UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

1860505715

PHYSICS **0625/33**

Paper 3 Extended **October/November 2010**

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, 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 **19** printed pages and **1** blank page.

DC (NF/SW) 24984/4

UNIVERSITY *of* CAMBRIDGE
International Examinations

1 A young athlete has a mass of 42 kg. On a day when there is no wind, she runs a 1 n 14.2 s. A sketch graph (not to scale) showing her speed during the race is given in Fig. 1

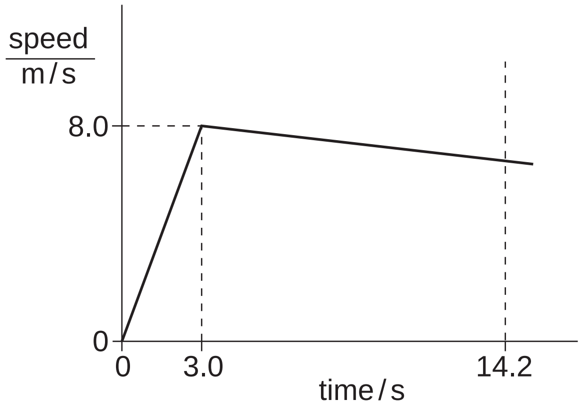


Fig. 1.1

(a) Calculate

(i) the acceleration of the athlete during the first 3.0 s of the race,

acceleration = ... [2]

(ii) the accelerating force on the athlete during the first 3.0 s of the race,

force = ... [2]

(iii) the speed with which she crosses the finishing line.

speed = ... [3]

(b) Suggest two differences that might be seen in the graph if there had been a [illegible]d opposing the runners in the race.

1. ....

....

2. ....

.... [2]

[Total: 9]

2 **(a)** A loose uniform wooden floorboard weighs 160 N and rests symmetrically on four supports, P, Q, R and S.

The supports are 0.50 m apart, as shown in Fig. 2.1.

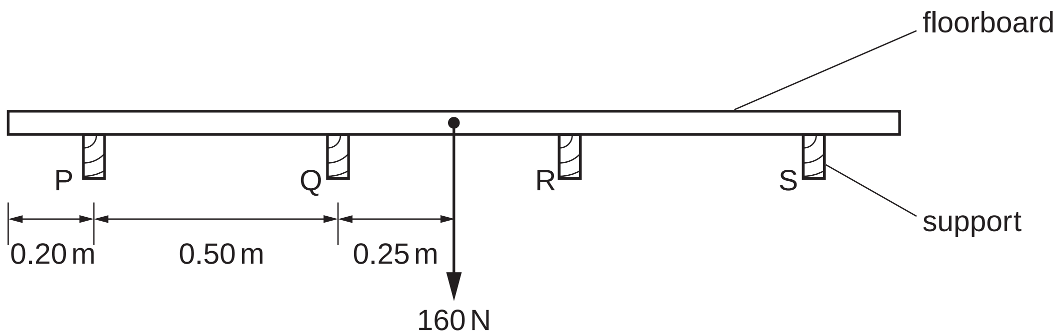


Fig. 2.1

Calculate the force exerted on the floorboard by each of the supports, and state the direction of these forces. One value is already given for you.

force exerted by P = ...

force exerted by Q = ...40 N..

force exerted by R = ...

force exerted by S = ...

direction = ... [2]

(b) A workman of weight *W* stands on the end of the floorboard described in **(a)**.

This just causes the floorboard to tip up, as shown in Fig. 2.2.

The supports are each 0.060 m thick.

