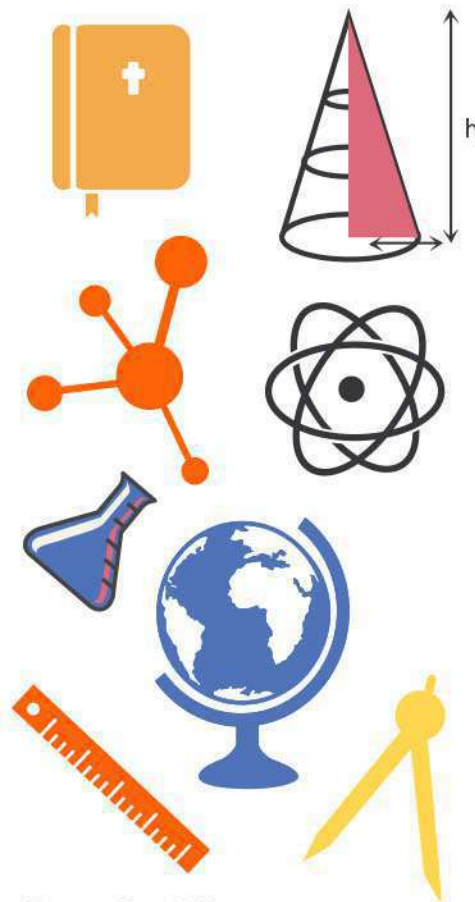


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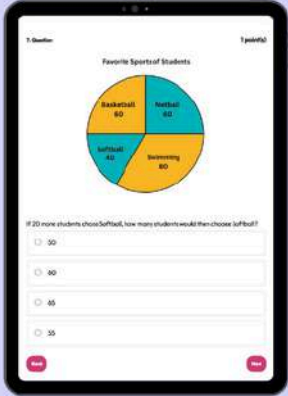


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PHYSICS

PAPER 1 3117/1

Thursday **29 MAY 2025** 12:00 NOON–1:15 P.M.

Additional materials:
None

MINISTRY OF EDUCATION NATIONAL EXAMINATIONS

BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION

INSTRUCTIONS AND INFORMATION TO CANDIDATES

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

All answers are to be recorded in this booklet.

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

Answer **ALL** questions. For each question, four possible answers, **A**, **B**, **C**, and **D** are given.

Circle the letter of the response which you consider to be correct.

FOR EXAMINER'S USE ONLY

Total marks

This question paper consists of 19 printed pages and 1 blank page.

1. Given the acceleration due to gravity is 10 m/s^2 , calculate the mass of an object with a weight of 30 N.
 - A. 30 kg
 - B. 3 000 g
 - C. 300 g
 - D. 0.3 kg

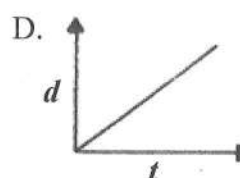
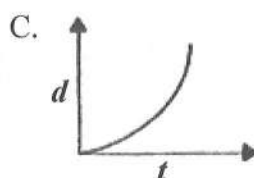
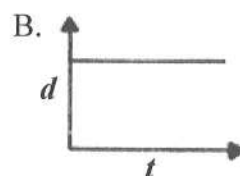
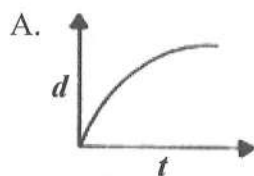
2. Given that a metal cube with dimensions 50 cm on each side has a mass of 50 kg, calculate the pressure each side exerts on a flat surface. ($g = 10 \text{ m/s}^2$)
 - A. 20 000 Pa
 - B. 2 000 Pa
 - C. 200 Pa
 - D. 20 Pa

3. Which of the following is not a simple machine?
 - A. pulley
 - B. ramp
 - C. screw
 - D. sphere

4. Which statement best describes Boyle's law?
 - A. For a fixed mass of gas at constant pressure the volume is inversely proportional to its temperature.
 - B. For a fixed mass of gas at constant volume, the temperature is directly proportional to the pressure.
 - C. For a fixed mass of gas at constant temperature the pressure is inversely proportional to the volume.
 - D. For a fixed mass of gas at constant temperature the pressure is directly proportional to the volume.



5. Which distance (d) vs time (t) graph represents an object that is at rest?



6. Which row of the table below, correctly classifies speed and velocity?

	Speed	Velocity
A.	scalar quantity	scalar quantity
B.	scalar quantity	vector quantity
C.	vector quantity	scalar quantity
D.	vector quantity	vector quantity

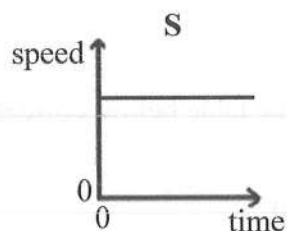
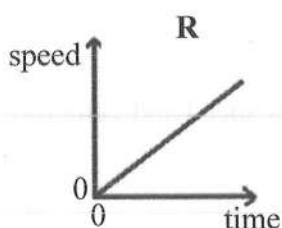
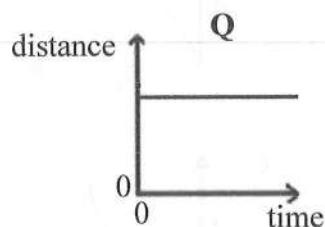
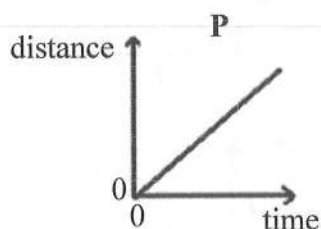
7. A car increases its velocity from 5.0 m/s to 28 m/s in 60 seconds.

What is the acceleration of the car?

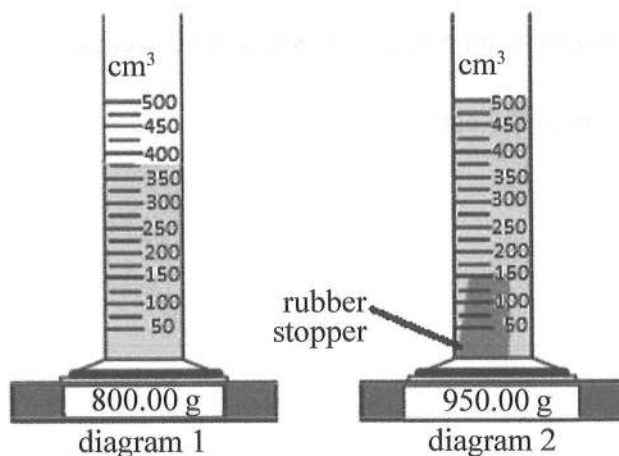
- A. 0.08 m/s²
 B. 0.38 m/s²
 C. 0.47 m/s²
 D. 0.55 m/s²

8. Four motion graphs **A**, **B**, **C** and **D** are shown.

Which two graphs represent an object moving at constant speed?



- A.
B.
C.
D.
- graphs **P** and **R**
graphs **P** and **S**
graphs **Q** and **R**
graphs **Q** and **S**
9. A measuring cylinder containing a liquid is placed on an electronic balance. A rubber stopper is gently immersed in the liquid in diagram 2.

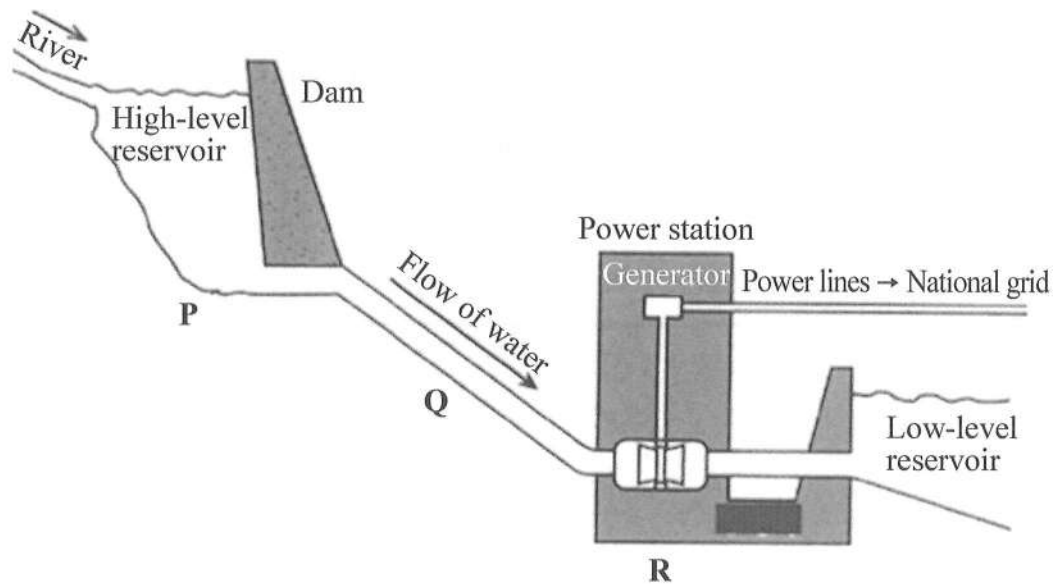


Given that no liquid splashes out of the measuring cylinder, what is the density of the rubber stopper?

