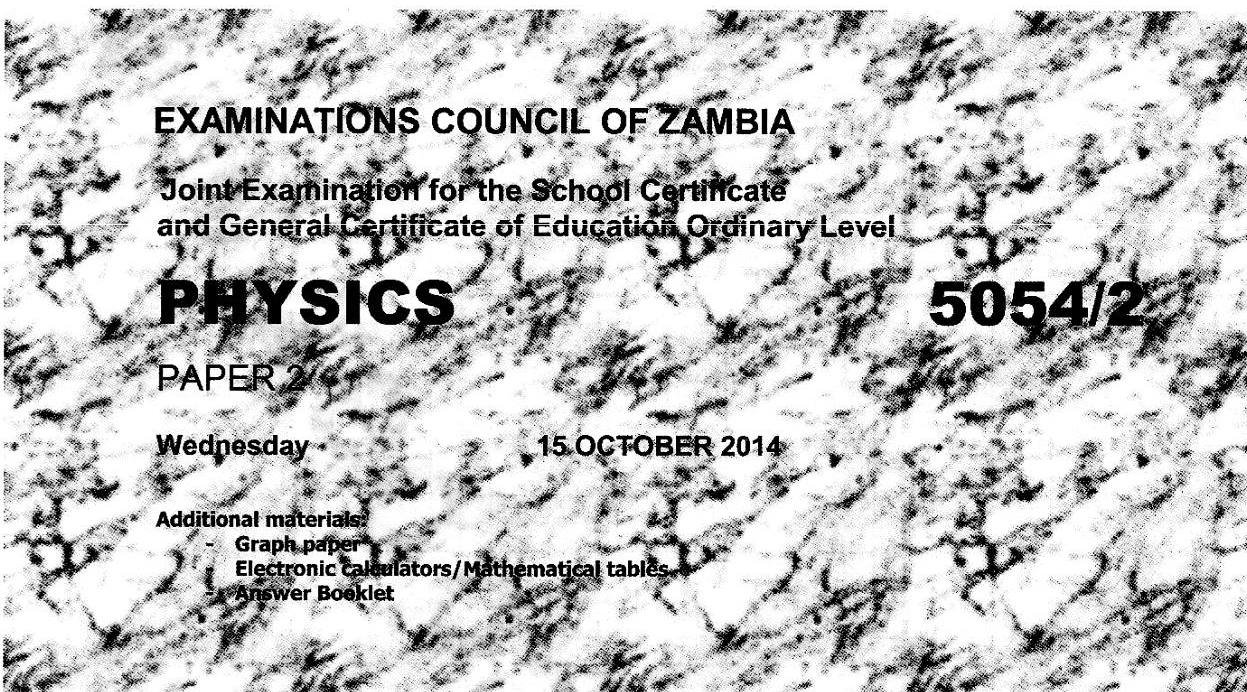


Candidate Name: _____

Centre Number				Candidate Number									



TIME: 2 hours

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces provided at the top of this page and on any separate Answer Booklet used.

Section A

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

Section B

Answer **any three** questions.

Write your answers on the separate Answer Booklet provided.

At the end of the examination:

- 1 fasten separate Answer Booklets used securely to the question paper,
- 2 enter the numbers of the Section **B** questions you have answered in the grid below.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [] at the end of each question or part question. Candidates are reminded that **all** quantitative answers should include appropriate units.

Tick the questions answered in **Section B**.

Candidates are advised to **show all their working** in a clear and orderly manner, as more marks are awarded for showing all the necessary steps than for correct answers.

Candidate's Use	Examiner's Use
Section A	
Section B 9	
B10	
B11	
B12	
TOTAL	

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Section A

Answer **all** the questions. [50 marks]

- 1 A large plastic ball is dropped from the top of a tall building.

