MINISTRY OF EDUCATION AND HIGHER EDUCATION

FORM FOUR EXAMS, 2011

PHYSICS

2011

P/LAND NATIONAL EXAMINATION BOARD

Name .....

School .....

Roll Number.....

Puntland State of Somalia

Ministry of Education

Puntland National Examination Board

Form 4

PHYSICS EXAMINATION

2011

Time 2 hours

Plus 10 minutes before the exam for reading through the paper

TOTAL TIME 2 hours 10 minutes

INSTRUCTIONS TO CANDIDATES

This paper consists of 20 printed pages.
Count them now. Inform the invigilator if there are any missing.

PART ONE (10 Multiple choice questions): 10 marks
PART TWO (10 Structured questions): 90 marks

TOTAL 100 marks

- Answer ALL questions.
- All answers and working must be written on this paper in the spaces provided immediately after each question.
- Rough work can be done on page 2. This will not be marked
- No extra paper is allowed.
- No calculators are allowed.
- If you make a mistake cross out the incorrect answer clearly and write your correct answer.

Use This Page for Rough Work, It Will Not Be Marked

PART 1: Multiple choice questions **(10 Marks)**. Answer all the questions. Circle the correct answer.

1. Which energy source is renewable?

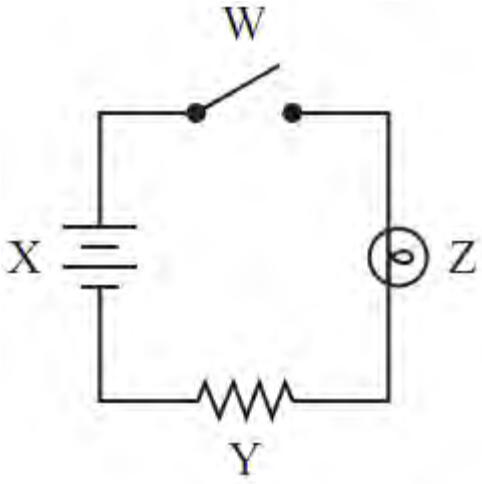
   A). oil B) coal C) solar D) natural gas

2. Acceleration is the change in

   A) distance per unit time B) displacement per unit time

   C) speed per unit time D) velocity per unit time.

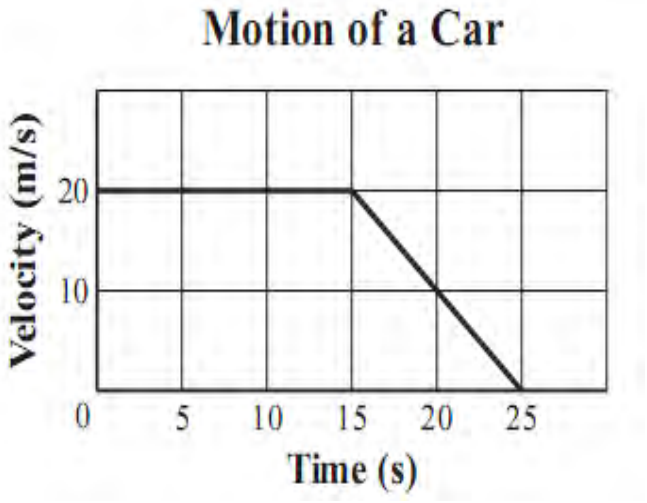
3. A circuit diagram is shown below.



Which component in the diagram converts chemical energy into electrical energy?

A. component W
B. component X
C. component Y
D. component Z

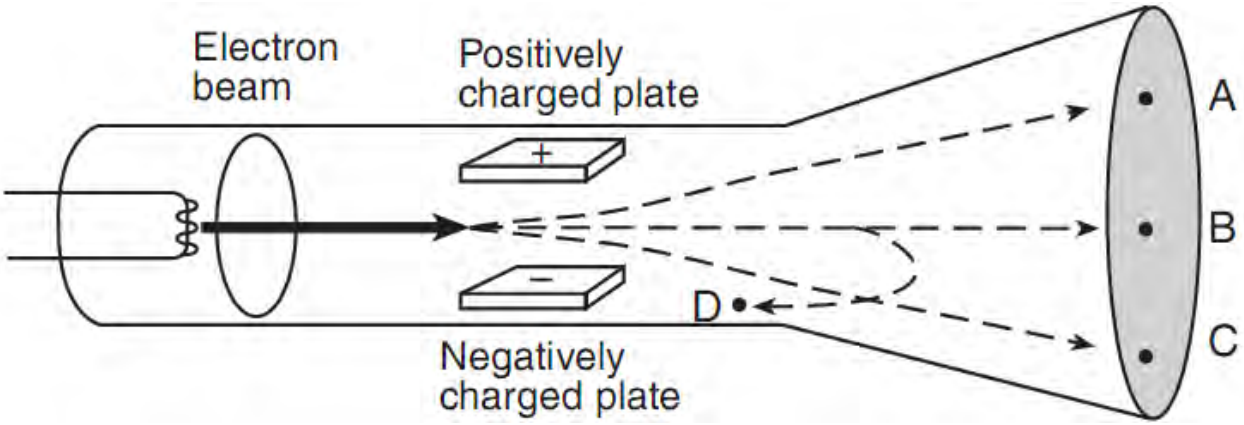
4. The graph below shows velocity measurements made as a car moved north for 25 seconds.



How far did the car move during the first 15 s of the trip?

A. 20 m
B. 25 m
C. 300 m
D. 500 m

5. The diagram below shows a beam of electrons fired through the region between two oppositely charged parallel plates in a cathode ray tube.



