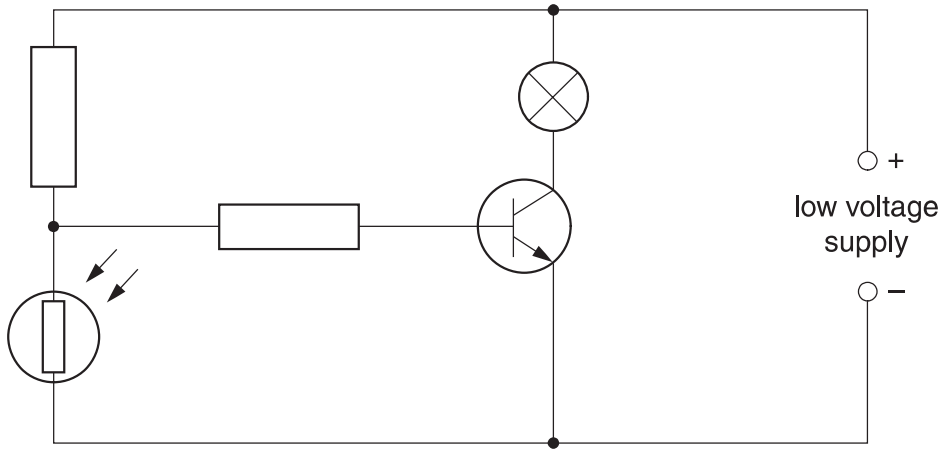


Fig. 10.1

- (a) On Fig. 10.1, label
- (i) with the letter X the component that detects the change in external light intensity,
 - (ii) with the letter Y the lamp,
 - (iii) with the letter Z the component that switches the lamp on and off.
- [3]

(b) Describe how the circuit works as the external light intensity decreases and the lamp comes on.

.....

.....

.....

.....

.....

.....

.....

.....

[3]

[Total: 6]

11 Fig. 11.1 shows the basic design of the tube of a cathode ray oscilloscope (CRO).

For
Examiner's
Use

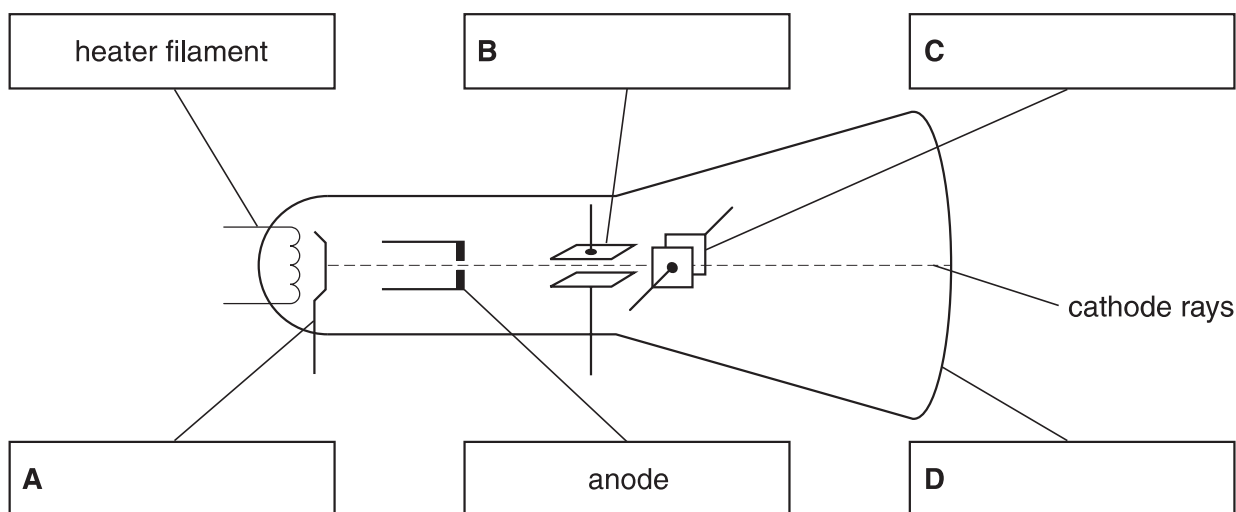


Fig. 11.1

(a) On Fig. 11.1, write the names of parts **A**, **B**, **C** and **D** in the boxes provided. [2]

(b) State the function of:

part **A**,

.....

part **B**,

..... [2]

(c) A varying p.d. from a 12V supply is connected to a CRO, so that the waveform of the supply is shown on the screen.

To which of the components in Fig. 11.1

(i) is the 12V supply connected,

..... [1]

(ii) is the time-base connected?

..... [1]

[Total: 6]

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.