



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

CANDIDATE
NAME

CENTRE
NUMBER

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CANDIDATE
NUMBER

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PHYSICS

0571/03

Paper 3

October/November 2012

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 10N (i.e. acceleration of free fall = 10 m/s^2).

For Examiner's Use

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



- 1 (a) Fig. 1.1 shows part of a rule with a line A marked up to the scale.

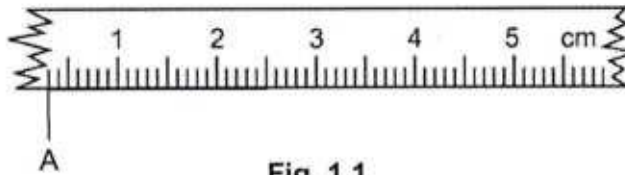


Fig. 1.1

What is the reading on the rule at the line A?

reading =[1]

- (b) Fig. 1.2 shows the same rule used to measure the length of an object.

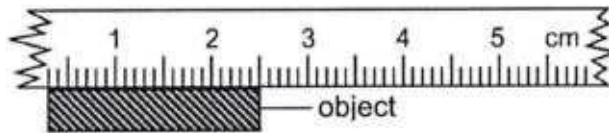


Fig. 1.2

What is the length of the object?

length =[1]

- (c) State **one** possible source of error when using a rule to measure length.

.....[1]

- (d) Fig. 1.3 shows a stopwatch that is used to time 15 complete oscillations of a simple pendulum.

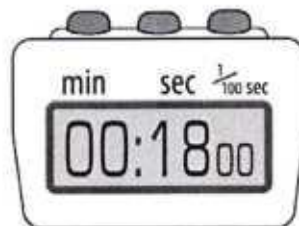


Fig. 1.3

- (i) What is the time taken to complete 15 oscillations?

time taken =[1]

- (ii) Calculate the period of the pendulum.

period =[2]

- 2 Fig. 2.1 shows the velocity-time graphs of two students, Tshepo and Kabo, as they cycled from their homes to school.