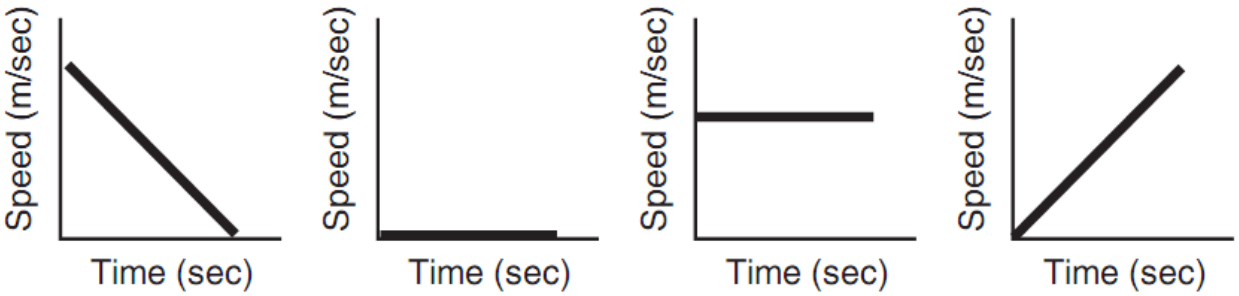
After passing between the charged plates, the electrons will most likely travel path

A) A B) C C) B D) D

6 Which of the following will not allow the transmission of sound waves?

A Brick B Vacuum C Water D Air

7. Which graph below shows an object slowing down?



A B C D

8. X-rays are used in medicine to show broken bones. X-rays can be detected using

A an optical fibre B photographic film

C a thermistor D an eye.

9. As a sample of water turns to ice,

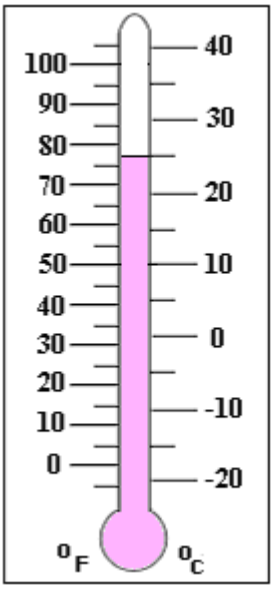
   A. new molecules are formed.

   B. the mass of the sample is increased.

   C. the arrangement of the molecules changes.

   D. energy is absorbed by the molecules

10. Identify the temperature shown on the thermometer.



   A. 25°F

   B 20°F

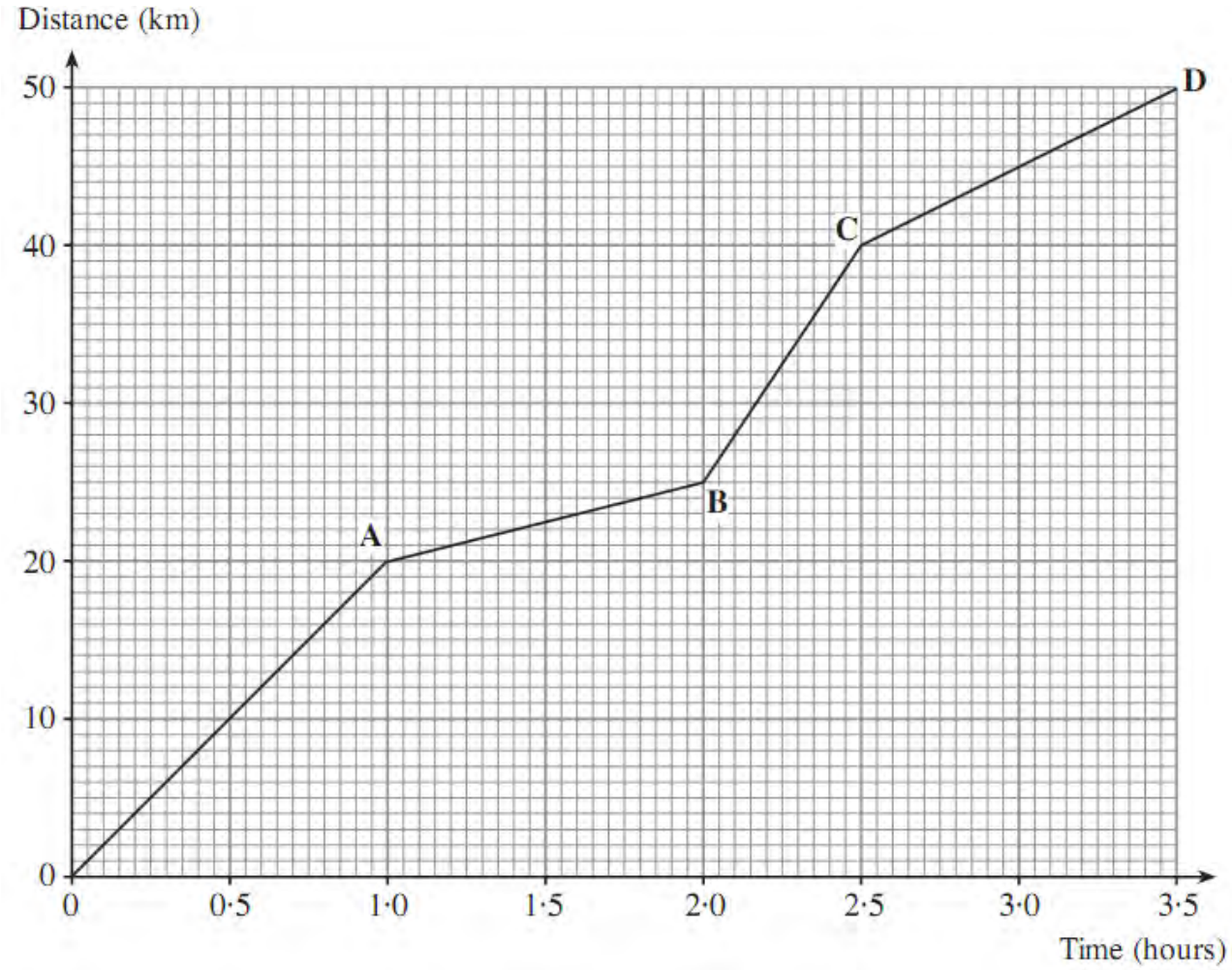
   C 77°C

   D. 25°C

PART TWO: ANSWER ALL QUESTIONS (90 marks)

QUESTION ONE: MECHANICS (10 marks)

A cyclist takes part in a 50 km race. Part of the race requires the competitors to cycle up a very steep mountain and down the other side. The graph shows the motion of the cyclist during the race.