- A.
B.
C.
D.
- 0.30 g/cm^3
 1.2 g/cm^3
 1.6 g/cm^3
 1.9 g/cm^3

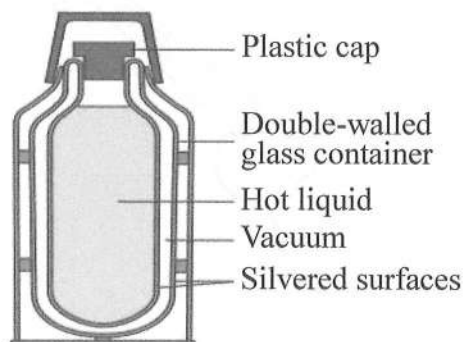


10. The diagram shows a simplified model of a hydroelectric power station.



Name the energy transformations, $P \rightarrow Q \rightarrow R$, that occurs in the hydroelectric power station.

- A. chemical potential $\longrightarrow$ kinetic $\longrightarrow$ electrical
 - B. electrical $\longrightarrow$ gravitational potential $\longrightarrow$ kinetic
 - C. gravitational potential $\longrightarrow$ kinetic $\longrightarrow$ electrical
 - D. kinetic $\longrightarrow$ electrical $\longrightarrow$ gravitational potential
11. The diagram shows an insulated vacuum flask.

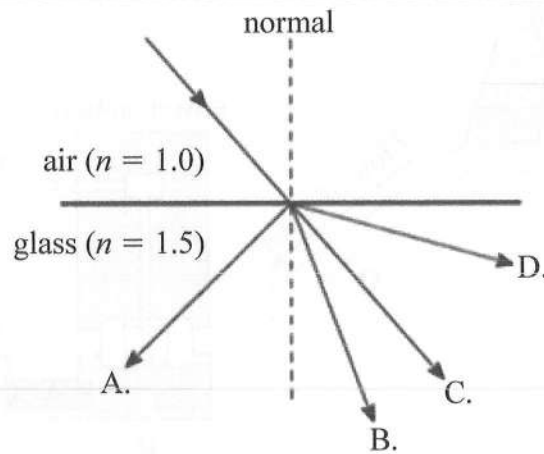


Which form(s) of radiation is reduced by the silvered surfaces?

- A. conduction
- B. convection
- C. radiation
- D. conduction, convection and radiation

12. The diagram below represents monochromatic light passing from air into glass. The refractive index of air is 1.0, while glass has a refractive index, n of 1.5.

What path will the monochromatic light take as it leaves air and enters glass?



13. The musical instrument below shows a guitar.

A sound is produced by plucking any of the strings with a finger.

A musician can increase the pitch of a given string by increasing its tension. This is done by tightening the tuning knob, which is located at the top.

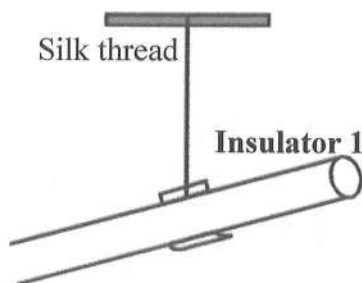


Which of the following is another method to increase the pitch of the guitar string?

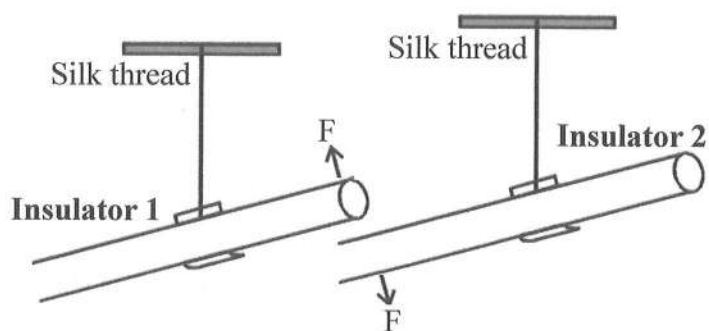
- A. increasing the length
- B. striking the string harder
- C. using a thicker string
- D. using a thinner string



14. **Insulator 1** is suspended by a silk thread, as shown in the diagram.



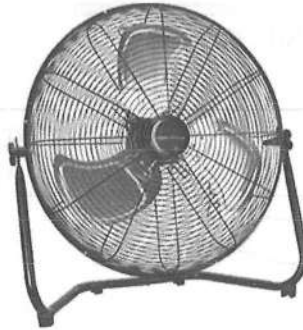
When **insulator 2** is brought near **insulator 1**, the insulators are observed to move away from each other.



What are possible charges on **insulator 1** and **2**?

	Insulator 1	Insulator 2
A.	negative	positive
B.	neutral	negative
C.	neutral	positive
D.	positive	positive

15. An 800 W rated industrial fan is connected to a 120 V mains supply.

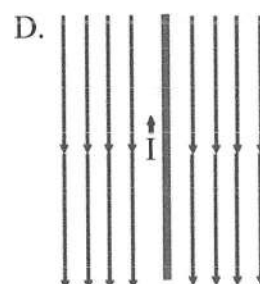
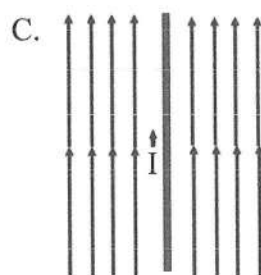
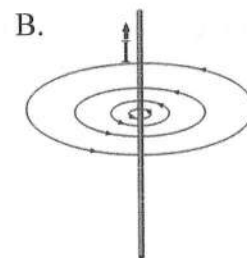
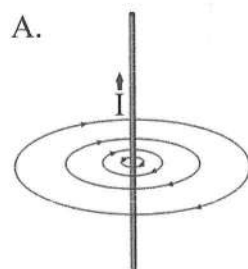


Which fuse is most suitable to be used, in a circuit, with the fan?

- A. 1 A
B. 5 A
C. 7 A
D. 13 A
16. A straight wire carrying an electric current, I , whose direction is shown in the diagram below.



Which of the following diagram shows the direction and shape of the magnetic field lines, formed around the wire?



17. Two nuclides have the symbols ${}^{60}_{28}\text{Ni}$ and ${}^{60}_{29}\text{Cu}$.

Which statement is correct about the nuclei of Ni-60 and Cu-60?

- A. Ni-60 has one more proton than Cu-60.
- B. Ni-60 has the same number of protons as Cu-60.
- C. Ni-60 has the same number of neutrons as Cu-60.
- D. Ni-60 has the same total number of neutrons and protons as Cu-60.

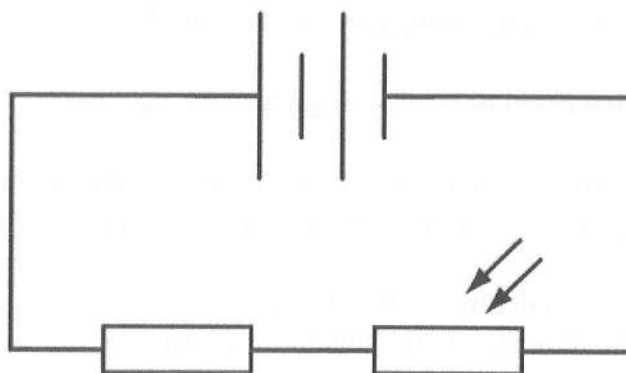
18. The ratio of ${}^{12}\text{C}:$ ${}^{14}\text{C}$ in living organisms is 10 000 000:1. This ratio is found to be 40 000 000:1 in a fossil.

