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PHYSICS

PAPER 2 3117/2

Thursday **29 MAY 2025** 1:30 P.M.–3:00 P.M.

Additional materials:
None

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BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION

INSTRUCTIONS AND INFORMATION TO CANDIDATES

Do not open this booklet until you are told to do so.

Write your school number, candidate number, surname and initials in the spaces provided above.

Answer **ALL** the questions in this paper in the spaces provided.

Calculators may be used on this paper. However NO graphing calculators are allowed.

Read each question carefully and make sure you know what you have been asked to do before starting your answer.

Show **ALL** your working when answering numerical questions. Lines are provided on the question paper for your answers. You should write your answers on these lines only.

The mark for each part-question is given in brackets [].

For Examiner's Use	
1	
2	
3	
4	
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7	
8	
Total	

This question paper consists of 15 printed pages and 1 blank page.

1. The diagram in **Fig. 1.1** represents Hooke's Law apparatus.

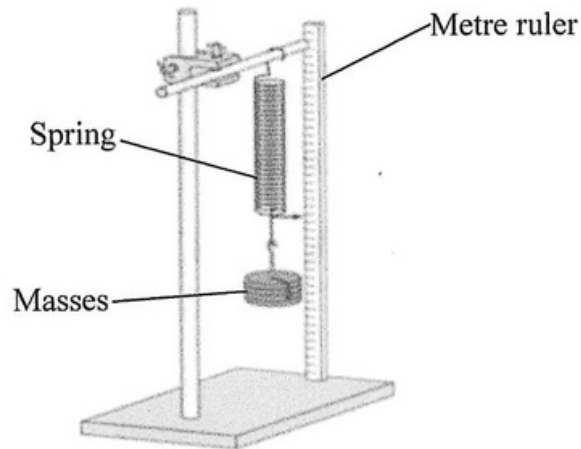


Fig. 1.1

- (a) On **Fig. 1.1** draw the direction of two forces on the masses, using arrows, to indicate weight and tension. Label these two forces. [2]
- (b) Given that the acceleration due to gravity is 9.81 m/s^2 , calculate the total weight of four 100 g masses and one 150 g mass. [2]
- (c) When eight 100 g masses are hung on the spring the extension of the spring is 2.2 cm. Calculate the value of the spring constant. [3]
- (d) Calculate the number of 100 g masses that cause an extension of 12.1 cm when hung on the spring. Assume that the spring still obeys Hooke's law. [3]



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[Turn over

2. **Fig. 2.1** shows a car. It accelerates from rest to a speed of 4.0 m/s in 1.5 s .

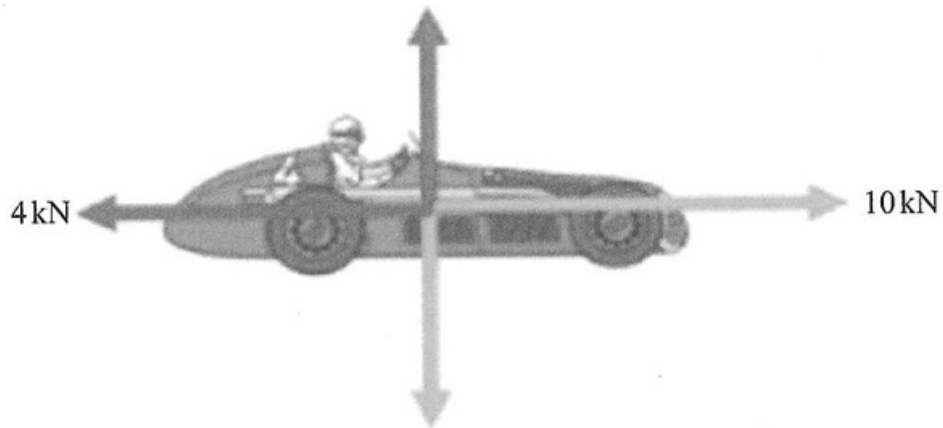


Fig. 2.1

- (a) Calculate the acceleration of the car, during the 1.5 s .

[3]

- (b) Calculate the resultant horizontal force on the car.