(a) How far did the cyclist travel in the first hour?.....km [1 mark]

(b) (i) In which region of the graph, OA, AB, BC or CD, did the cyclist travel at the lowest speed? ..... [1 mark]

(ii) Give a reason for your answer to (i).

.....

..... [2 mark]

(iii) Explain why B is most likely to represent the top of the mountain.

…… .

…… [2mark]

(c) (i) State how far the cyclist travelled between 2 hours and 2·5 hours.

…… km [1 mark]

(ii) What was the cyclist's average speed, in km/h, between 2 hours and 2·5 hours?

.....

…… .

…… .

…… km/h [3 marks]

QUESTION TWO: FRICTION, WORK, AND ENERGY (10 Marks)

A passenger at Bosaso airport pulls a suitcase towards the check-in desk.

(a) The suitcase has been designed to reduce the effects of friction when it is pulled.

(i) Explain how the suitcase has been designed to reduce friction.

.....

.....

..... [2 mark]

(ii) Why is it important to reduce the force of friction on the suitcase?

.....

..... [1mark]

(b) The suitcase is pulled for a distance of 15 metres using a force of 20 newtons.

Calculate the work done in pulling the suitcase.

.....

.....

..... [2 marks]

(c) (i) At the check-in desk, the suitcase is lifted through a vertical height of 0·4 metres onto a scale. The reading on the scale is 16 kilograms.

Calculate the gravitational potential energy gained by the suitcase when it is lifted onto the scale.

.....

.....

.....[3 marks]

(ii) The maximum weight allowed for a suitcase is 150 newtons. Is the weight of the suitcase within the weight limit? You must justify your answer with a calculation.

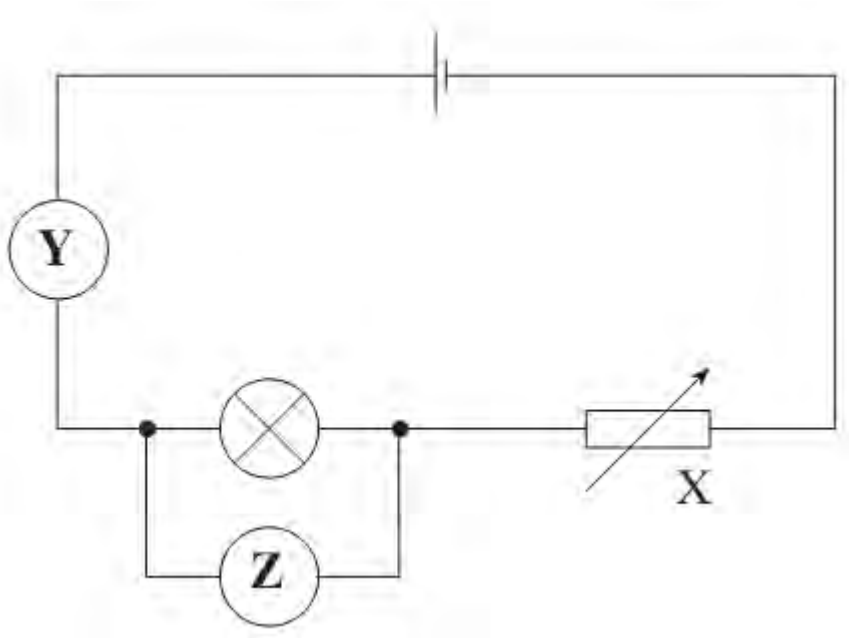
.....

.....

..... [2 marks]

QUESTION THREE : ELECTRICITY- CIRCUITS (7 Marks)

The circuit diagram below is used to investigate how the current passing through a lamp changes with the voltage across it.



(a) (i) Which component, X, Y or Z measures the current through the lamp?

……

..... [1 mark]

(ii) . Which of X, Y or Z can be used to adjust the current through the lamp?

……

..... [1 mark]

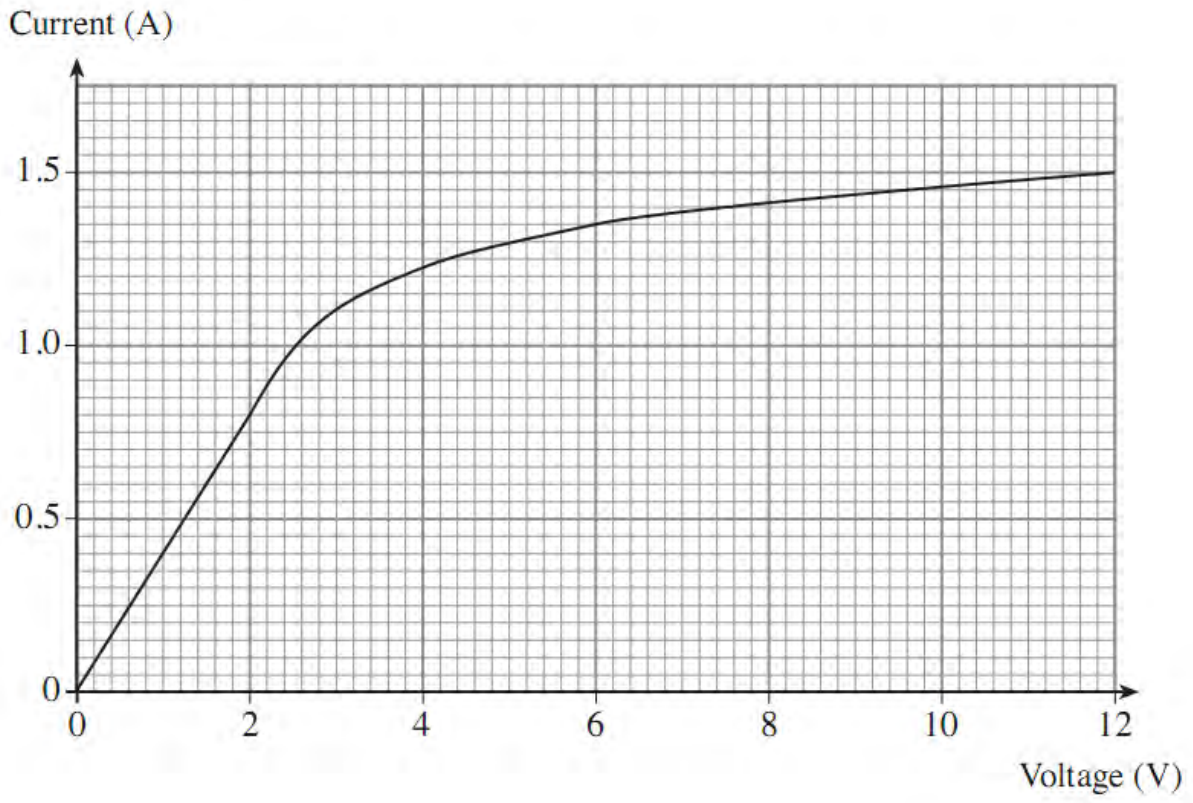
iii). What adjustment will decrease the current?