What is the age of the fossil?

(${}^{12}\text{C}$ is a stable isotope and ${}^{14}\text{C}$ is a radioactive isotope with a half-life of 6 000 years).

- A. 1 500 years
- B. 3 000 years
- C. 12 000 years
- D. 24 000 years

19. A fixed resistor and a light dependent resistor (LDR) are connected in series with a low voltage power supply as shown in the diagram.



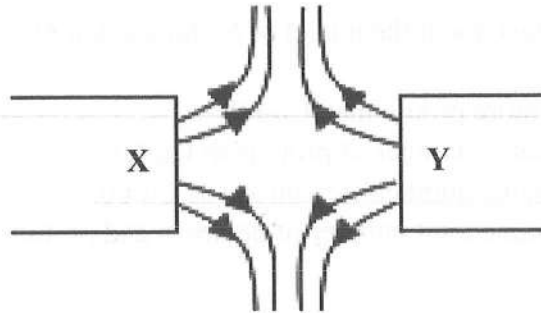
In dark conditions, the current in the circuit is 0.3 mA.

Light is then shone on the LDR.

What is a possible value of the new current in the circuit?

- A. 0 mA
- B. 0.2 mA
- C. 0.3 mA
- D. 0.4 mA

20. The diagram below shows the magnetic field lines between two poles, X and Y of a bar magnet.



Which are the correct names for poles X and Y?

	Pole X	Pole Y
A.	North	North
B.	North	South
C.	South	North
D.	South	South

21. You are provided with a steel bar, a coil of conducting copper wire called a solenoid, a direct current (d.c) supply and an alternating current (a.c) supply.

Which of the following could be used to magnetise the steel bar?

- A. connect the coil to a direct current (d.c.) supply and place the steel bar inside the coil.
- B. connect the coil to an alternating current (a.c.) supply and place the steel bar inside the coil.
- C. pass a direct current through the steel bar.
- D. pass an alternating current through the steel bar.

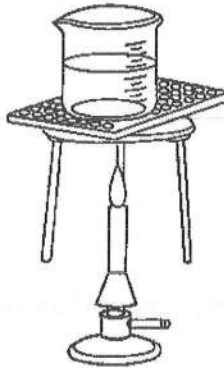
22. Which of the following is an electrical safety device?

- A. a circuit breaker
- B. an electric motor
- C. a reed switch
- D. a diode



23. Given that the speed of sound in air is 330 m/s, calculate the time taken for the echo of a ship's horn to be heard if the ship is 1000 m away from a cliff face.
- A. 0.33 s
 - B. 0.66 s
 - C. 3.0 s
 - D. 6.1 s
24. Which of the following is **NOT** correct about electromagnetic waves?
- A. They are longitudinal waves.
 - B. They can be refracted.
 - C. They can be diffracted.
 - D. They travel at a speed of 3.0×10^8 m/s in a vacuum.
25. The designers of marinas normally leave a narrow slot like entrance for boats to enter the protective basin. What occurs at the entrance?
- A. reflection
 - B. refraction
 - C. diffraction
 - D. the wavelength increases
26. A spring with a natural length of 3 cm extends by 0.5 cm for every 2 N of force.
- Which force is required to stretch the spring to a total length of 10.5 cm?
- A. 30 N
 - B. 40 N
 - C. 45 N
 - D. 50 N
27. Which of the following physical properties decreases in magnitude when a 10 kg rock is taken from Earth to the Moon?
- A. density
 - B. mass
 - C. volume
 - D. weight

28. Heat is continuously added to a liquid sample.



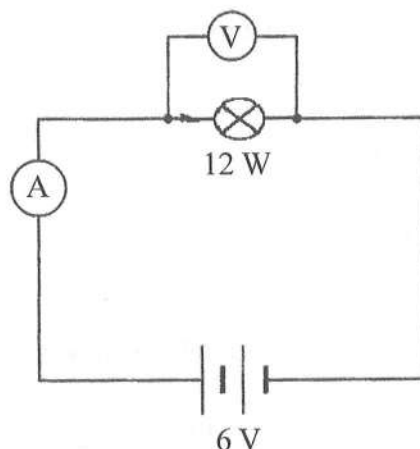
Which physical change takes place in the water?

- A. burning
B. condensation
C. evaporation
D. fusion
29. Given that the conversion of degrees Fahrenheit to degrees Celsius can be achieved using the formula $^{\circ}\text{C} = (^{\circ}\text{F} - 32) \times \frac{5}{9}$, what is the value of 120°F in $^{\circ}\text{C}$?
- A. 48.9°C
B. 84.4°C
C. 120°C
D. 158°C
30. In cold countries the electrical power providers have to take into account the effect of weather on the hanging of electrical lines. Which answer best describes the effect of cold weather and hot weather on electrical wires.

	cold weather	hot weather
A.	expansion	contraction
B.	expansion	no change
C.	contraction	expansion
D.	no change	contraction



31. The diagram shows a 6.0 V, 12 W lamp connected to a 6 V battery, an ammeter and a voltmeter.



What is the reading on the ammeter?

- A. 2.0 A
 B. 12 A
 C. 18 A
 D. 72 A
32. Which of the following is an example of the occurrence of nuclear fusion?
- A. radioactive decay
 B. heat and light produced in the sun
 C. heat produced in a nuclear power plant
 D. the use of radioactive tracers
33. A doctor wants to investigate organ function in a patient, by injecting them with a radioactive isotope.

Which radioactive isotope has the best half-life and emits radiation of a suitable type?

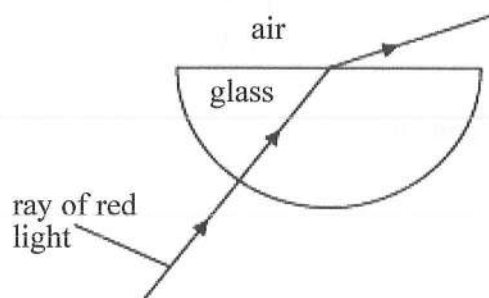
	Radioisotope	Half Life	Emission Type
A.	Carbon-14	6000 years	Beta
B.	Polonium-210	138 days	Alpha
C.	Strontium 90	28.8 years	Beta
D.	Technetium-99	6 hours	Gamma

34. Fiber optic cables allow high-speed communication by transmitting light over long distances.

Which property of light enables this capability?

- A. partial internal reflection
- B. partial internal refraction
- C. total internal reflection
- D. total internal refraction

35. The diagram shows the path of a ray of red light, as it travels from glass into air.



Why does the ray of light change direction, as it travels from glass into air?

- A. it changes to white light
 - B. its amplitude changes
 - C. its frequency changes
 - D. its speed changes
36. 1 kg of water is heated to 100°C and changes from a liquid to a gas.
- Which best describes the change in internal energy during this change of state?
- A. it decreases
 - B. it fluctuates
 - C. it increases
 - D. it remains constant
37. A stone of mass 2 kg is taken to a height of 20 m. It is then dropped.

What is the kinetic energy of the stone, just before it hits the ground? Assume no energy is lost due to air resistance. ($g = 10\text{ m/s}^2$)

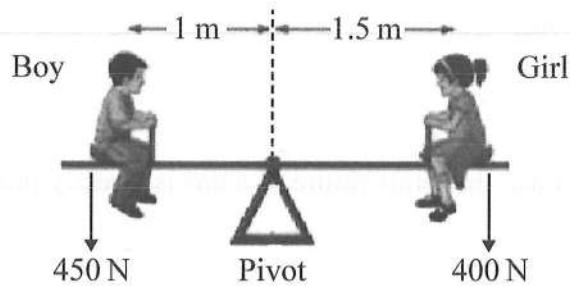
- A. 32 J
- B. 200 J
- C. 400 J
- D. 800 J



38. Which of the following **decreases** the rate of diffusion of the particles of a gas?
- A. raising the temperature
 - B. lowering the temperature
 - C. stirring or mixing
 - D. decreasing particle size
39. According to Charles' Law, the temperature of a gas is directly proportional to which property of the gas?
- A. mass
 - B. pressure
 - C. average speed of the gas particles
 - D. volume of the gas particles
40. A rocket that is free to move, propels exhaust gases downwards.
- According to Newton's Third Law, what is the direction of the force on the rocket caused by the exhaust gases?
- A. downwards
 - B. upwards
 - C. to the left
 - D. to the right
41. Which term describes the tendency of an object to resist changes in its motion?
- A. inertia
 - B. pressure
 - C. speed
 - D. weight

42. The diagram shows a boy and a girl on a see-saw.

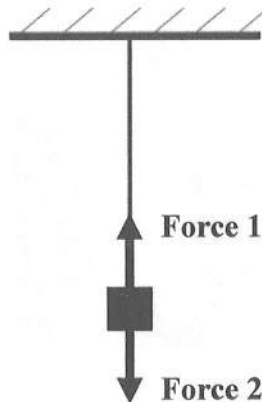
What is the moment of the girl about the pivot?