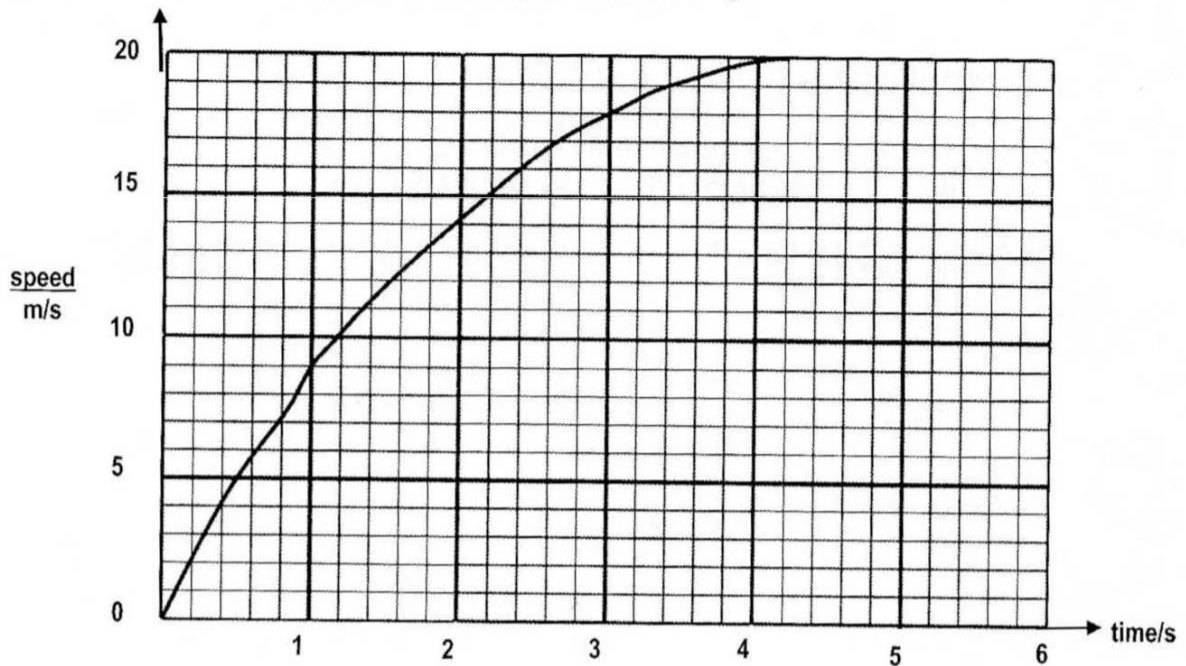


Figure 1.1

Figure 1.1 shows the speed-time graph for the falling ball up to the time it strikes the ground.

- (a) From the graph, estimate;

- (i) the time during which the ball is travelling with terminal velocity.

time: _____ [1]

- (ii) the time during which the ball is accelerating.

time: _____ [1]

- (iii) the distance fallen while the ball is travelling with terminal velocity.

distance: _____ [2]

- (iv) the height of the building.

height _____ [2]

- (b) Explain in terms of force acting on the ball, why the acceleration of the ball decreases.

 _____ [2]

[Total:8]

- 2 A cathedral measures 100m by 75m by 20m. The air inside has a density of 1.5kg/m^3 at room temperature.

(a) Calculate,

- (i) the volume of the air in the cathedral.

Volume: _____ [2]

- (ii) the mass of the air.

Mass of air: _____ [2]

- (b) A few minutes later, the heating system in the cathedral is switched on. State and explain what happens to the mass of the air in the cathedral as it warms up

Statement: _____

Explanation: _____

_____ [2]

- (c) The choir sits in the balcony, high above the doors. Suggest why the choir members are likely to feel warmer than the people below the balcony within the cathedral.

_____ [1]

Total [7]

[Turn over]

- 3 **Figure 3.1** below shows a liquid-in-glass thermometer.