……

……

.....[1 mark]

(b) Results obtained from using the above circuit produced the following graph.



(i) The resistance of the lamp at 2V is 2·5 Ω. Find the resistance of the lamp at 12V.

……

……

……

……

……

……

……

.....[3 marks]

(ii) At what voltage does the resistance of the lamp start to increase?

……

…… [1 mark]

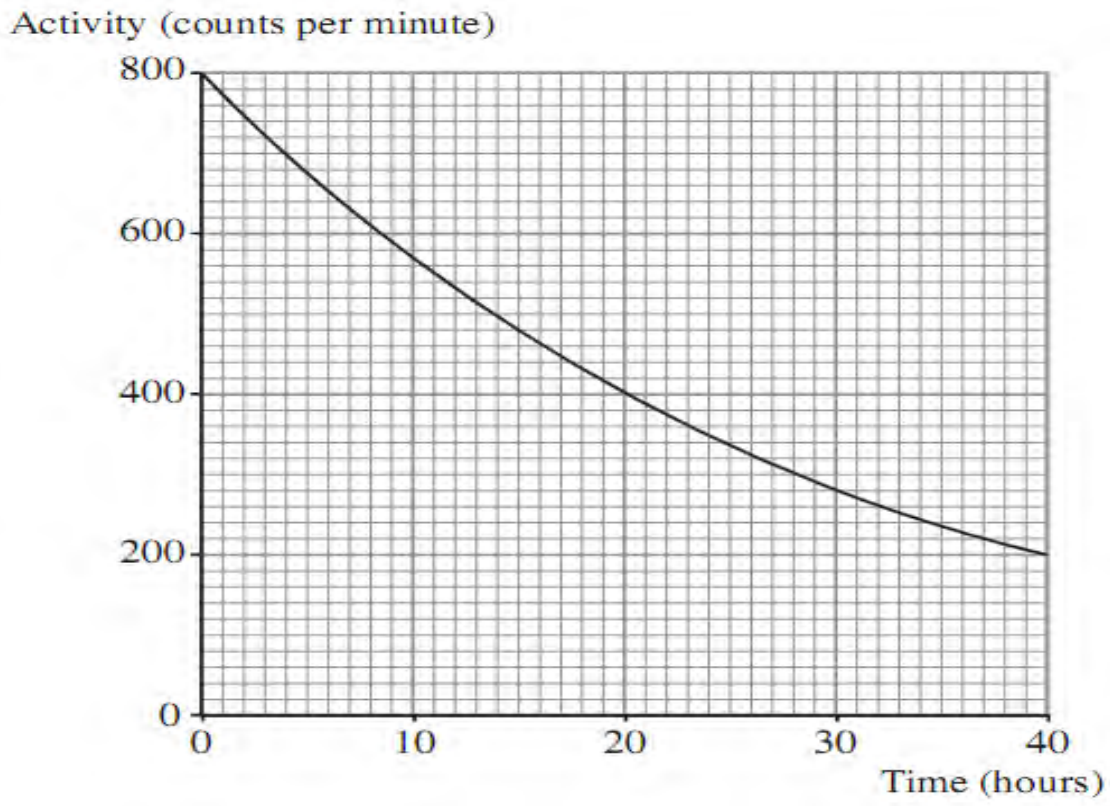
QUESTION FOUR : RADIOACTIVITY (9 Marks)

(a) What is meant by half life?

……

…… [2 marks]

(b) The graph shows how the activity of a radioactive source changes with time.



(i) What is the drop in the activity over the first 20 hours?

…… [1mark]

(ii) What is the half life of the source? …… [1mark]

iii) At what time is the activity equal to 200 counts per minute?

…… [1mark]

iv) What would the activity be at 60 hours? …… [1mark]

(c) i) Cobalt 60 is a radioactive source which has a half life of 5·25 years. A sample of cobalt 60 has a mass of 40mg. Calculate the mass of undecayed cobalt 60 left after 21 years. Show your working.

……

……

……[2 marks]

(ii) Give one reason why it is important to dispose of radioactive waste safely.

……

…… [1 mark]

QUESTION FIVE: MEASUREMENT (7 marks)

(a) An unopened bottle of olive oil has a mass of 0.97 kg. The empty bottle has a mass of 0.51 kg.

0.97 kg

0.51 kg

Calculate the mass of the olive oil.

