BOTSWANA EXAMINATIONS COUNCIL
in collaboration with
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE
Botswana General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

PHYSICS **0571/03**

Paper 3 **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 in the spaces provided at the top of this page.
Answer **all** questions.
Write your answers in the spaces provided on the question paper.
You may lose marks if you do not show your working or if you do not use appropriate units.
Do not use staples, paper clips, highlighters, glue or correction fluid.
The number of marks is given in brackets [ ] at the end of each question or part question.
Take the weight of 1 kg to be 10 N (i.e. acceleration of free fall = 10 m/s^2).

For Examiner's Use

This document consists of **12** printed pages.

1 Fig. 1.1 shows a car of length 5.8 m. The car accelerates from point **A** to point **B**.

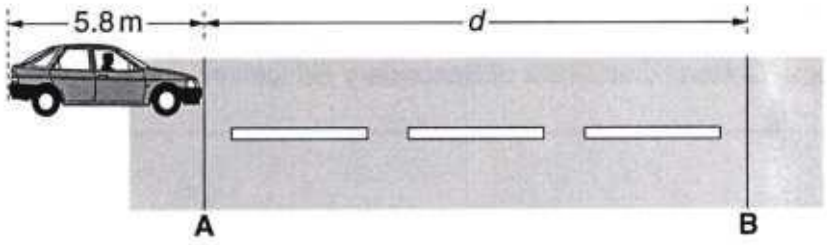

Fig. 1.1

The car takes 0.80 s to pass point **A** and 0.50 s to pass point **B**.

(a) Calculate the speed of the car when passing

(i) point **A**,

speed = ...[2]

(ii) point **B**.

speed = ...[1]

(b) The car takes 6.0 s to move from **A** to **B**.

Calculate the acceleration of the car.

acceleration = ...[2]

(c) Find the distance *d* between **A** and **B**.

d = ...[2]

2 A bag of mass 5.0 kg is dropped from a helicopter hovering above the ground. The bag hits the ground after 8.0 s ($g = 10\,m/s^2$).

(a) Assuming that there is no air resistance, calculate the height of the helicopter above the ground.

height = ...[2]

(b) The bag reaches terminal velocity before hitting the ground.

Describe how each of the following quantities changes as the bag falls to the ground.

(i) velocity

.....

.....[1]

(ii) acceleration

.....

.....[2]

3 Fig. 3.1 shows a spring balance used to keep a uniform beam in equilibrium.
The beam is pivoted at the centre and a load of 4.2 N is hung 6.0 m from the pivot.

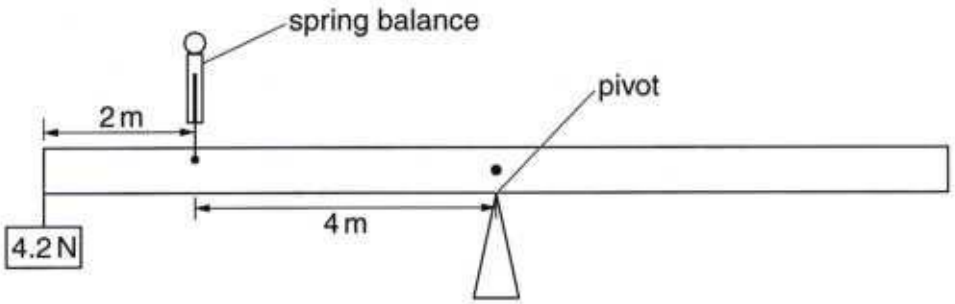

Fig. 3.1

(a) State the principle of moments.

.....

.....[1]

(b) Determine the reading on the spring balance.

reading = ...[2]

(c) What is the direction of the force acting on the pivot?

.....[1]

(d) Calculate the size of the force acting on the pivot. Assume that the weight of the beam is negligible.

force = ...[2]

4 Fig. 4.1 shows an instrument used to measure the density of liquids.
The instrument is shown floating in water at a temperature of 20 °C.

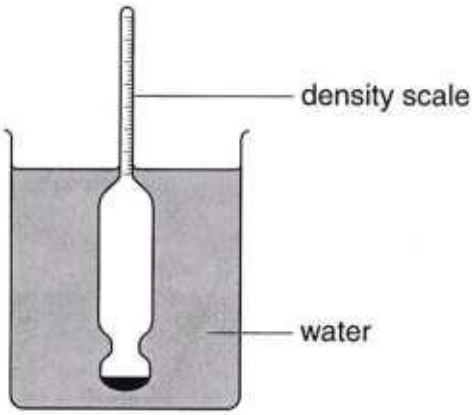

Fig. 4.1

(a) What is the name of the instrument?