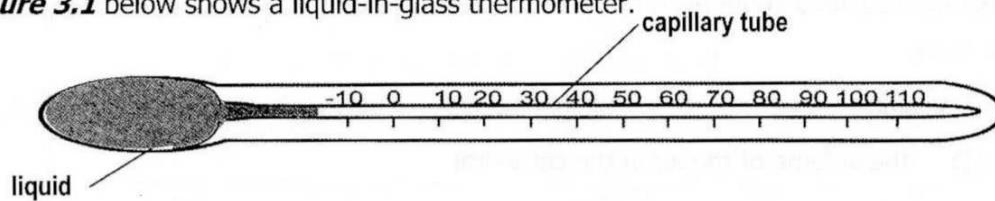


Figure 3.1

- (a) This thermometer is used for measuring temperature in a school laboratory.
- (i) Define temperature _____ [1]
- (ii) State the units in which temperature is measured _____ [1]
- (b) On the diagram of **Figure 3.1**, clearly mark;
- (i) **X**, where the liquid thread will reach when the thermometer is placed in pure melting ice. [1]
- (ii) **P**, where the liquid thread will reach when the thermometer is placed in steam above boiling water. [1]
- (c) Give **one** type of thermometer other than the liquid-in-glass thermometer. _____ [1]

Total [5]

- 4 A virtual image may be produced by a plane mirror or a convex lens.

Figure 4.1 shows a plane mirror and an object labelled **O**.

Figure 4.2 shows a convex lens with an object labelled **P**.

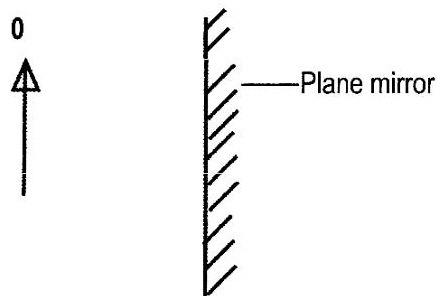


Figure 4.1

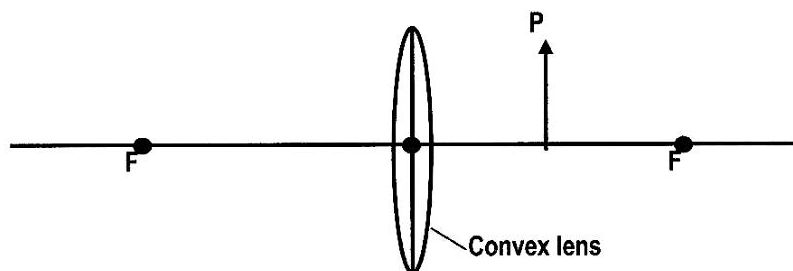


Figure 4.2

- (a) On **Figure 4.1** and **4.2**, draw rays of light to locate the positions of the images of the two objects **O** and **P**.

Both images are virtual

[5]

- (b) (i) What is meant by a virtual image?

[1]

- (ii) State **one** difference between the two images.

[1]

Total [7]

- 5 **Figures 5.1** and **5.2** below show two electrical circuits. The two circuits are using identical batteries.