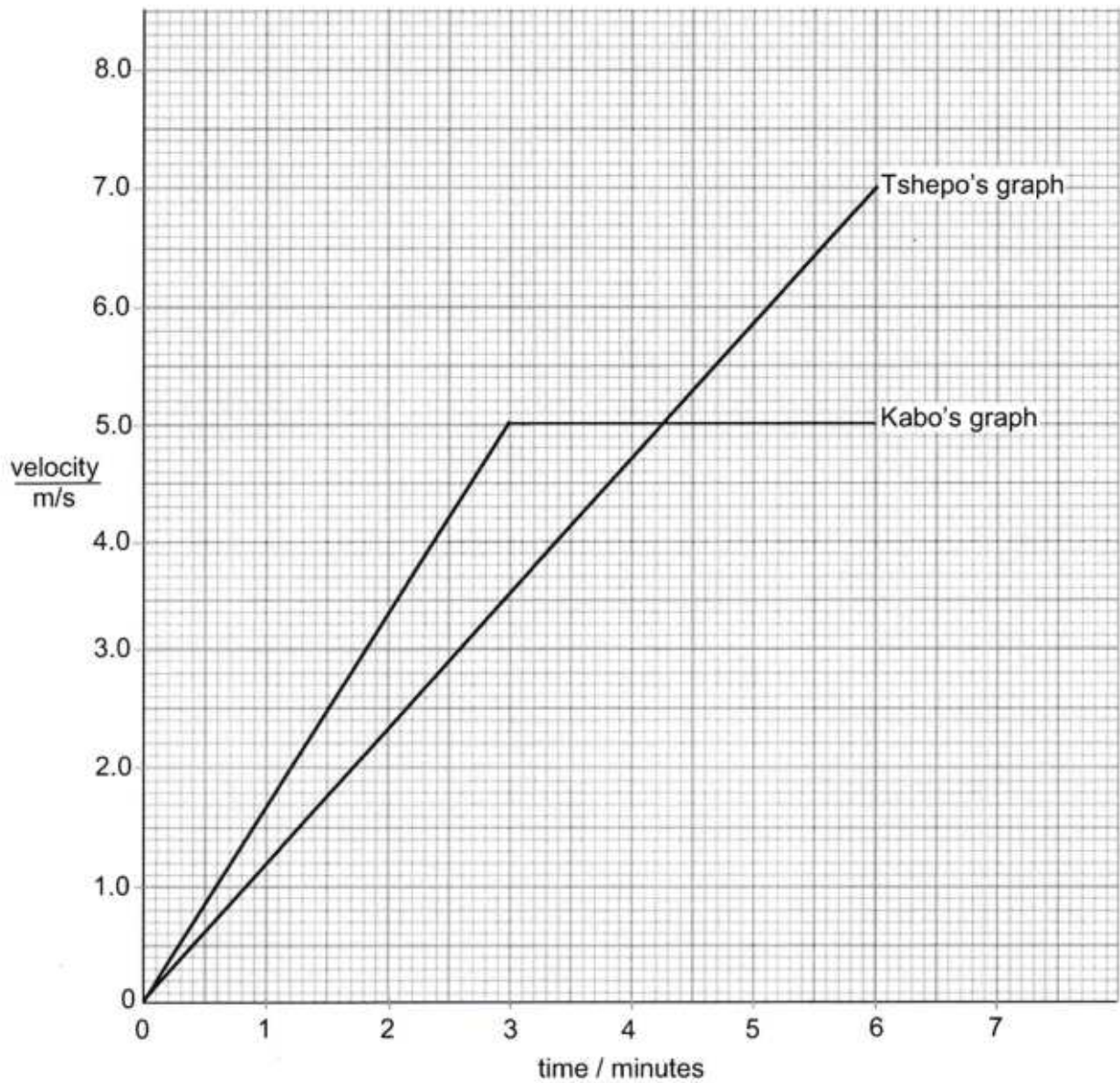


Fig. 2.1

Each student takes 6 minutes to reach school.

- (a) What is the distance between Kabo's home and the school?

distance =[3]

- (b) What is the acceleration of Tshepo?

acceleration =[2]



- (c) Who was accelerating faster during the first 2 minutes of the journey?
Explain your answer.

.....

 [2]

- 3 (a) Fig. 3.1 shows a car accelerating along a curved road. The car is moving at a constant speed of 20 m/s.



Fig. 3.1

- (i) Explain why the car in Fig. 3.1 is accelerating.

.....

 [1]

- (ii) Name a force that causes this acceleration.

..... [1]

- (b) Fig. 3.2 shows a car pulling a caravan down a steep road.

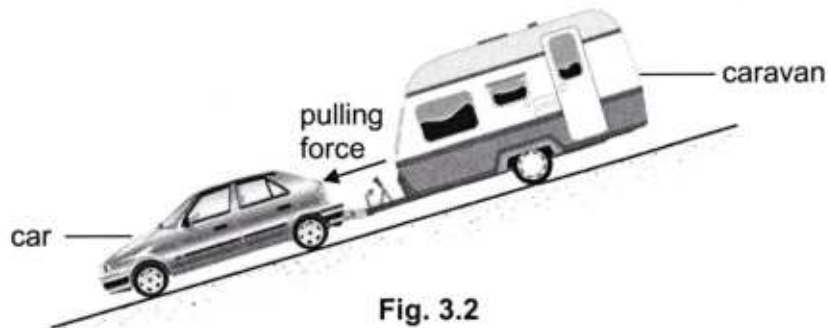


Fig. 3.2

The force with which the car pulls the caravan is labelled as the pulling force.

- (i) On Fig. 3.2 draw and label arrows to represent the correct position of the other forces acting on the caravan. [2]

- (ii) Name a property of the car and caravan that makes stopping difficult.

..... [1]

- 4 (a) Fig. 4.1 shows a microwave oven used to cook food. The inner walls of the microwave oven are silvered.

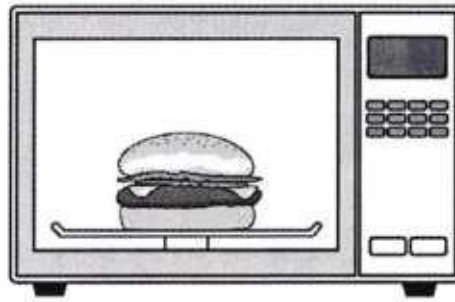


Fig. 4.1

- (i) Explain how the silvered walls improve the efficiency of the oven.

.....
[2]

- (ii) State **one** other use of microwaves.