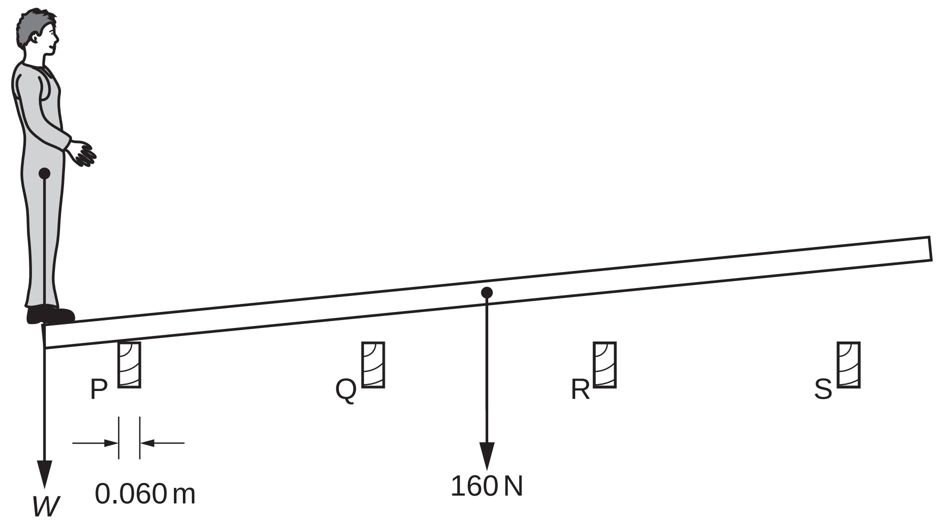


Fig. 2.2

(i) Calculate the weight *W* of the workman.

weight *W* = ... [3]

(ii) Calculate the force that each of the supports now exerts on the floorboard.

force exerted by P = ...

force exerted by Q = ...

force exerted by R = ...

force exerted by S = ... [2]

[Total: 7]

3 **(a)** Fig. 3.1 represents the path taken in air by a smoke particle, as seen in a Brownian motion experiment. The smoke particles can be seen through a microscope, but the air molecules cannot.

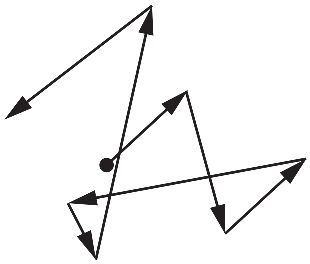


Fig. 3.1

(i) State what causes the smoke particles to move like this.

....

.... [1]

(ii) What conclusions about air molecules can be drawn from this observation of the smoke particles?

....

....

....

....

.... [2]

(b) A can, containing only air, has its lid tightly screwed on and is left in strong sunlight.

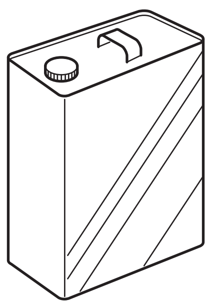


Fig. 3.2

(i) State what happens to the pressure of the air in the can when it gets hot.

.... [1]

(ii) In terms of molecules, explain your answer to **(b)(i)**.

....

....

....

.... [3]

[Total: 7]

4 **(a)** **(i)** Name the process by which thermal energy is transferred through a metal r

....

(ii) Describe how this process occurs.

....

....

....

.... [2]

(b) An iron rod and a copper rod of equal length are each held by hand at one end, with the other end in the flame from a Bunsen burner, as shown in Fig. 4.1.