- A. 450 Nm
B. 600 Nm
C. 1 000 Nm
D. 1 125 Nm
43. What is the density of an object that floats when placed in water that has a density of 1.09 g/cm^3 ?
- A. 0.60 g/cm^3
B. 1.20 g/cm^3
C. 2.70 g/cm^3
D. 19.3 g/cm^3



44. A mass is hung from a rigid support by a rope and two equal forces act on the mass.



What are the names of **Force 1** and **Force 2**?

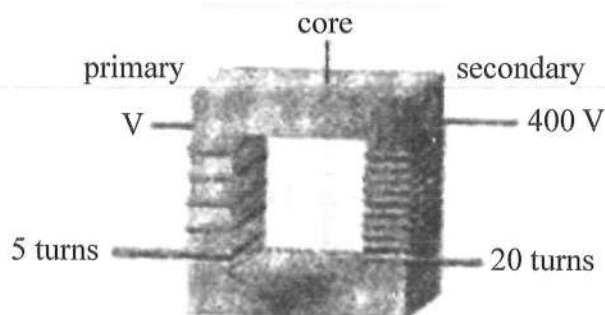
	Force 1	Force 2
A.	weight	tension
B.	weight	elastic force
C.	tension	weight
D.	tension	elastic force

45. A car of mass 1 000 kg is travelling at 20 m/s.

What is the kinetic energy of the car?

- A. 10 000 J
- B. 20 000 J
- C. 200 000 J
- D. 400 000 J

46. The diagram shows an ideal transformer with an output voltage of 400 V. The primary coil has 5 turns and the secondary coil has 20 turns.

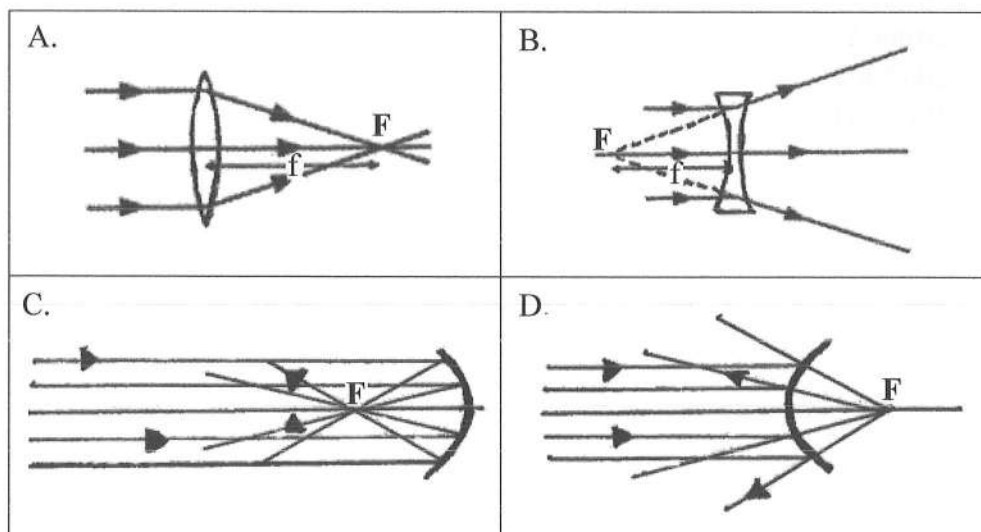


What is the potential difference across the primary coil of the transformer?

- A. 4 V
 - B. 80 V
 - C. 100 V
 - D. 1600 V
47. A long solenoid carries an electric current.

What is the pattern of the magnetic field at the centre of the solenoid?

- A. concentric circles
 - B. diverging lines
 - C. random and chaotic
 - D. uniform and parallel lines
48. Which diagram correctly labels the focal point F of a convex lens?

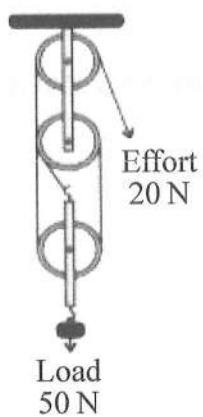


49. An athlete with a mass of 55 kg, is running at a speed of 4.0 m/s.



What is the momentum of the athlete?

- A. 54 kg m/s
 - B. 220 kg m/s
 - C. 440 kg m/s
 - D. 880 kg m/s
50. Determine the mechanical advantage of the pulley system shown.



- A. 0.40
- B. 2.0
- C. 2.5
- D. 5.0

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PHYSICS

PAPER 2 3117/2

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

Additional materials:
None

MINISTRY OF EDUCATION NATIONAL EXAMINATIONS

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

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

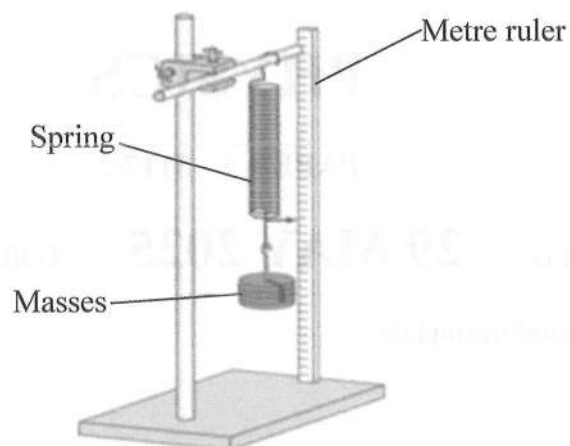


Fig. 1.1

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

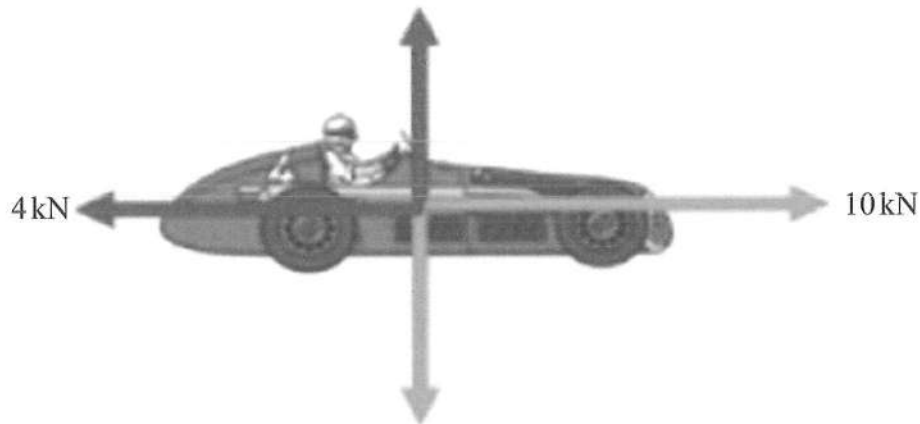


Fig. 2.1

- (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**.