.....[1]

- (b) Fig. 4.2 shows wavefronts moving from deep water to shallow water.

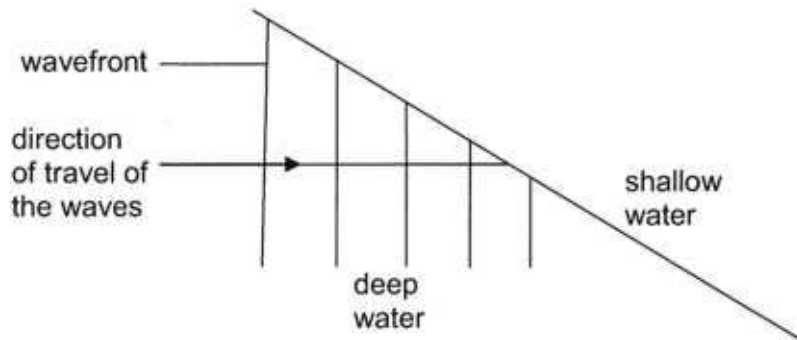


Fig. 4.2

- (i) Complete Fig. 4.2 to show the wavefronts and the direction of travel of the waves in shallow water. [2]

- (ii) Explain what is meant by a wavefront.

.....
[1]



(iii) State whether the following quantities will **increase**, **decrease** or **stay the same** when the wavefronts enter shallow water.

speed

wavelength

frequency[3]

5 Fig. 5.1 shows Angie, of weight 200 N, and Kagiso, of weight 500 N, playing on a fixed 3.0 m long climbing frame. Angie is hanging at the centre of the climbing frame and Kagiso is on side PQ. You may neglect the weight of the climbing frame in this question.

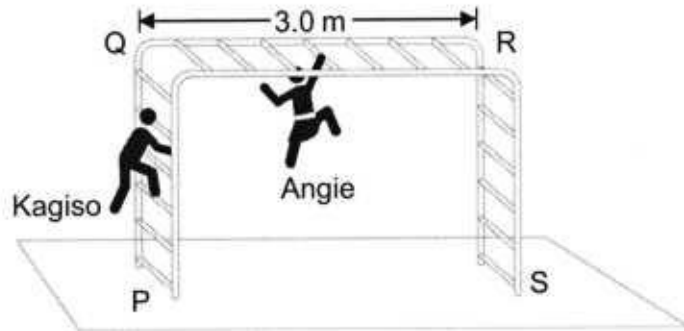


Fig. 5.1

(a) What is the value of the upward force on the climbing frame at P?

force =[2]

(b) Where do Angie and Kagiso have to be on the climbing frame if the upward force at P is as low as possible?

.....[1]

(c) Kagiso leaves the frame. Angie is hanging 1.0 m from point Q. Calculate the upward force on the climbing frame at

(i) P,

force =[2]

(ii) S.

force =[1]

6 Fig. 6.1 shows a hydroelectric power station.

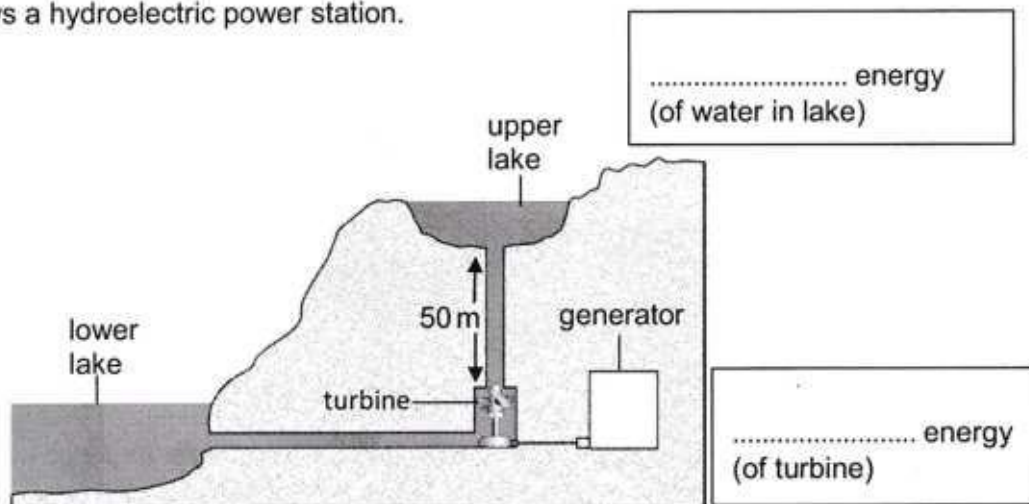


Fig. 6.1

- (a) On Fig. 6.1 complete the boxes by filling in the forms of energy in the hydroelectric power station. [2]
- (b) Water of mass 100 000 kg falls 50 m from the upper lake onto the turbine. Calculate the decrease in potential energy of the falling water.