……

……

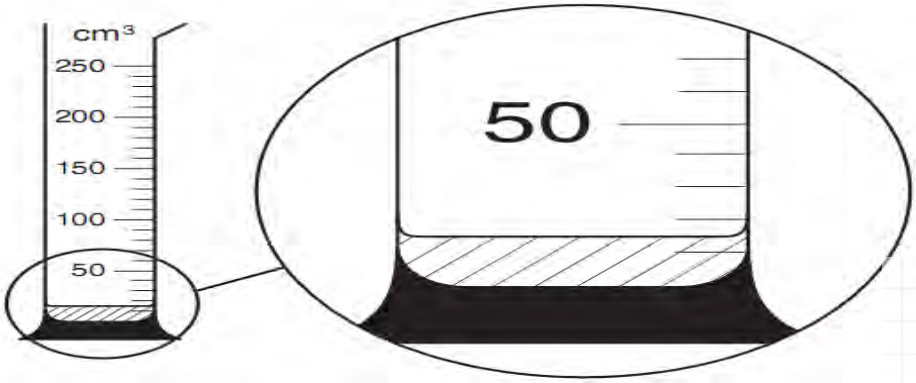
……

……

……

…… [1 mark]

(b) The olive oil is poured into three 250 cm^3 measuring cylinders. The first two cylinders are filled to the 250 cm^3 mark. The third is shown in the figure below.



(i) What is the volume of the olive oil in the third measuring cylinder?

……..... [1 mark]

(ii) Calculate the volume of the olive oil in the unopened bottle.

……

……..... [2marks]

(iii) Calculate the density of the olive oil. Express your answer to 2 significant figures.

……

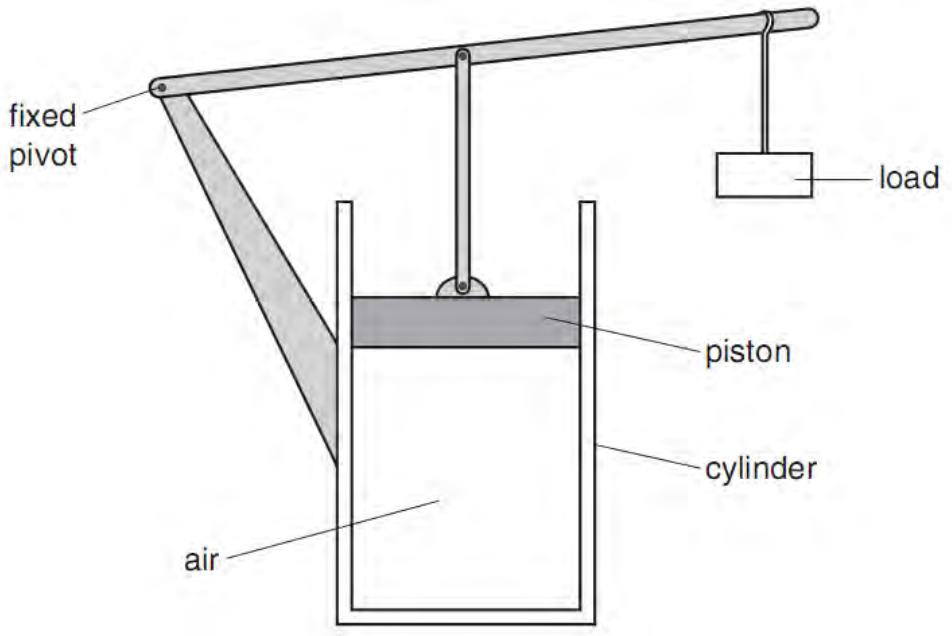
……

……

……. [3 marks]

QUESTION SIX: PRESSURE (8 Marks)

The air trapped in a cylinder by a piston is kept under pressure by a load, as shown in the figure below.



(a) Describe how the pressure in the cylinder is caused by the air molecules.

……

……

……

..... [2 marks]

(b) The load is increased.

(i) State what happens to the piston.

……

..... [1mark]

(ii) State what happens to the pressure in the cylinder, and give a reason.

What happens .....

……

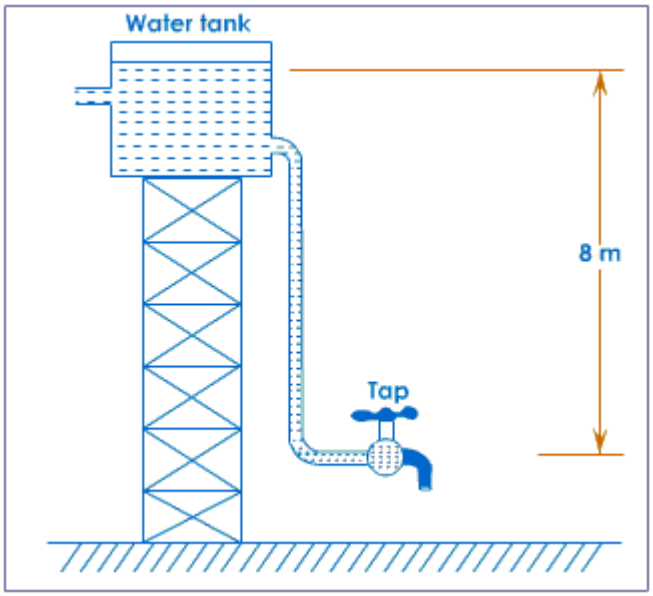
..... [1mark]

Reason .....

……

…… [2marks]

c) The water tank in the figure below is 8 m above the tap. What pressure forces the water out from the tap? (Gravity = 10 ms^{-1}, density of water = 1000 kgm^{-3})



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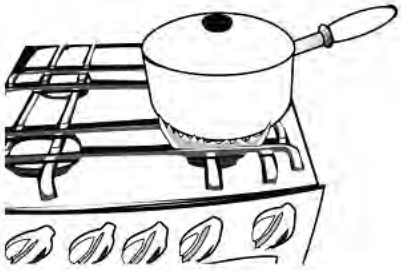
……

…….. [2marks]

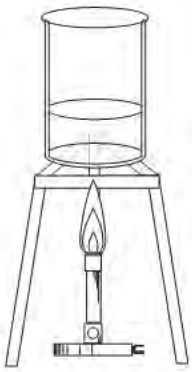
QUESTION SEVEN: HEAT (9 marks)

The same volume of water is heated in three different ways for the same length of time as shown below.