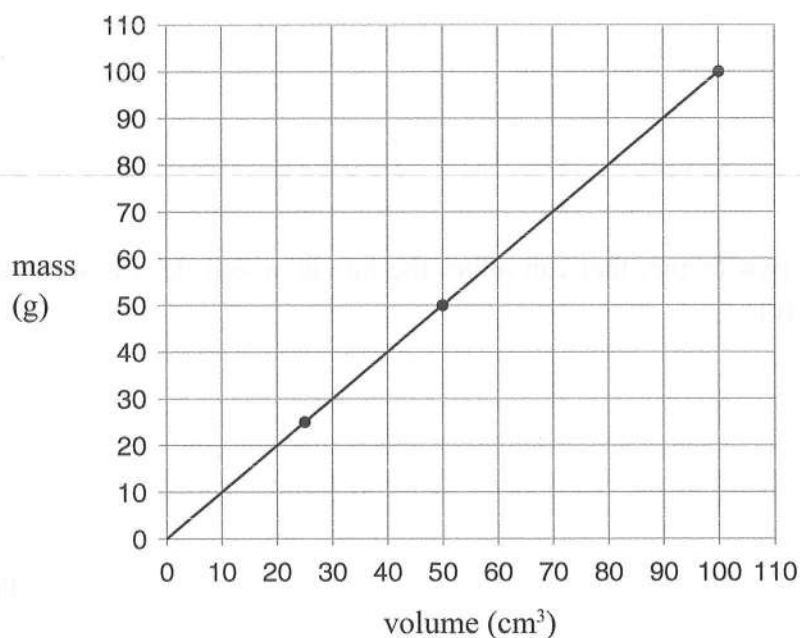


Fig. 3.1

- (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**.

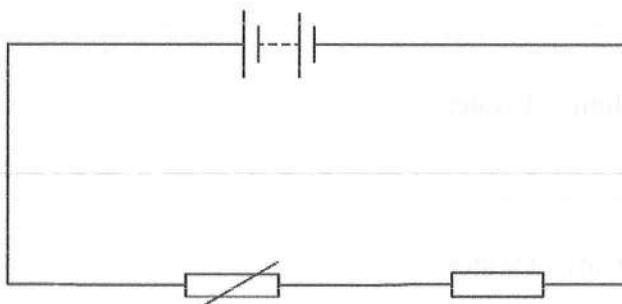


Fig. 4.1

- (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.

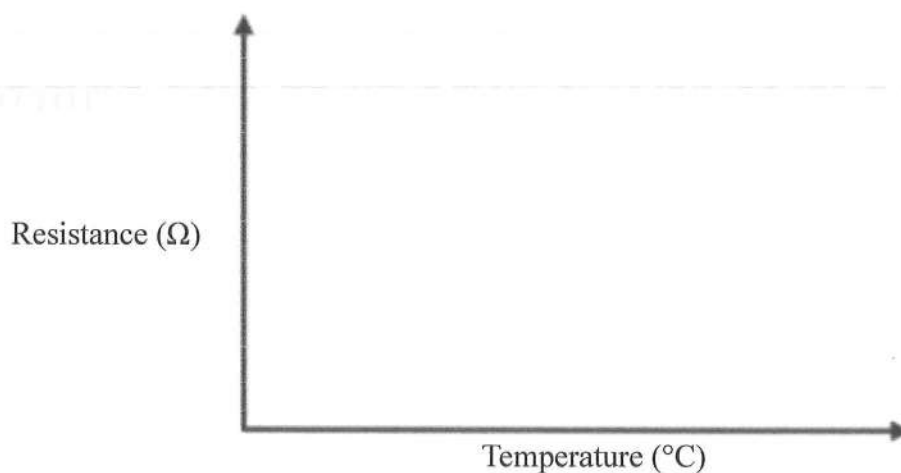


Fig. 4.2

[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.

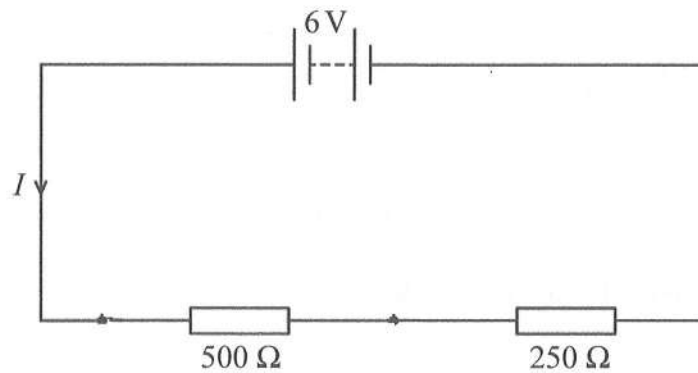


Fig. 4.3

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.

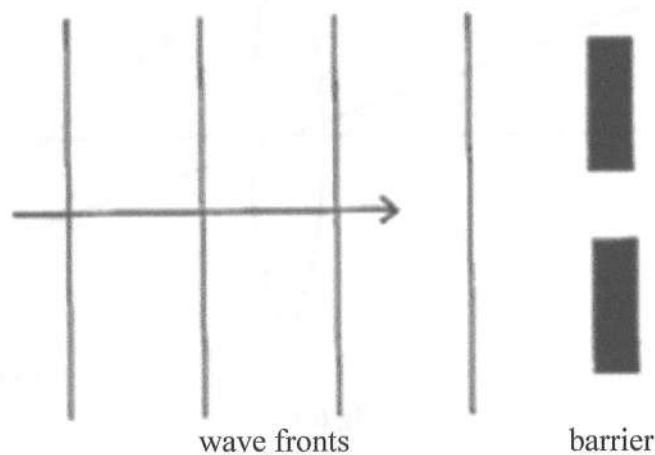


Fig. 5.2

[2]

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

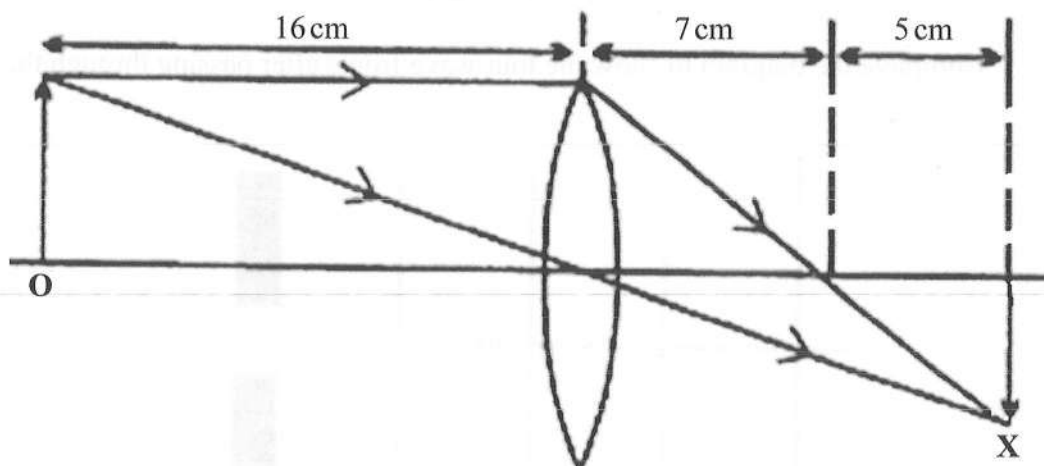
_____ [1]

- (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).

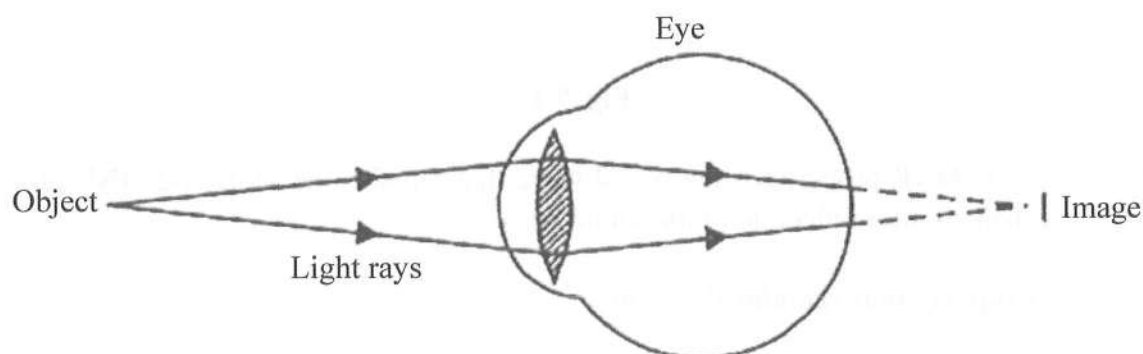


Fig. 6.2

- (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.