[2]

- (c) (i) The driver takes his foot off the accelerator and the car coasts uniformly to a stop in 35 seconds .

State the name of the force that slows the car down.

[1]



- (ii) Calculate the deceleration of the car.

[2]

- (d) List **two** factors that can affect the rate at which the car slows down, as described in part (c).

1. _____

2. _____

[2]

TOTAL MARKS [10]



3. A student measured the volumes of 25 g, 50 g and 100 g of pure water at 25°C.

The three masses and their corresponding volumes are plotted, and a mass vs volume graph is drawn. The graph is shown in **Fig. 3.1**.

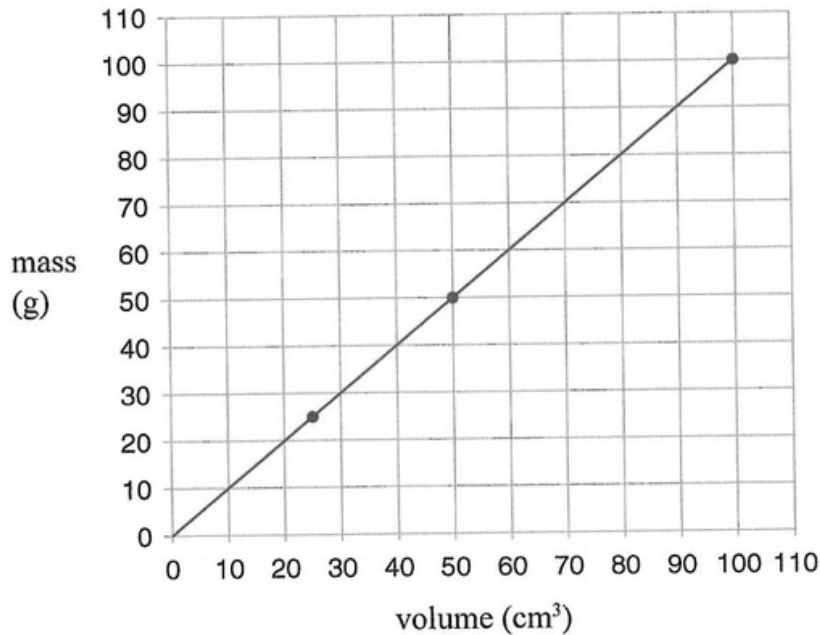


Fig. 3.1

- (a) (i) Determine the density of pure water, from the graph. Show your working.

[3]

- (ii) The molecules of steam are about 10 times further apart than the molecules of water. Based on the density of water calculated in (a) (i), estimate the density of steam.

[1]

- (iii) State how the slope of the graph changes, if salt is added to the water.

[1]



- (b) The student cools 100 g of water from 25°C to 5°C.
State what happens to the:

(i) kinetic energy of particles of water

_____ [1]

(ii) volume of water

_____ [1]

(iii) density of water

_____ [1]

- (c) (i) State how impurities affect the boiling point of water.

_____ [1]

(ii) State **one** other factor that affects the boiling point of water.

_____ [1]

TOTAL MARKS [10]



4. A student investigates the action of a thermistor when there is a change in temperature.

- (a) The student sets up the thermistor in series with a fixed resistor and a battery as shown in **Fig. 4.1**.

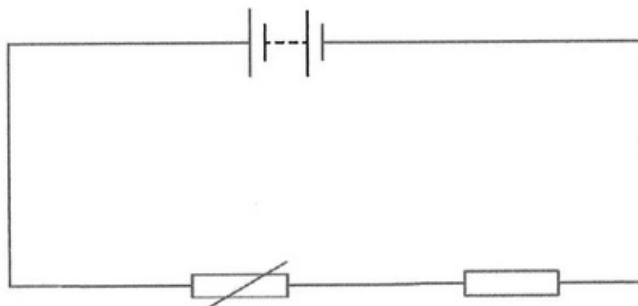


Fig. 4.1

- (i) Draw on **Fig. 4.1**, using suitable circuit symbols, an ammeter to measure current and a voltmeter to measure the potential difference across the thermistor. [2]
- (ii) Sketch a graph on **Fig. 4.2** below to show how the resistance of the thermistor varies with temperature.