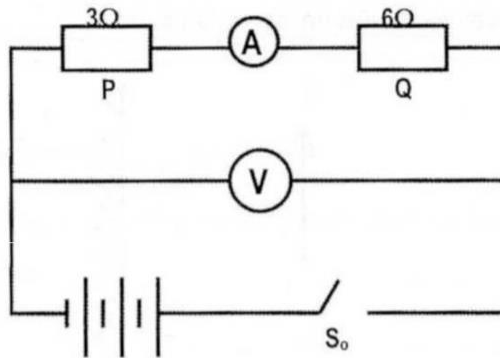


Figure 5.1

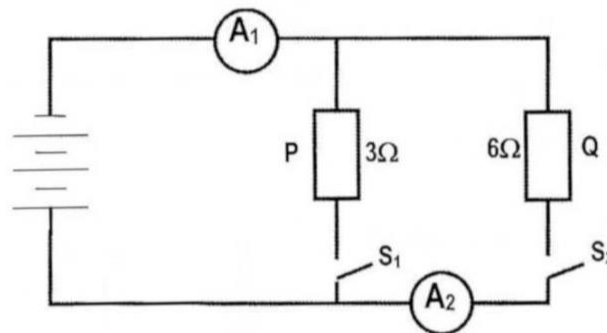


Figure 5.2

- (a) State the circuit with parallel connection and that with series connection of resistors.
- (i) Parallel: _____ [2]
- (ii) Series: _____
- (b) The two resistors **P** and **Q** are light bulbs. State two disadvantages of connecting the bulbs as shown in **Figure 5.1**.
- (i) _____ [1]
- _____
- (ii) _____ [1]
- _____
- (c) In circuit **5.1** the ammeter reads 1.5A when the switch S_0 is closed. Calculate the voltmeter reading in this circuit.
- _____ [2]
- _____
- (d) When switches S_1 and S_2 in circuit **5.2** are closed, what is the combined resistance of the circuit?
- _____ [2]
- _____

Total [8]

- 6 A coil of insulated wire is connected as shown in **Figure 6.1** below.

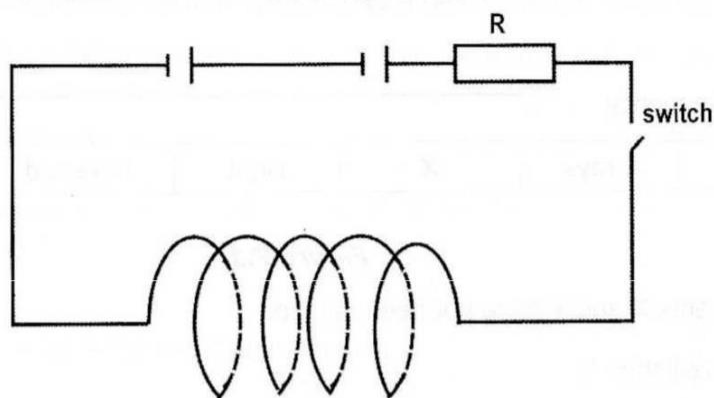


Figure 6.1

- (a) A magnetic field is created when the switch is closed.
- (i) On **Figure 6.1** draw the shape of the magnetic field in and outside the coil. [2]
- (ii) What effect is produced on the magnetic field by placing an iron bar inside the coil? [1]

- (b) Two thin iron rods are placed inside the coil as shown in **Figure 6.2** below.

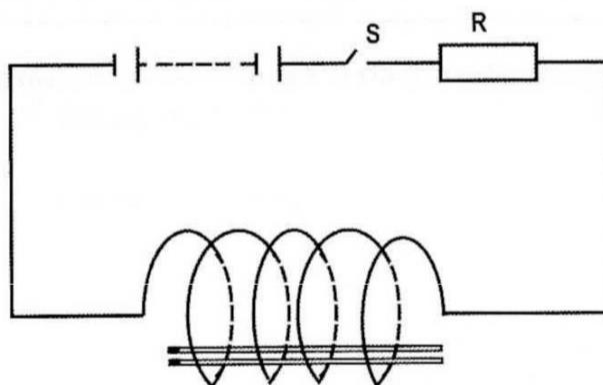


Figure 6.2

When the switch S is closed, the iron rods move apart.

Explain clearly why the rods move apart when the switch is closed.

[3]

Total [6]

- 7 **Figure 7.1** shows components in the electromagnetic spectrum in order of decreasing frequency.

decreasing frequency

gamma	X-rays	X	Light	Infra-red	Microwaves	Y
-------	--------	----------	-------	-----------	------------	----------

Figure 7.1

Two components **X** and **Y** have not been named.

- (a) Name radiation **X**.

_____ [1]

- (b) Define frequency of a wave.