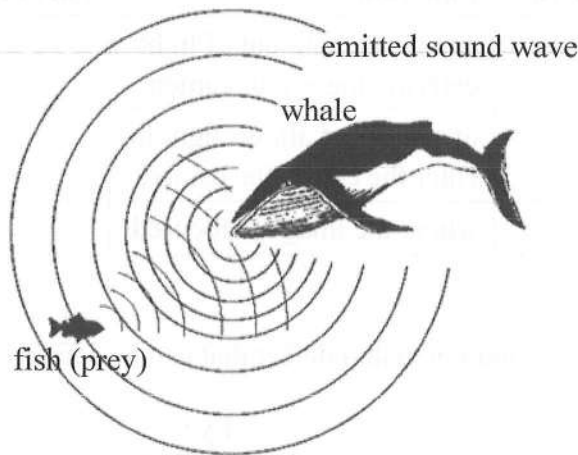


Fig. 7.1

- (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]



School Number	Candidate Number
Surname and Initials	

PHYSICS

PAPER 3 3117/3

Thursday **5 JUNE 2025** 12:30 P.M.–2:00 P.M.

Additional materials:
Graph paper

MINISTRY OF EDUCATION NATIONAL EXAMINATIONS

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 at the top of this page as well as at the top of all lined paper submitted.

Answer **ALL** the questions in **Section A** in the spaces provided on this question booklet.

Answer **TWO** questions from **Section B** on the lined paper provided at the back of this question booklet.

Show **ALL** working when answering numerical questions.

Answers to numerical problems should be given to a suitable number of significant figures.

The intended marks for each question or part question are given in brackets [].

For Examiner's Use	
Section A	
1	
2	
3	
4	
Section B	
5	
6	
7	
Total	

This question paper consists of 17 printed pages and 3 lined pages.

LIST OF FORMULAE

weight = mass $\times$ gravitational field strength

force = mass $\times$ acceleration

pressure = $\frac{\text{normal force}}{\text{area}}$

pressure due to a liquid = depth $\times$ gravity $\times$ density

average speed = $\frac{\text{distance travelled}}{\text{time taken}}$

average velocity = $\frac{\text{distance travelled in a given direction}}{\text{time taken}}$

acceleration = $\frac{\text{change in velocity}}{\text{time}}$

density = $\frac{\text{mass}}{\text{volume}}$

combined gas laws equation

Charles' law equation

kinetic energy = $\frac{1}{2}$ mass $\times$ velocity²

change in gravitational potential energy =

weight $\times$ change in height

power = $\frac{\text{energy}}{\text{time}}$

efficiency = $\frac{\text{work output}}{\text{work input}}$

efficiency = $\frac{\text{power output}}{\text{power input}}$

wave speed = frequency $\times$ wavelength

energy = mass $\times$ specific heat capacity $\times$ temperature change

capacitance = $\frac{\text{charge}}{\text{potential difference}}$

charge = current $\times$ time

potential difference = $\frac{\text{work done}}{\text{charge moved}}$

resistance = $\frac{\text{potential difference}}{\text{current}}$

total resistance in series, R_T

total resistance in parallel, R_T

power = potential difference $\times$ current

$$\frac{\text{voltage across primary coil}}{\text{number of turns on primary coil}} = \frac{\text{voltage across secondary coil}}{\text{number of turns on secondary coil}}$$

refractive index of a medium, n

magnification, $m = \frac{\text{image distance}}{\text{object distance}}$

$w = mg$

$F = ma$

$p = \frac{F}{A}$

$p = hgp$

$s = \frac{d}{t}$

$v = \frac{d}{t}$

$a = \frac{v - u}{t}$

$D = \frac{m}{v}$

$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$

$\frac{V_1}{T_1} = \frac{V_2}{T_2}$

$K.E. = \frac{1}{2} mv^2$

$PE = wh$

$P = \frac{E}{t}$

$v = f\lambda$

$W = mc\Delta\theta$

$C = \frac{Q}{V}$

$Q = It$

$V = \frac{W}{Q}$

$R = \frac{V}{I}$

$R_T = R_1 + R_2$

$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2}$

$P = VI$

$\frac{V_P}{n_P} = \frac{V_S}{n_S}$

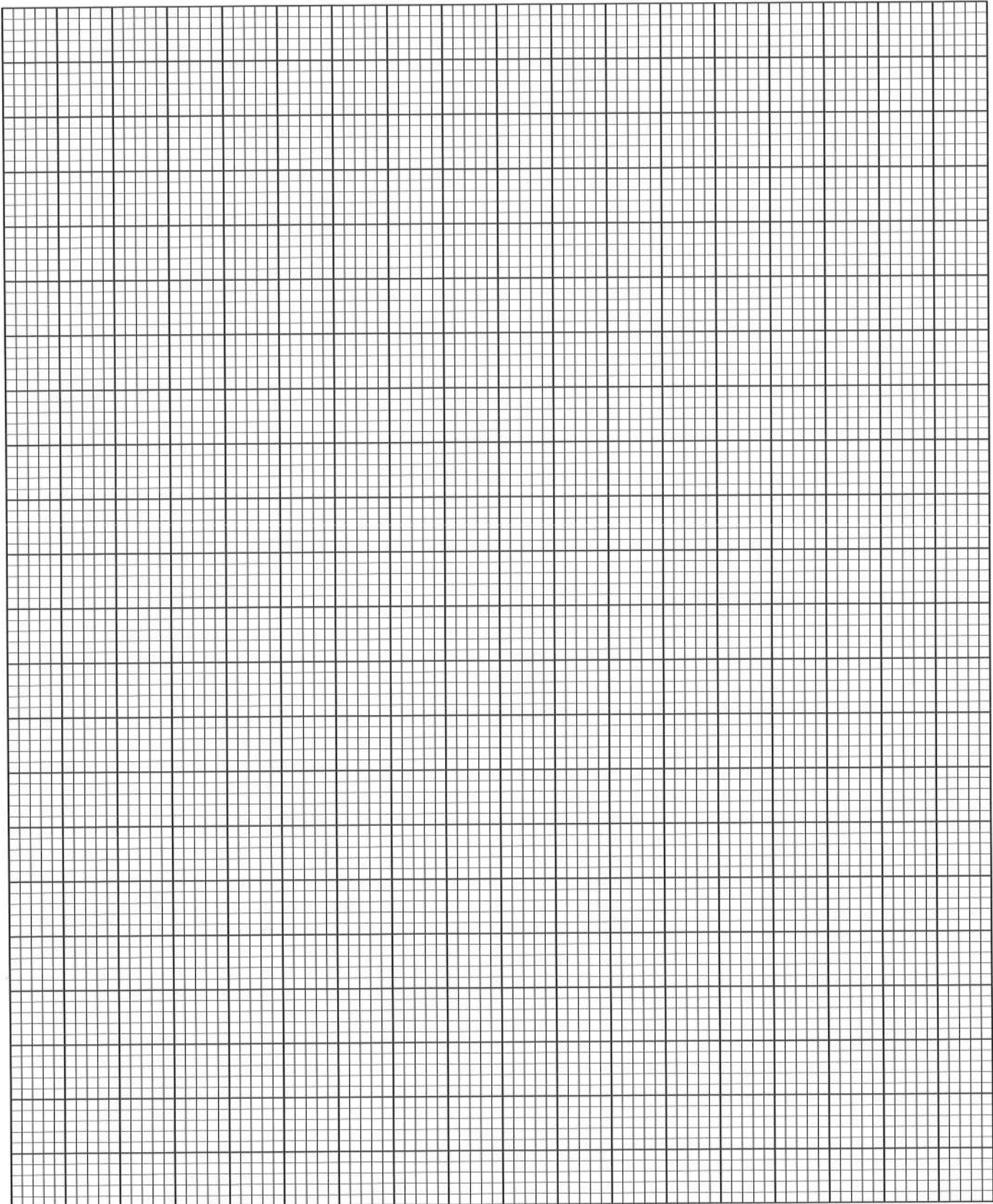
$n = \frac{\sin i}{\sin r}; n = \frac{\text{real depth}}{\text{apparent depth}}$

$m = \frac{v}{u}$



MINISTRY OF EDUCATION
BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION
EXAMINATION

School No.	Candidate No.	Level:	For Examiner's Use
Subject Number & Title:		Paper:	
Surname & Initials:		Section:	
Signature:	Date:	Qu. No.	