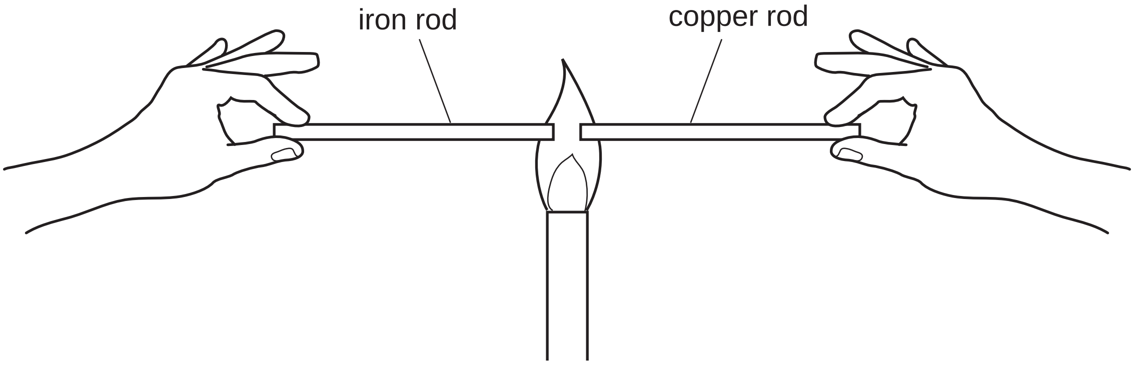


Fig. 4.1

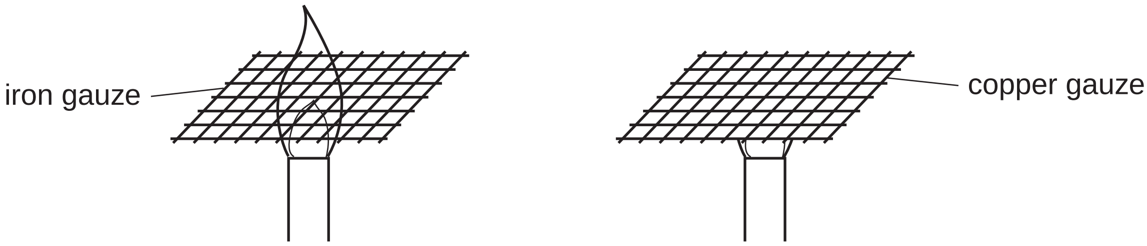
The copper rod becomes too hot to hold much sooner than the iron rod.

What does this information tell you about iron and copper?

.... [1]

(c) Gas has to be above a certain temperature before it burns.

Fig. 4.2 shows two similar wire gauzes, one made of iron wire and one made of copp
Each is held over a Bunsen burner. When the gas supply is turned on and ignited below
gauze, the effect is as shown in Fig. 4.2.



observation:
flame appears both above and below the gauze

observation:
flame only appears below the gauze

Fig. 4.2

How can these observations be explained?

....

....

....

....

.... [4]

[Total: 8]

5 **(a)** Define *specific heat capacity*.

....

.... [2]

(b) Solar energy is striking the steel deck of a ship.

(i) Describe how the colour of the deck affects the absorption of the solar energy.

....

.... [1]

(ii) The solar energy strikes the deck at the rate of 1400 W on every square metre.

The steel plate of the deck is 0.010 m thick.

Steel has a density of 7800 kg/m^3 and a specific heat capacity of 450 J/(kg °C).

13% of the solar energy striking the deck is absorbed and the rest is reflected.

Using these figures, calculate

1. how many joules of solar energy are absorbed by 1.0 m^2 of the deck in 1.0 s,

number of joules = ... [1]

2. the mass of 1.0 m^2 of deck,

mass = ... [2]

3. the rate of rise in temperature of the deck, stating the equation you use.

rate of rise = ... °C/s [3]

[Total: 9]

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6 A boy drops a ball of mass 0.50 kg. The ball falls a distance of 1.1 m, as shown in Fig e air resistance throughout this question.

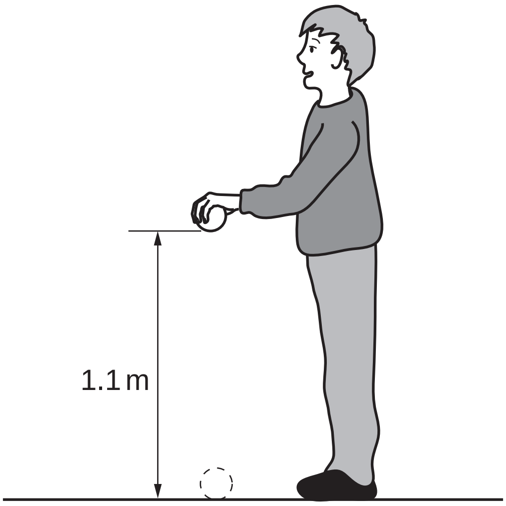

Fig. 6.1

(a) Calculate the decrease in gravitational potential energy of the ball as it falls through the 1.1 m.

decrease in potential energy = ... [2]

(b) The ball bounces and only rises to a height of 0.80 m.