.....[1]

(b) **(i)** Name the force that prevents the instrument from sinking.

.....[1]

(ii) How does the force in **(b)(i)** compare with the weight of the instrument?

.....[1]

(c) The instrument is placed in water at a higher temperature.
State and explain what is observed.

observation .....[1]

explanation .....

.....[1]

[Turn over

5 Fig. 5.1 shows a television aerial supported by two wires. The wires apply forces of 80 N and 120 N. The diagram is not drawn to scale.

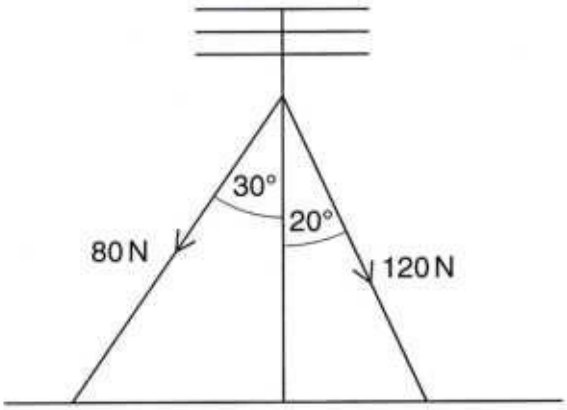

Fig. 5.1 (not to scale)

(a) What is the angle between the two wires?

.....[1]

(b) Choosing a suitable scale, draw a vector diagram to determine the resultant force when the 80 N and the 120 N forces are added.
State the scale that you use.

scale .....

size of the resultant force = ...[5]

For Examiner's Use

6 Lemonade is cooled by adding lumps of ice to it. 140 g of ice at a temperature of 0 °C cools 0.90 kg of lemonade from 26 °C to 12 °C.

The latent heat of fusion of ice is 330 000 J/kg.
The specific heat capacity of water is 4200 J/(kg °C).

(a) Calculate the amount of energy

(i) gained by the ice in melting,

energy = ...[1]

(ii) gained by the melted ice,

energy = ...[1]

(iii) lost by the lemonade.

energy = ...[1]

(b) Find the specific heat capacity of lemonade.

specific heat capacity = ...[2]

(c) The actual amount of heat lost by the lemonade is smaller than that calculated in **(a)(iii)**. Explain why.

.....

.....[1]

7 Fig. 7.1 shows part of the electromagnetic spectrum.

A	B	C	Visible light	D	Radio waves

Fig. 7.1

(a) Name the waves represented by the letters **C** and **D**.

C .....

D .....[2]

(b) Which letter represents a wave that comes from the nuclei of radioactive sources?

.....[1]

(c) Fig. 7.2 shows a quarry mine near a hill and an office.

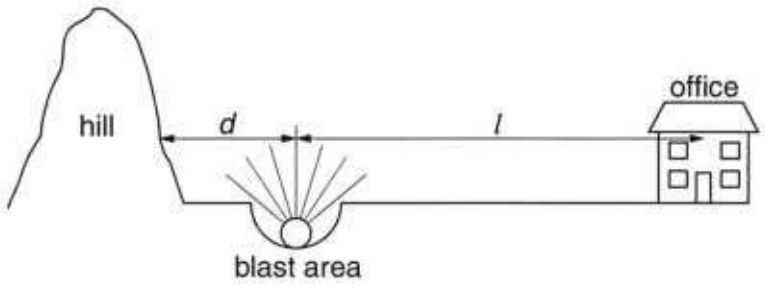

Fig. 7.2

During blasting, the office staff hear a sound 1.5 s after they see the blast.
A further 1.0 s later the staff hear a similar but quieter sound. The speed of sound in air is 330 m/s.

(i) What name is given to the second sound?