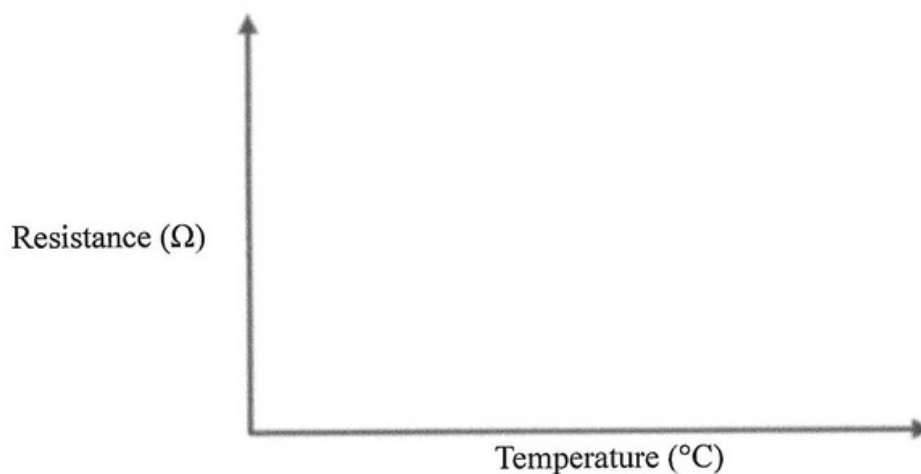


Fig. 4.2

[1]



- (b) **Fig. 4.3** shows another circuit set up by the student, with a 6 V power supply, a $500\,\Omega$ resistor and a $250\,\Omega$ resistor in series.

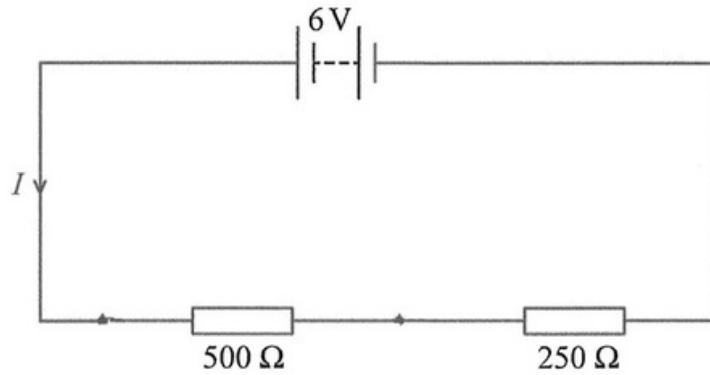


Fig. 4.3

Calculate:

- (i) the total resistance of the two resistors
- [2]
- (ii) the main current, I
- [2]
- (iii) the potential difference across the $250\,\Omega$ resistor.
- [1]
- (c) State **two** factors that can increase the potential difference across the $250\,\Omega$ resistor.

[2]

TOTAL MARKS [10]

5. (a) The table, in **Fig. 5.1** below shows the electromagnetic spectrum, with parts labelled **A** and **B** missing.

low frequency $\xrightarrow{\hspace{10em}}$ high frequency

radio waves	micro waves	A	visible light	ultra-violet	B	gamma rays
-------------	-------------	----------	---------------	--------------	----------	------------

Fig. 5.1

- (i) Name the radiation at **A**.
_____ [1]
- (ii) Name the radiation at **B**.
_____ [1]
- (iii) State **one** use of ultra-violet radiation.
_____ [1]
- (iv) State **one** harmful effect of ultra-violet radiation on living organisms.
_____ [1]
- (b) Give **two** properties that all electromagnetic waves have in common.

_____ [2]



- (c) The diagram, **Fig. 5.2** shows water wave fronts as they approach a barrier. The wavelength of the waves is 3.0 cm. The barrier has a gap that is 1.5 cm wide.

Complete the diagram to show the four wave fronts after passing through the gap.