_____ [1]

- (c) State the speed of the waves in **Figure 7.1**

Speed: _____ m/s [1]

- (d) State **one** property, other than speed that all electromagnetic waves have in common.

_____ [1]

Total [4]

- 8 (a) A spring of original length 3.0cm is stretched to a new length of 5.0cm by a force of 8N.
Determine the force required to stretch the spring to a new length of 6.0cm

[3]

- (b) **Figure 8.1** shows an experiment on moments.

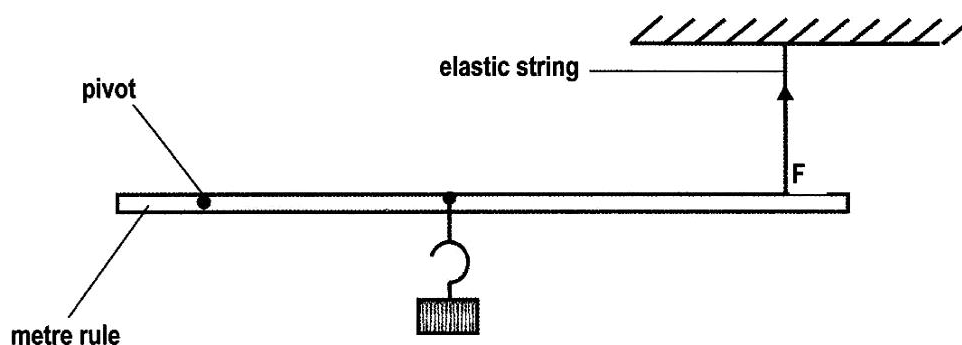


Figure 8.1

The string exerts a force F on the metre rule.

- (i) On **Figure 8.1**, mark another quantity which must be measured in order to find the moment of the force F . [1]
- (ii) State how the moment of the force F is calculated. [1]

Total [5]

Section B

[45 marks]

Answer **any three** questions from this section. Each of the questions in this section carries 15 marks.

Write your answers on the separate Answer Booklet provided. Show your working.

- 9 (a) (i) Explain the term radioactive decay. [2]
- (ii) Explain what background radiation is and give two sources of background radiation. [3]
- (iii) State the nature of beta particles. [1]
- (b) An experiment to test the absorption of β -particle by thin aluminium sheets was set as shown in **Figure 9.1**. below.

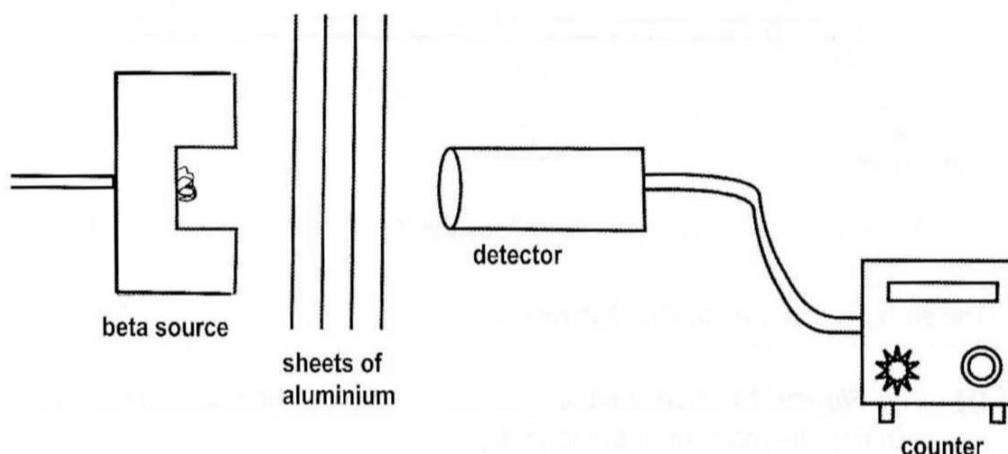


Figure 9.1

Ten sheets of aluminium each 0.5mm thick are available. The experiment assumes there is no background radiation.