Plastic kettle



Metal saucepan



Glass beaker

Type of heater	Total heat energy supplied (J)	Heat transferred to the water (J)	Efficiency
Kettle	30 000	24 000	
Gas hob	20 000	12 000	60%
Bunsen burner	18 000	9 900	55%

(a) Calculate the efficiency of the kettle.

……

……

……

…… [2 mark]

(b) (i) Give a reason why the kettle loses less heat than the saucepan by the process of conduction.

……

…… [1 mark]

(ii) The water at the bottom of the kettle is heated. Name the process by which all the water in the kettle becomes hot.

……

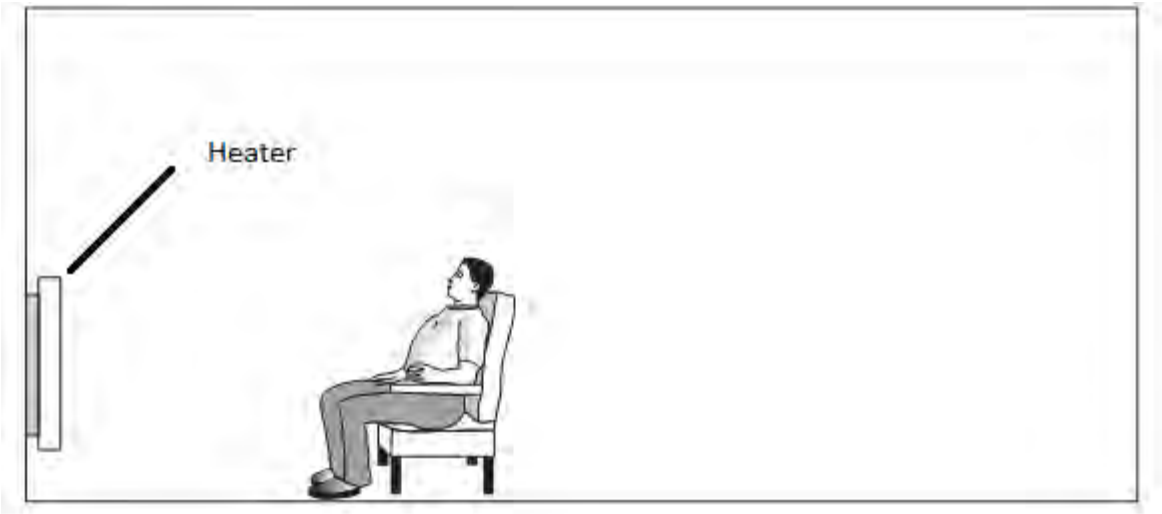
…… [1 mark]

(c) Use the information in the table to give one reason why the water in the kettle will boil first.

……

…… [1 mark]

(d). A heater is used to heat Abdillahi's room as shown in the diagram below.



(a) (i) Which process transfers heat directly to a Abdillahi when sitting in a chair in front of the heater?

..... [1 mark]

(ii) Which process transfers heat to the ceiling and around the room?

..... [1 mark]

(b) The room heater has a power rating of 2kW and is used by Abdillahi's family for 35 hours.

(i) Use the equation : **units used (kWh) = power(kW) × time(h),** to calculate the number of units used.

.....

..... [1 mark]

(ii) Use the equation: **cost = units used × cost per unit**

to find the cost of using the heater if 1 unit costs $0.1

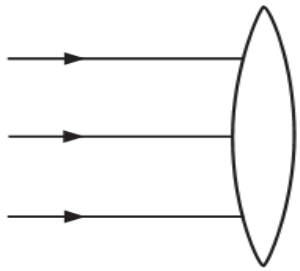
.....

.....

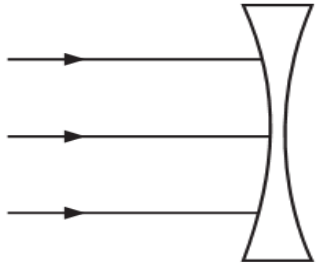
..... [1 mark]

QUESTION EIGHT : LIGHT (10 Marks)

(a) State the names of the lenses and complete the diagrams to show the paths of the rays of light through each lens. [4 marks]



Name of lens…… 1 mark



Name of lens…… …… 1 mark

(b) A student can see clearly when looking at distant objects, but has to use spectacles when reading a book.

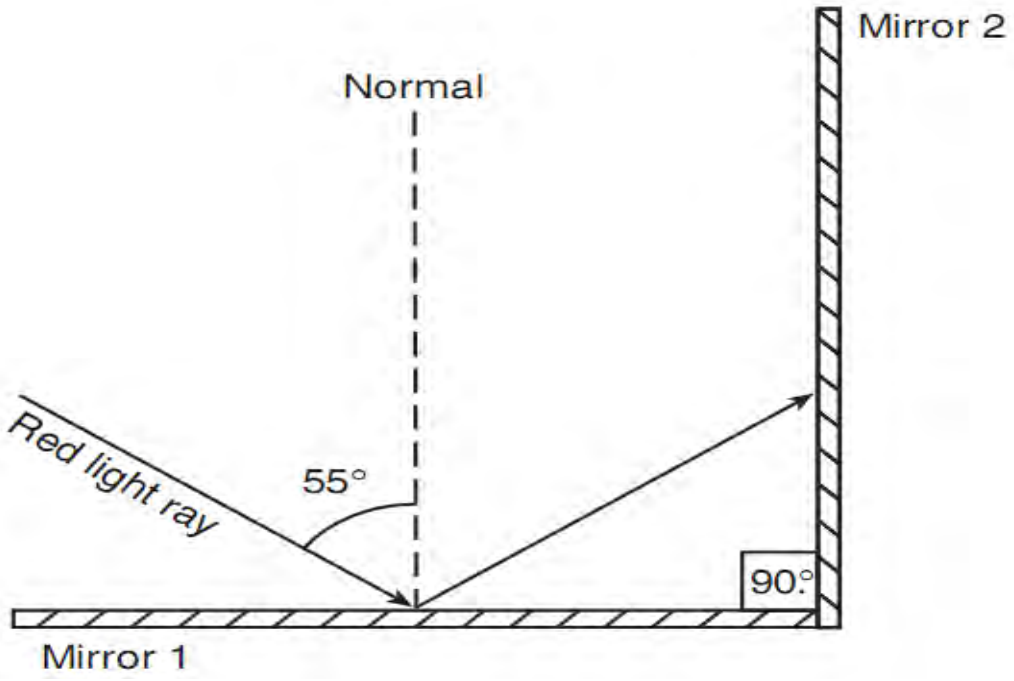
(i) What is this eye defect called?