.....[1]

(ii) Calculate *l*, the distance between the office and the blast area.

l = ...[2]

(iii) Determine *d*, the distance between the blast area and the hill.

d = ...[3]

8 Fig. 8.1 shows an electric heater.

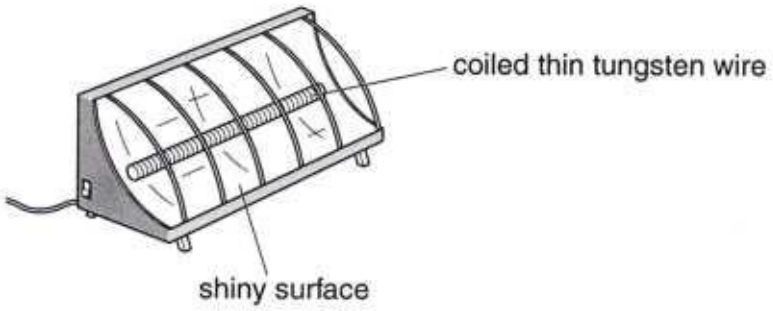

Fig. 8.1

(a) Name the type of radiation produced by the tungsten wire when the current is flowing.

.....[1]

(b) Give a reason why the tungsten wire is

(i) coiled,

.....

(ii) made thin.

.....

.....[2]

(c) Explain why the surface of the heater is

(i) shiny,

.....

(ii) curved.

.....

.....[2]

[Turn over

For Examiner's Use

9 Fig. 9.1 shows two coils wound around a cardboard tube.

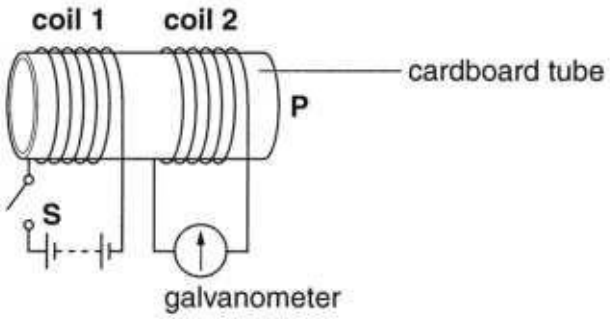

Fig. 9.1

The switch, **S**, is closed and coil 1 is slid towards coil 2.

(a) State and explain what is observed.

observation .....

.....

.....

explanation .....

.....

.....[3]

(b) The experiment in Fig. 9.1 is repeated with the cardboard replaced by a soft iron rod.

(i) State and explain what is observed.

observation .....

.....

explanation .....

.....

.....[2]

(ii) What will be the pole of the rod at end **P**?

.....[1]

10 A permanent magnet is pushed into a coil, as shown in Fig. 10.1.

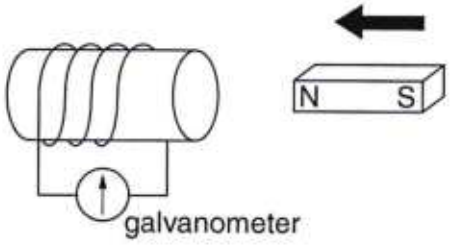

Fig. 10.1

(a) (i) State and explain what is observed when the magnet is pushed into the coil.

.....

.....[2]

(ii) On Fig. 10.1, draw an arrow to show the direction of the induced current. [1]

(b) Fig. 10.2 shows the structure of a bicycle dynamo.

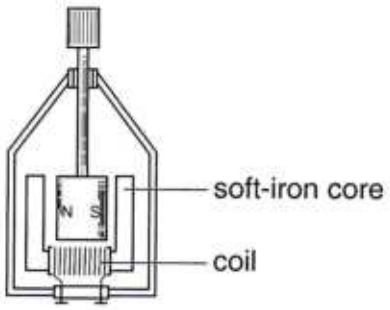

Fig. 10.2

(i) What type of current is produced by the dynamo?

.....[1]

(ii) What is the purpose of the soft-iron core?

.....[1]

(iii) State **three** ways of increasing the output voltage.

1. .....

2. .....

3. .....[3]

(iv) Explain why no current is induced when the bicycle stops.

.....

.....[2]

[Turn over

11 (a) Strontium-90 decays by emitting a beta-particle.
State how the atomic number and mass number are affected by the emission of a beta-particle.

(i) atomic number .....

(ii) mass number ..... [2]

(b) A radioactive source has a half-life of 2 months. After 8 months, the count rate has reduced to 25 counts per minute. Complete Table 11.1 to find the initial count rate of the source.

Table 11.1

count rate/min					25
time/months	0	2	4	6	8

[2]

initial count rate = ... [1]