Describe, with reference to the diagram of **Figure 9.1** how the experiment to test the absorption of Beta particles can be carried out.

In your description include statements of what readings should be taken. [4]

- (c) (i) State **two** dangers of nuclear radiation. [2]
- (ii) Define isotopes. [1]
- (iii) Give **two** uses of radioisotopes. [2]

Total [15]

- 10 **Figure 10.1** is a diagram showing the set up of apparatus that could be used to determine the properties of a thermistor under varying temperatures.

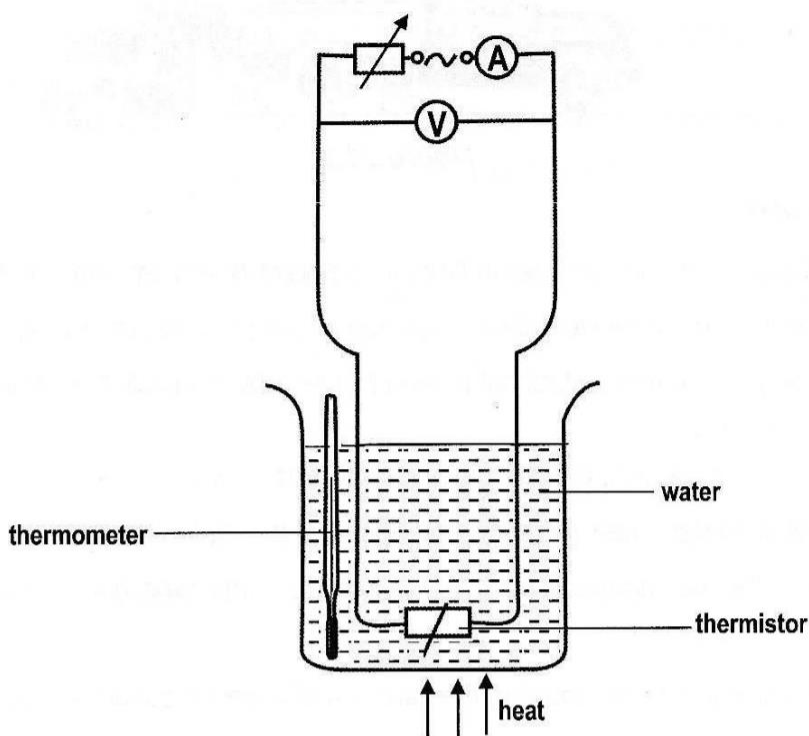


Figure 10.1

The current is adjusted and when the ammeter reads 25mA, the corresponding values of temperature and voltage are recorded. The process is repeated for different temperature values.

The results obtained are tabulated below.

Temperature/ $^{\circ}\text{C}$	15	30	45	60	75	90
Voltage/V	18.8	8.8	4.7	2.6	1.5	1.2

- (a) Plot a graph of voltage against temperature. (Use a scale of 2cm to 5 volts on the vertical axis and 2cm to 20°C on the horizontal axis) [6]
- (b) Use your graph to find the voltage needed to give a current of 25mA at
- (i) 40°C [2]
- (ii) 80°C [2]
- (c) Using the results obtained in (b) above, calculate the resistance of the thermistor at
- (i) 40°C [2]
- (ii) 80°C [2]
- (d) What conclusion can be drawn regarding the properties of the thermistor? [1]

Total [15]

[Turn over]

11 **Figure 11.1** shows Gezani loading 5 pockets of cement onto a light truck. (take $g = 10\text{N/Kg}$)