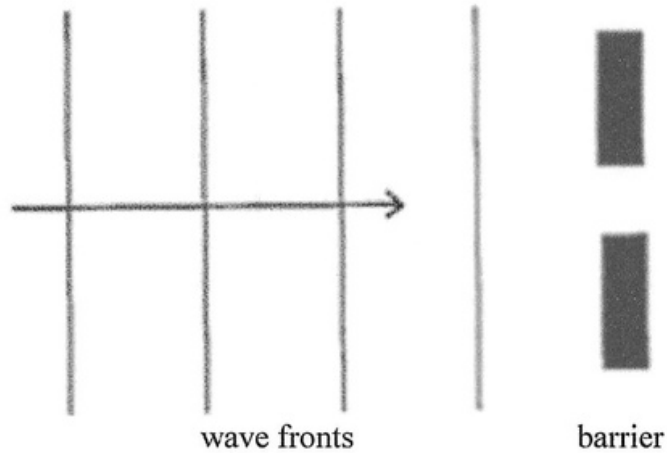


Fig. 5.2

[2]

- (d) Give the name of the effect shown in the completed diagram, in **Fig. 5.2**.

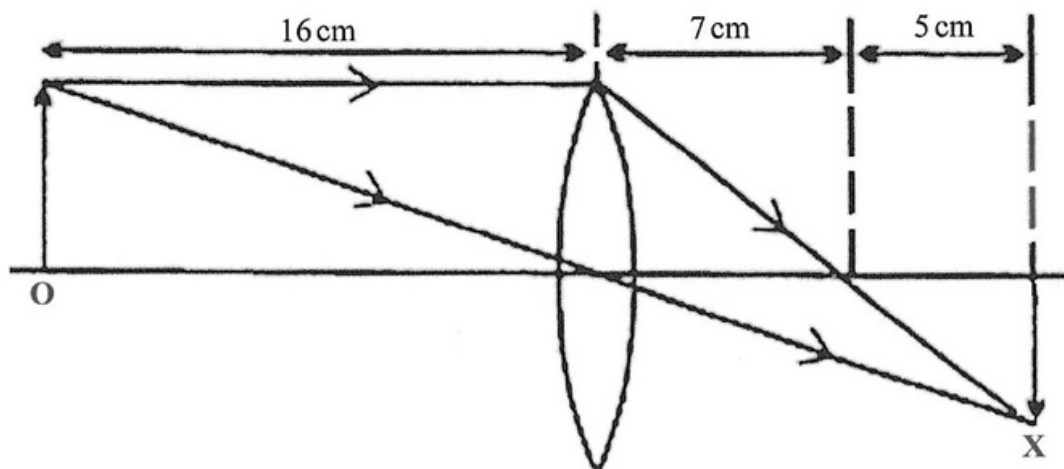
[1]

- (e) State the effect, if any, on the wave in part (c) after it passes through a gap that is widened to 4.0 cm.

[1]

TOTAL MARKS [10]

6. **Fig. 6.1** shows the path of two light rays, from the top of an object **O**, through a thin lens.



(NOT DRAWN TO SCALE)

Fig 6.1

- (a) (i) State the type of lens shown in the ray diagram.

_____ [1]

- (ii) State the focal length of the lens.

_____ [1]

- (iii) The image of **O** is formed at **X**.

State **two** properties of the image formed at **X**.

1. _____

2. _____ [2]



- (b) The human eye and a camera have similar features.

State the part of the human eye that has similar function to the diaphragm and the film in a camera.

Write your answers in the third column of the table below.

Part of Camera	Function	Part of Human Eye
diaphragm	adjusts the amount of light entering the eye or camera	
aperture	opening that allows light to enter the eye or the camera	
film	where the image is focused	

[3]

- (c) **Fig. 6.2** shows a common vision defect that can be corrected by the lens in part (a).