(i) Calculate the energy lost during the bounce.

energy lost = ... [1]

(ii) Suggest one reason why energy is lost during the bounce.

....

.... [1]

(c) On another occasion, the boy **throws** the ball down from a height of 1.1 m, givi[illegible] kinetic energy of 9.0 J.

Calculate the speed at which the ball hits the ground.

speed = ... [3]

[Total: 7]

7 Fig. 7.1 shows how the resistance of the filament of a lamp changes as the current in the lamp changes.

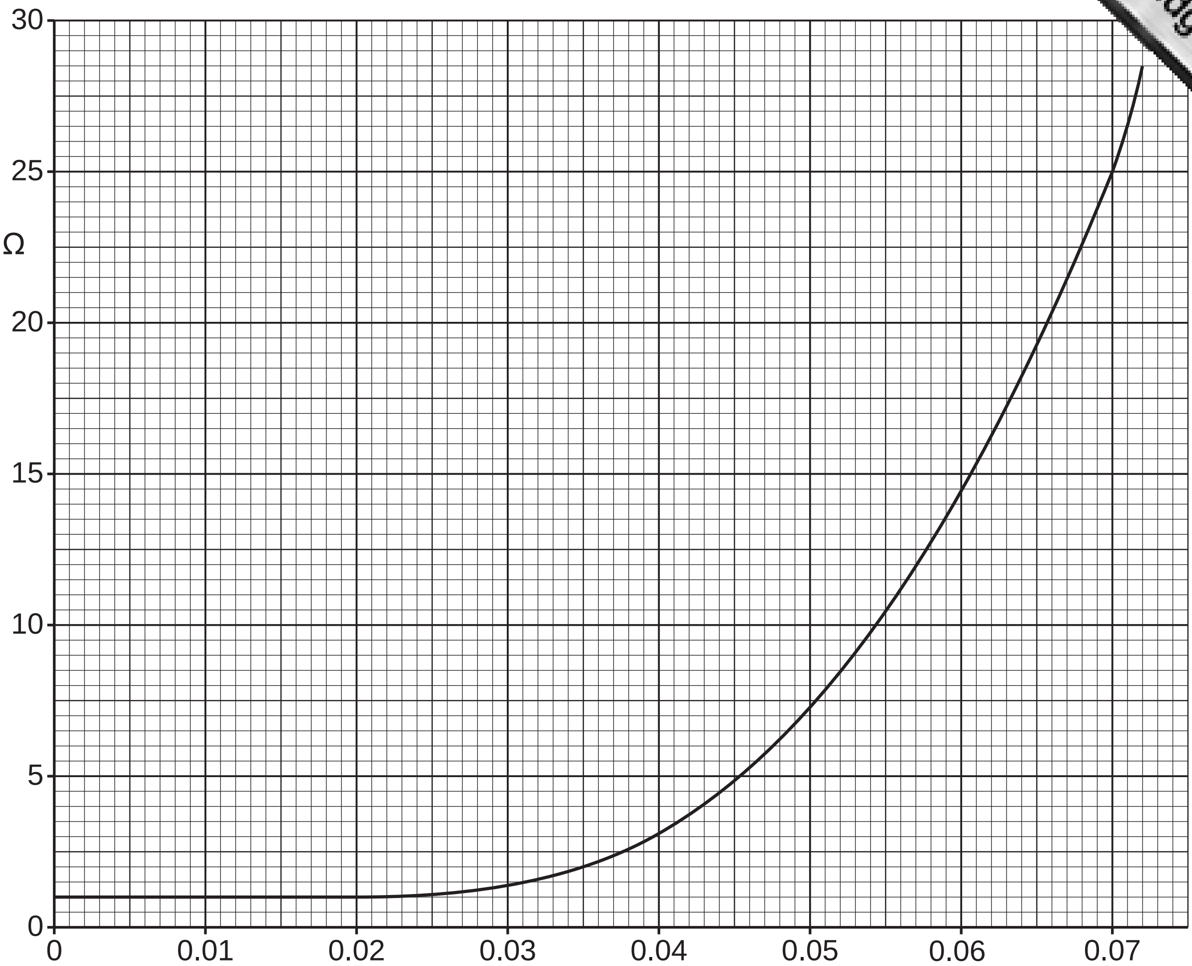

Fig. 7.1

(a) Describe how the resistance of the lamp changes.