energy =[2]

- (c) The energy output from the generator is 15% of the energy the water has in the upper lake. Suggest **one** possible way in which energy is wasted.

.....

[1]



- 7 (a) Fig 7.1 shows a computer chip fitted with a 'heatsink'. The 'heatsink' cools the computer chip.

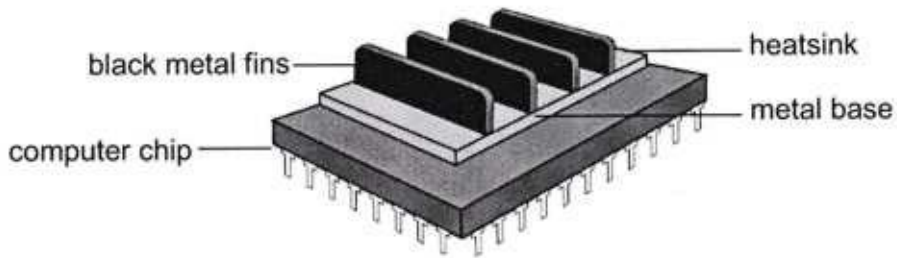


Fig. 7.1

Complete Table 7.1 to show how each feature is suitable for its purpose.

Table 7.1

design feature	how it is suitable for its purpose
black metal fins	
many fins	
metal base	

[3]

- (b) Fig 7.2 shows a small plastic beaker floating upside down in a large beaker containing cold water. Water in the beaker is heated but it does not boil.

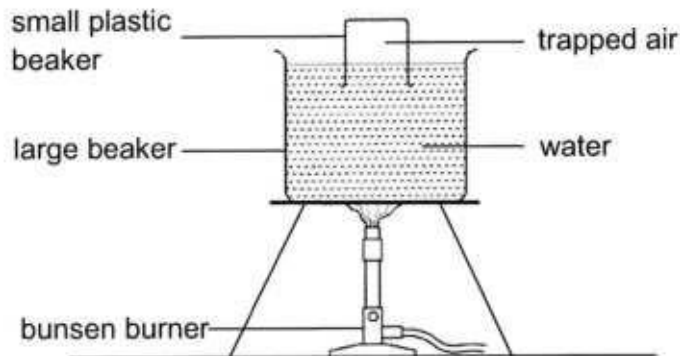


Fig. 7.2

State and explain what is observed as the temperature of the water increases.

observation.....[1]

reason

.....[2]

- 8 (a) Fig 8.1 shows a circuit diagram for an electrical appliance with a three way switch to a motor.

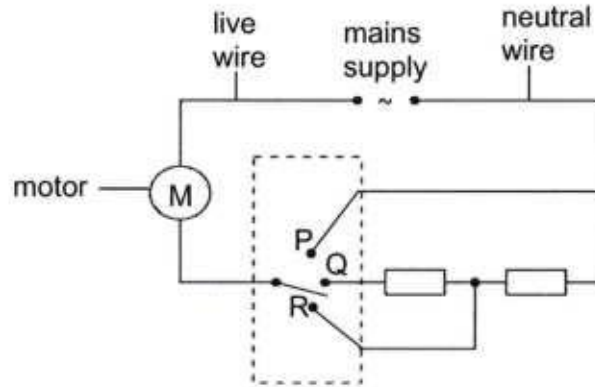


Fig. 8.1

- (i) Which position gives the fastest speed of the motor? Explain your answer.

position.....
 explanation

[2]

- (ii) On Fig. 8.1 mark with a cross (X) the correct position of another switch that will turn the motor ON/OFF.

[1]

- (b) Fig. 8.2 shows a transformer.