EXAMINATION

School No.	Candidate No.	Level:	For Examiner's Use
Subject Number & Title:		Paper:	
Surname & Initials:		Section:	
Signature:	Date:	Qu. No.	

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SECTION A

Answer **all** questions in this section.

1. This question is on simple machines.

Fig. 1.1 shows a pulley used to raise a 1500 N raft to a height of 5.0 m for storage.

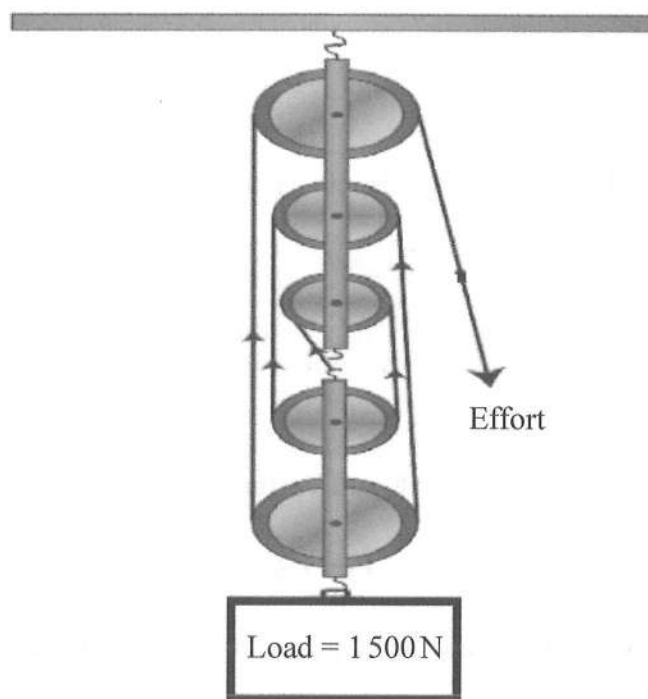


Fig. 1.1

- (a) (i) State the velocity ratio of the pulley.

_____ [1]

- (ii) Calculate the distance moved by the effort in raising the 1500 N raft to the desired height of 5.0 m. Show your working.

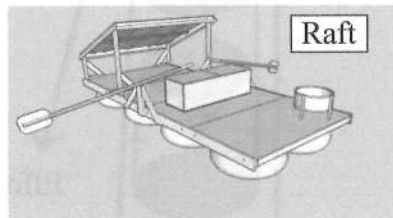
[2]

[Turn over]

- (iii) The pulley system has an efficiency of 80%. Calculate the effort force needed to raise the 1500 N raft.

[3]

- (b) One of the rafts being lifted falls into a pool of fresh water and floats as shown in **Fig. 1.2**.



Fresh Water

Fig. 1.2

- (i) On **Fig. 1.2**, draw the vertical forces acting on the raft.

Label each force with its name and indicate the magnitude of each force. [3]

- (ii) Determine the weight of the water displaced by the raft.

[1]

TOTAL MARKS [10]



2. This question is about mechanical energy.

(a) (i) Define the term energy.

[1]

(ii) Complete the table below to show the type of energy contained in a stretched rubber band and an atom just before it emits an alpha particle.

		Type of energy
a	a stretched rubber band	
b	an atom just before it emits an alpha particle	

[2]

- (b) **Fig. 2.1** below show three positions **A**, **B** and **C** for a 2000 kg roller coaster cart along its track. The cart starts from rest at position **A**.

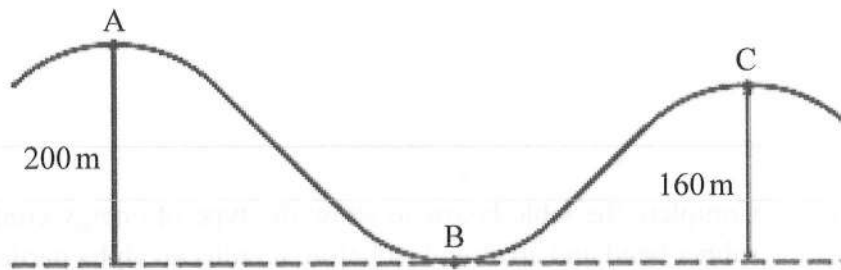


Fig. 2.1

- (i) Suggest the position where the cart has the maximum gravitational potential energy.
- _____ [1]
- (ii) Calculate the gravitational potential energy possessed by the cart when it is at position **C**. ($g = 9.8 \text{ N/kg}$)
- _____ [3]
- (iii) Assuming, no energy is lost due to friction, calculate the speed of the cart when it arrives at position **B** from position **A**.
- _____ [3]

TOTAL MARKS [10]



3. This question is about electrical safety.

Fig. 3.1 shows a simplified model of a typical clothes dryer.

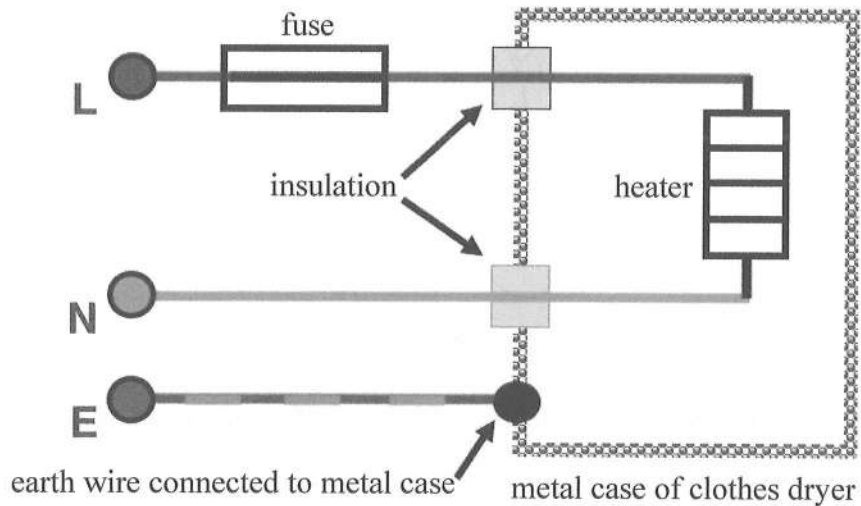


Fig. 3.1

- (a) Appliances with metal cases such as clothes dryers are usually earthed.

If the live wire becomes loose inside the dryer and touches the metal case, explain how:

- (i) the earth wire ensures safety.

[2]

- (ii) the fuse ensures safety.

[2]

- (b) Name an electromagnetic device that serves a similar function to a fuse in a building.

[1]

- (c) An electrical kettle with a power rating of 1.5 kW is shown in **Fig. 3.2**. The electrical kettle has a plastic case so there is no need for an earth wire connection in the plug.



Fig. 3.2

- (i) Explain why the electrical kettle is safe to use even though there is no earth wire.

[2]

- (ii) Calculate the operational current of the electrical heater if its power rating is 1.5 kW and the potential difference is 120 V .

[3]



TOTAL MARKS [10]

4. Car **A** of mass 900 kg is travelling at a steady speed of 35 m/s against a resistive force of 2000 N as shown in **Fig. 4.1**.

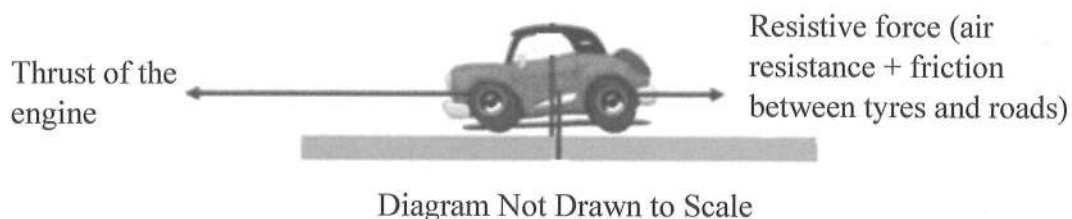


Fig. 4.1

- (a) State **one** difference between the **speed** and the **velocity** of the car.
- _____ [1]
- (b) If Newton's First Law of Motion is obeyed by the car, state the thrust produced by the engine.
- _____ [1]
- (c) Car **A**, with an initial speed of 35 m/s collides with a stationary car **B** of the same mass, on the side of a cliff. Car **A** comes to rest while in contact with car **B** in 1.2 seconds.
- (i) Calculate the change in momentum of car **A**.