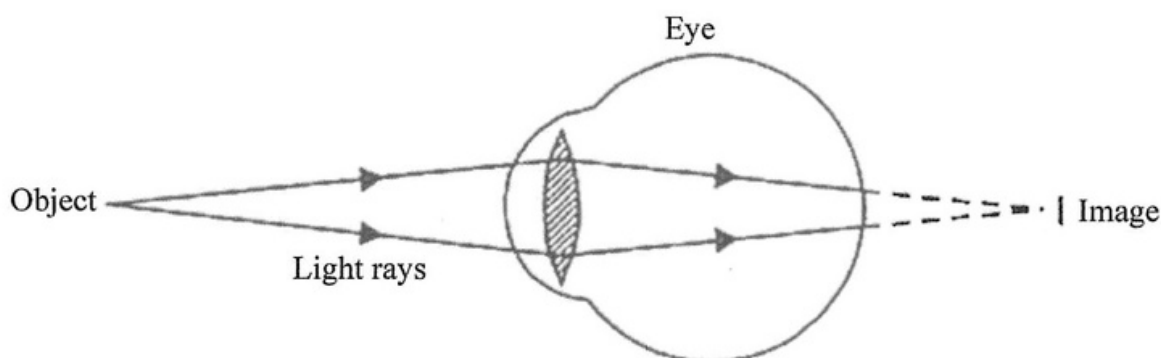


Fig. 6.2

- (i) State the name of the vision defect shown in **Fig. 6.2**.

_____ [1]

- (ii) Explain how the lens in **Fig. 6.1** corrects this vision defect. Include the words focal length in your explanation.

 _____ [2]

TOTAL MARKS [10]

[Turn over



7. This question is about sound waves.

Sound waves emitted by whales can be used for hunting, navigation and communication. The frequency of these sound waves is usually within the hearing range of humans.

Fig. 7.1 shows such a wave emitted by a whale and reflected upon reaching its prey. The reflected sound (called an echo) takes 1.2 seconds to travel from the whale to the fish and back to the whale.

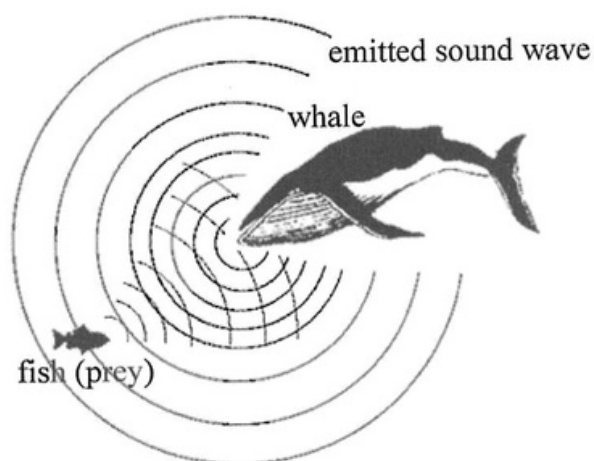


Fig. 7.1

- (a) State **ONE** property of the sound wave that remains the same and **ONE** property that changes after reflection of the sound wave.

Property that remains the same _____ [1]

Property that changes _____ [1]

- (b) Suggest a possible frequency for the sound wave emitted by the whale.

Frequency _____ [1]

- (c) Alligators can emit sound waves of frequencies below the hearing range of humans.

Give the name of this type of sound.

Name _____ [1]



(d) Given that the speed of sound wave in the ocean is 1 500 m/s.

(i) Calculate the distance between the whale and the fish.

[3]

(ii) Find the total distance travelled by the sound wave in producing the echo.

[1]

(e) State **ONE** medical use and **ONE** industrial use of the phenomenon of reflection of sound waves.

Medical Use _____

[1]

Industrial Use _____

[1]

TOTAL MARKS [10]



8. Technetium-99 is a radioactive isotope that is injected into the body for medical diagnostic studies.

It decays by gamma emission and has a half-life of 6 hours.

- (a) (i) A Geiger-Muller tube and counter detected a count rate of 20 counts per minute when neither the Technetium-99, nor any radioactive material were present.

Explain this observation and state a possible source of this radiation.

 [2]

- (ii) State **two** advantages of injecting a radioactive isotope with a relatively short half-life of 6 hours.

 [2]

- (b) Using words from the list, complete **Table 8.1** by naming each particle described.

List:

neutron beta particle electron alpha particle
proton nucleus atom

Each word in the list can be used only once or not at all.

Table 8.1

Description of particle	Name of particle
Negatively charged particle ejected from a nucleus	
Neutral subatomic particle	
Smallest particle of matter with the same properties as the element	
Single positively charged particle	
Negatively charged subatomic particle	
Identical to a Helium nucleus	

[6]

TOTAL MARKS [10]

End]