....

....

.... [2]

(b) For a current of 0.070 A, find

(i) the resistance of the lamp,

resistance = ...

(ii) the potential difference across the lamp,

potential difference = ... [2]

(iii) the power being dissipated by the lamp.

power = ... [2]

(c) Two of these lamps are connected in parallel to a cell. The current in each lamp is 0.070 A.

(i) State the value of the e.m.f. of the cell.

e.m.f. = ... [1]

(ii) Calculate the resistance of the circuit, assuming the cell has no resistance.

resistance = ... [2]

[Total: 10]

8 A coil is wound on a cylindrical cardboard tube and connected to a sensitive [illegible] millivoltmeter.

Figs. 8.1, 8.2 and 8.3 show three situations involving the coil and a magnet.

(a) On the lines alongside each situation, describe what, if anything, is seen happening on the millivoltmeter.

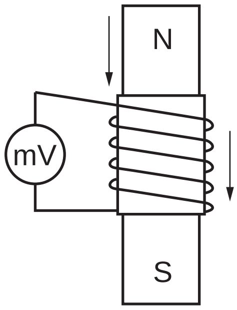

Fig. 8.1

magnet inside coil, both moving at same speed

....

....

....

....

.... [1]

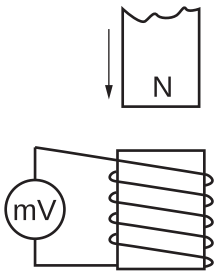

Fig. 8.2

magnet moving towards coil

coil stationary

....

....

....

....

.... [1]

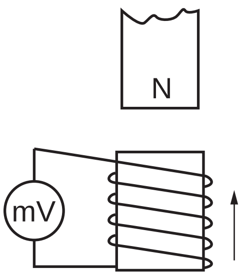

Fig. 8.3

magnet stationary

coil moving towards magnet

....

....

....

....

.... [2]

(b) Choose one of the situations in **(a)** where something is seen happening to the m... For this situation, state three changes which could be made to increase the ma... what is seen.

1. ....

2. ....

3. .... [3]

[Total: 7]

9 In Fig. 9.1, a ray of light TRS is shown entering, passing through and leaving a semi... block.

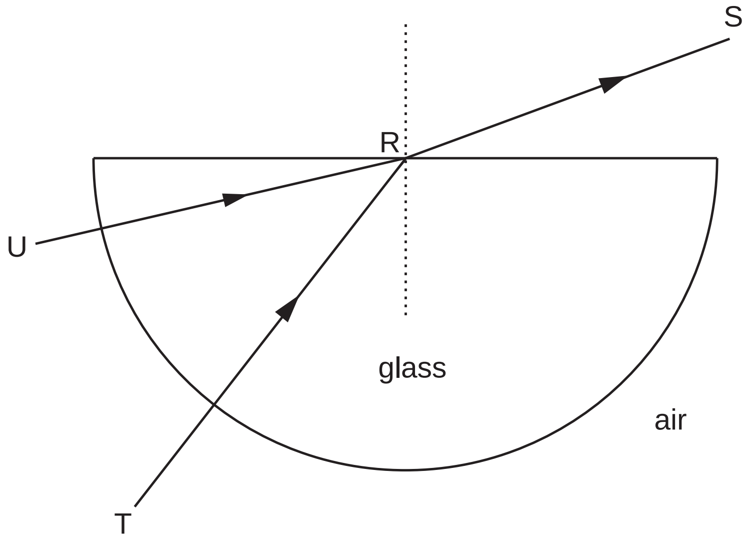

Fig. 9.1

(a) As the light enters the block, its frequency remains constant.