……. [1 mark]

(ii) What type of lens is used in the spectacles to correct this defect?

……. [1 mark]

c) Two plane mirrors are positioned perpendicular to each other as shown in the diagram. A ray of monochromatic red light is incident on mirror 1 at an angle of 55°. This ray is reflected from mirror 1 and then strikes mirror 2.



Determine the angle at which the ray is incident on mirror 2.

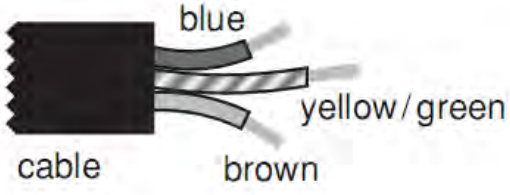
……[1 mark]

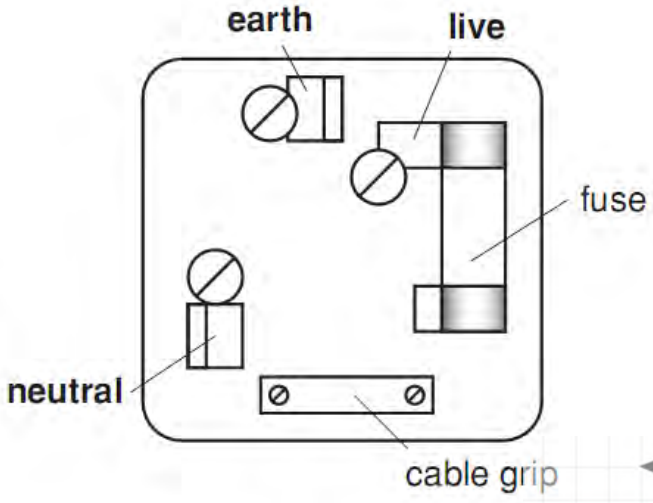
On the diagram draw the ray of light as it is reflected from mirror 2.

……[1 mark]

QUESTION NINE : ELECTRICITY- SAFETY AT HOME (10 Marks)

A) The figure shows a cable containing three wires coloured brown, blue and yellow/green, and a mains plug with the cover removed.





(a) Describe how to connect the cable and the three wires correctly and safely to the plug.

.....

.....

.....

.....[4 marks]

(b) Give a reason why the casing of a 3-pin plug is made of plastic or rubber.

.....

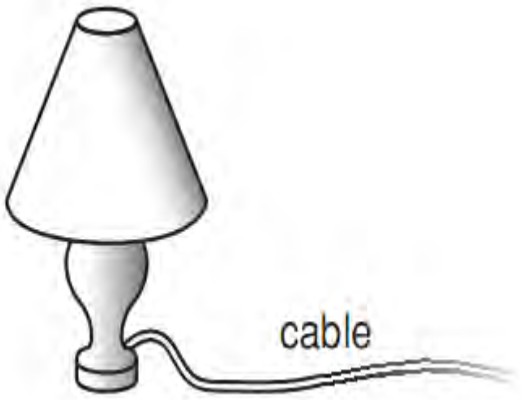
..... [1 mark]

(c) State the type of fault that would cause the fuse in the plug to break the circuit.

.....

.....[1 mark]

(B) The table lamp shown in the figure below is made from plastic. It has only two wires in the cable to connect it to the plug.



The lamp has a power rating of 100W and is used with a 230 V supply.

(i) Which wire, earth, live or neutral, is not needed in the cable for the lamp?

.....

.....

.....

..... [1mark]

ii) Explain why the lamp is safe to use even though it has only two wires in the cable.

.....

..... [1mark]

(i) Explain what is meant by a power rating of 100W.

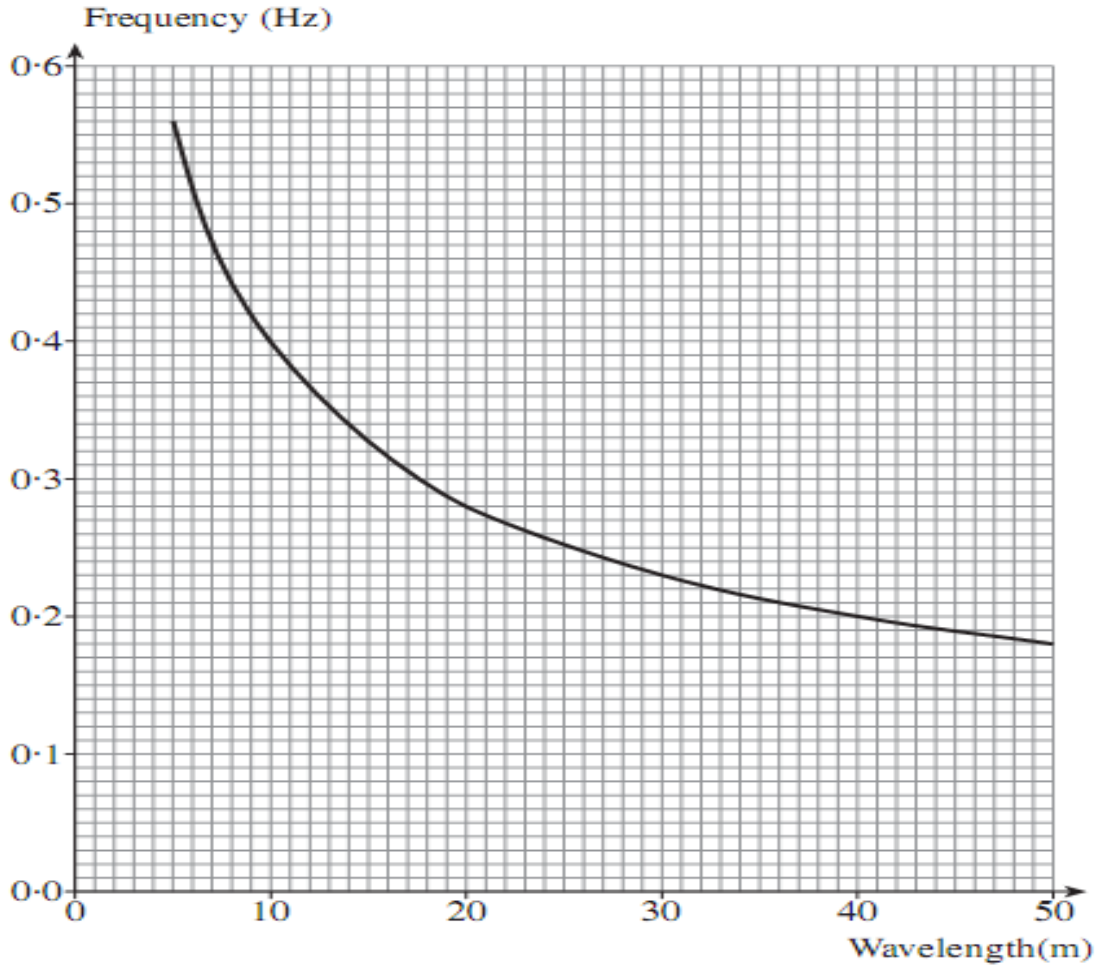
.....