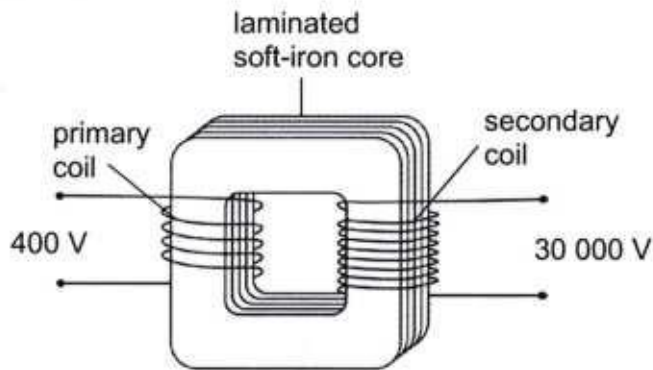


Fig. 8.2

- (i) Briefly explain how a transformer works.

.....

[4]



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

.....

[2]

(iii) Explain why power is transmitted at high voltages.

.....

[2]

9 Fig. 9.1 shows a light sensitive switch.

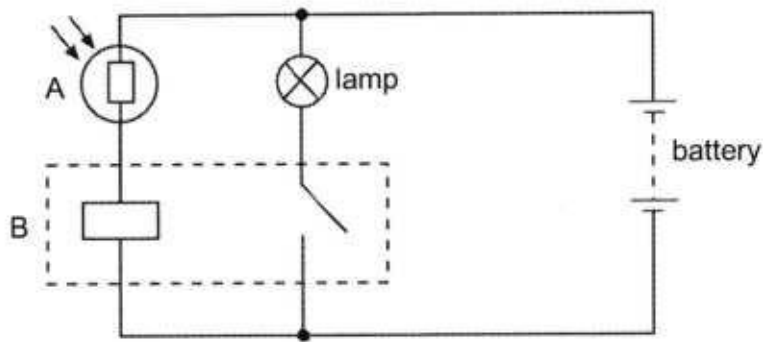


Fig. 9.1

(a) Name the components labelled A and B.

A.....
 B.....[2]

(b) Explain how the lamp switches on when it becomes dark.

.....

[3]

10 Fig. 10.1 shows a tube used to produce cathode rays.

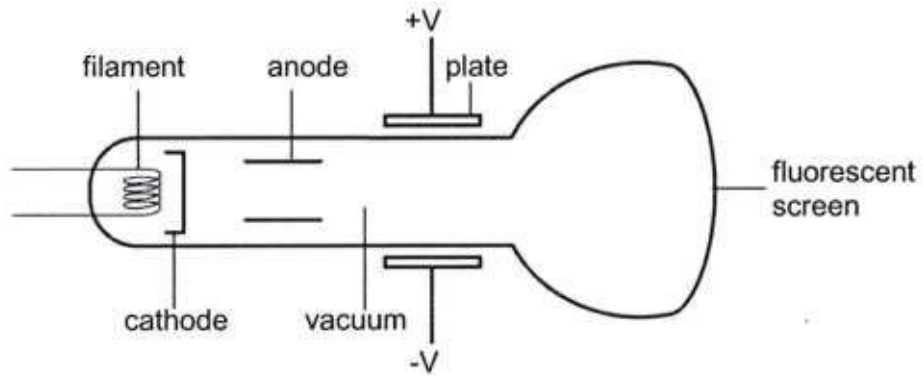


Fig. 10.1

(a) Name the part where thermionic emission occurs.

.....[1]

(b) Which particles are emitted during thermionic emission?

.....[1]

(c) Explain why the vacuum is necessary?

.....

[1]

(d) A large potential difference (voltage) is applied across the plates as shown in Fig. 10.1. The top plate is more positive than the bottom plate. On Fig. 10.1, draw the path of the cathode rays.

[1]



11 Table 11.1 shows how the activity of a radioactive isotope changes over time.

Table 11.1

activity (count/sec)	100	70	50	35	25
time (days)	0	10	20	30	40

(a) What is meant by half-life?

.....
[1]

(b) Determine the half-life of the isotope.

half life.....[1]

(c) (i) Uranium - 234 (${}_{92}^{234}\text{U}$) decays by emitting an alpha particle to become a new element.

What is the mass number (nucleon number) and the atomic number (proton number) of the new element?

mass number

atomic number[1]

(ii) Explain how the fission of uranium produces heat in a nuclear reactor.

.....

[3]

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