State what happens to

(i) the speed of the light as it enters the block,

....

(ii) the wavelength of the light as it enters the block.

.... [2]

(b) The refractive index of the glass is 1.48.

The speed of light in air is 3.00×10^8 m/s.

Calculate the speed of the light in the glass. State the equation you use.

speed = ... [2]

(c) Another ray of light enters the block along UR.

On Fig. 9.1, draw a line to show what happens to this ray after it has reached R. [2]

[Total: 6]

10 **(a)** A small object S is dipped repeatedly into water near a flat reflecting surface.

Fig. 10.1 gives an instantaneous view from above of the position of part of the [waves] produced.

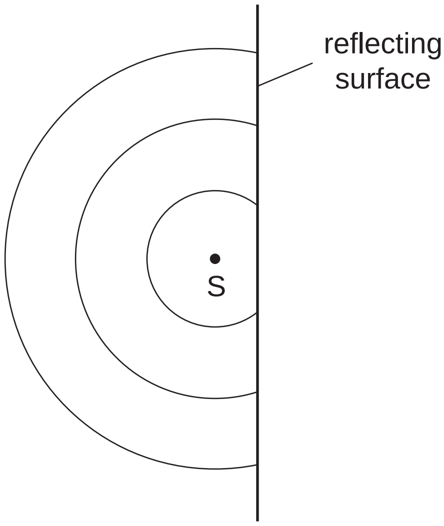

Fig. 10.1

On Fig. 10.1,

(i) put a clear dot at the point from which the reflected waves appear to come (label the dot R),

(ii) draw the reflected portion of each of the three waves shown. [3]

(b) Fig. 10.2 shows a small object P in front of a plane mirror M.

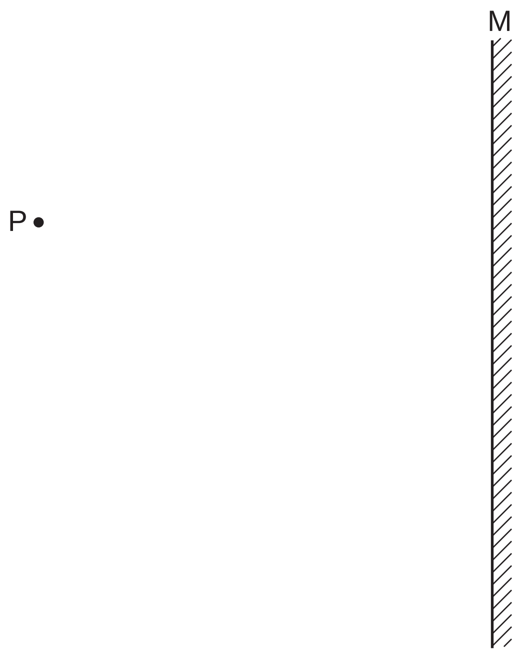

Fig. 10.2

On Fig. 10.2, carefully draw two rays that show how the mirror forms the image of object P. Label the image I. [3]

11 A radioactive source is placed near a radiation detector connected to a counter, [illegible] Fig. 11.1.

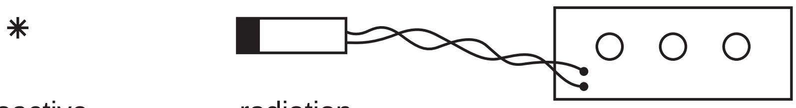

Fig. 11.1

(a) The count rate, measured over three successive minutes, gives values of

720 counts / minute

691 counts / minute

739 counts / minute.

Explain why a variation like this is to be expected in such an experiment.

....

.... [1]

(b) The radiation detector and counter are left untouched. The radioactive source is put in its lead container and returned to the metal security cupboard.

Once this has been done, a further measurement is taken over one minute.

This gives a reading of 33 counts / minute.

(i) State the name used for the radioactivity being detected during this minute.

....

(ii) Suggest two possible sources for this radioactivity.

1. ....

2. .... [3]

[Total: 4]