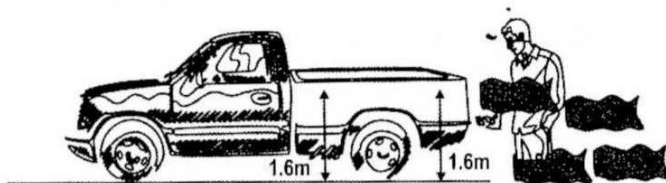


Figure 11.1

- (a) Define work. [1]
- (b) (i) Find the work Gezani does in lifting one pocket of cement onto the light truck. [2]
- (ii) Calculate the total work done in getting all the pockets onto the light truck. [3]
- (iii) Find the gain in gravitational potential energy by the pockets after they are all loaded. [3]
- (c) Gezani took 15 seconds to load one pocket onto the van.
- (i) Calculate the power generated by Gezani at the end of the task. [3]
- (ii) Describe the energy changes that take place in the execution of his task. [3]

Total [15]

12 **Figure 12.1** below is a graph showing the variation of speed of sound with temperature.

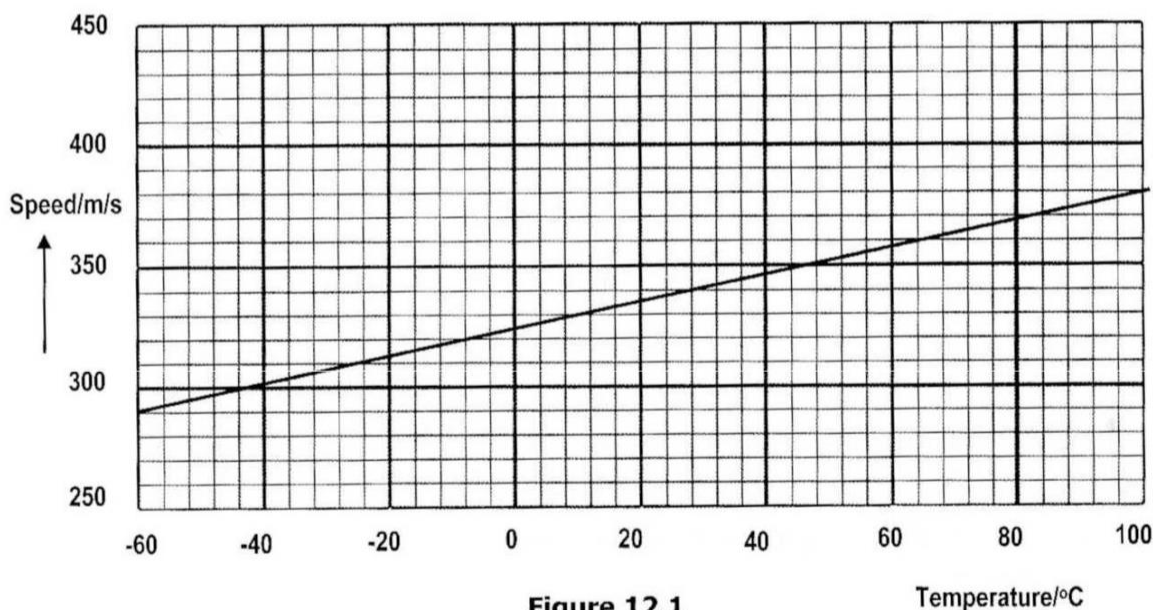


Figure 12.1

- (a) Use the graph above to determine the following:
 - (i) the speed of sound at 84°C . [1]
 - (ii) the wavelength at 84°C if the sound not emitted by the loudspeaker oscillates at 190Hz. [2]
- (b) (i) How will the wavelength of a sound note change when the air temperature drops? Explain your answer. [2]

- (ii) Explain clearly why the speed of sound is higher in iron than in air. [3]
- (c) There are two types of waves, transverse and longitudinal waves.
- (i) Draw a labelled diagram showing a longitudinal wave covering **two complete** wavelengths. [3]
- (ii) Give **two** differences between a longitudinal wave and a transverse wave. [2]
- (iii) Give **one** source and **one** detector for sound waves. [2]

Total [15]

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