.....

.....[2 marks]

QUESTION TEN: WAVES (10 marks)

a) The graph shows how the frequency of deep ocean waves depends upon the wavelength of the waves.



(i) Use the graph to find the frequency of the waves with a 40 m wavelength

frequency = …… Hz. [1 mark]

(ii) Use the equation: **wave speed = frequency × wavelength,** to calculate the speed of these 40 m waves.

wave speed = …….. ……..

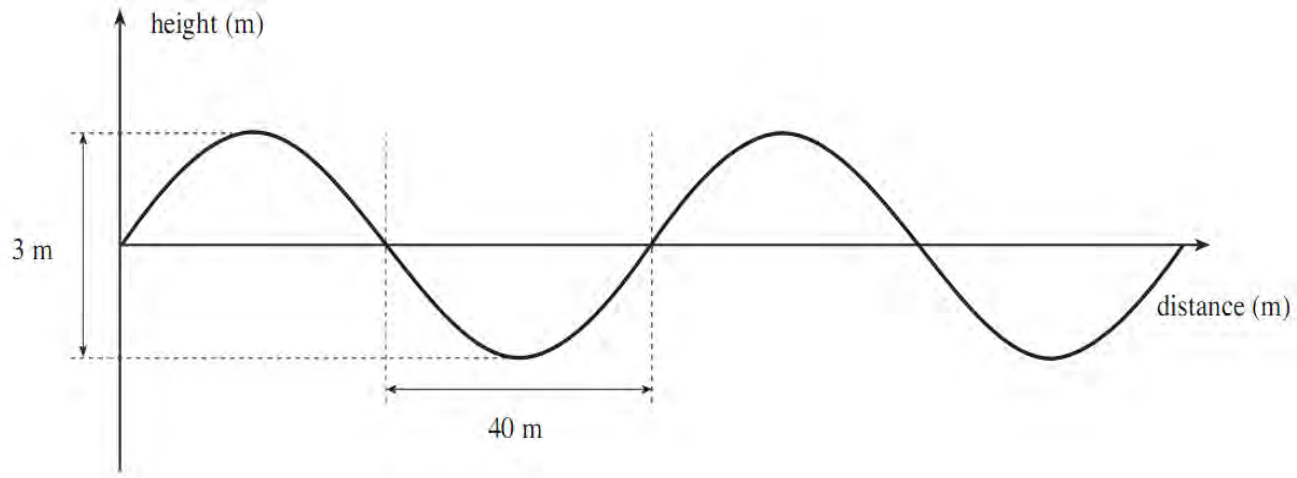
…… m/s [2 mark]

(iii) Calculate how long it would take the 40 m waves to arrive at an island 5600 m away.

……

……[1 mark]

b) The diagram represents a wave on the ocean.

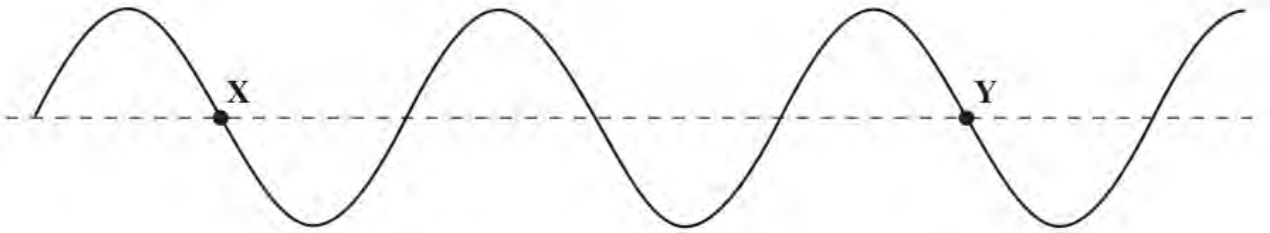


(a) Use the information given in the diagram to find:

(i) the wavelength of the wave: Wavelength = …… [1 mark]

(ii) the amplitude of the wave. Amplitude = …… [1 mark]

b). The diagram shows a wave travelling across the surface of water.



(a) Show clearly with a labelled arrow

(i) the amplitude of the wave [A],……[1 mark]

(ii) the wavelength of the wave [W], …… [1 mark]

(b) How many complete waves are there between X and Y?

..... [1 mark]

(c) The frequency of the wave is 5Hz. What does this mean?

……

……[1 mark]

END