[2]

- (ii) Calculate the average force exerted by car **B** on car **A**.

[2]

[Turn over

- (iii) Car **B** falls off the cliff and hits the ground below 3.0 seconds later.
Calculate the height of the cliff. ($g = 9.8 \text{ N/kg}$)



[2]

- (iii) Calculate the vertical velocity of car **B** just before it hits the ground.

[2]



TOTAL MARKS [10]

SECTION B

Answer any **two** questions from this section.

5. This question is about heat energy.

(a) Define the term specific heat capacity. [1]

(b) (i) Vegetable oil and water have specific heat capacities of $3.23 \text{ kJ/kg}^\circ\text{C}$ and $4.20 \text{ kJ/kg}^\circ\text{C}$ respectively.

Equal masses of each are heated at the same rate and in the same metal container.

State and explain which has the faster rise in temperature. [2]

(ii) Give a reason why a cooling system is usually pressurised. [1]

(iii) Give a reason why car radiators are normally painted black. [1]

(c) (i) State what happens to the volume of water during freezing and explain why this would be a problem in plumbing during the winter. [2]

(ii) Name the term used to describe this phenomenon in (c) (i). [1]

(iii) A mixture of water and ethylene glycol is used as a coolant in automotive engines and has a specific heat capacity of $2420 \text{ J/kg}^\circ\text{C}$.

Calculate the quantity of heat removed from the engine when the temperature of 4.0 kg of this mixture increases from 85°C to 120°C . [3]

(iv) Why is the energy absorbed by the mixture less than that released by automotive engines? [1]

(v) The engine is turned off and cools to a temperature of 120°C . As it cools, the energy released by the engine is the value obtained in (iii) plus an additional $360\,000 \text{ J}$ of heat energy.

The mass of the engine is 220 kg and its specific heat capacity of $450 \text{ J/kg}^\circ\text{C}$.

Calculate the initial temperature of the engine. [3]

- (d) A student determines the specific heat capacity of a coolant using an electrical method to provide energy.
- (i) Draw a circuit diagram and describe how the amount of energy provided can be determined. [3]
- (ii) Briefly state how the specific heat capacity of the coolant is calculated from the measurements. [2]

TOTAL MARKS [20]



6. (a) This question is about waves.

Fig. 6.1 shows a ray of light passing through a semi-circular glass block.

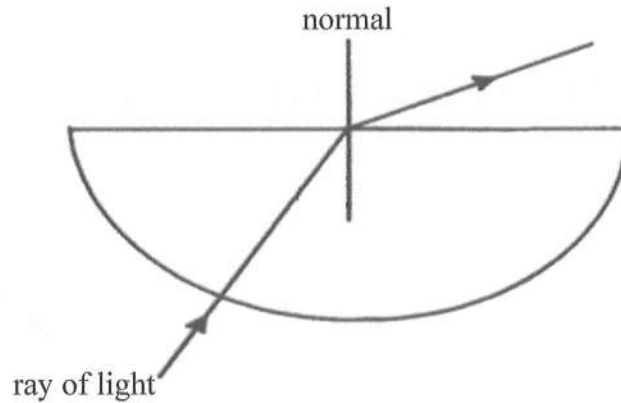


Fig. 6.1

- (i) Explain why the ray of light does not change direction when it enters the glass block, but changes direction when it leaves the glass block. [2]
- (ii) Apart from direction, state **TWO** other features of the light wave that change when it leaves the semi-circular glass block and enters air. [2]
- (b) A student performs an experiment to investigate the refractive index n of the glass used to make the semi-circular glass block as shown in **Fig. 6.2**.

The student passes red light into the semi-circular block at various angles of incidence i and measured angles of refraction r .

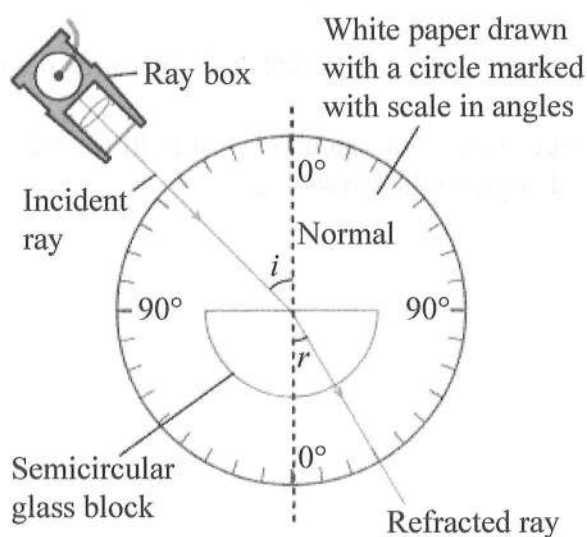


Fig. 6.2

In the practical conducted:

(i) Identify both the independent and dependent variables. [2]

(ii) Name **TWO** controlled variables. [2]

The student plots a graph of $\sin i$ against $\sin r$ as shown in **Fig. 6.3**.

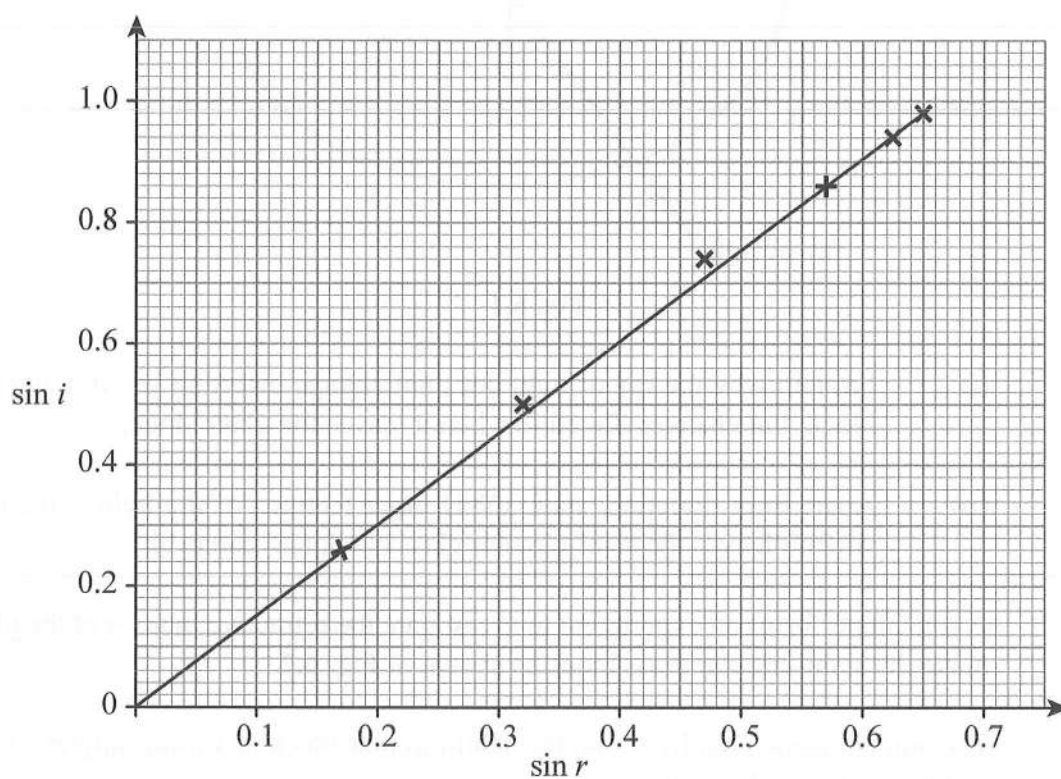


Fig. 6.3

(iii) Find the gradient of the graph and determine the refractive index of glass. [3]

(iv) Without using your calculated value in (b) (iii), use the graph to estimate the critical angle of the glass block. [3]



- (c) An optical fibre is a thin flexible fibre with a glass core through which light signals can be sent. The glass from which the optical fibre is made has a refractive index of 1.44.

Fig. 6.4 shows a section of an optical fibre in air, with a ray of light incident on the fibre wall at A.

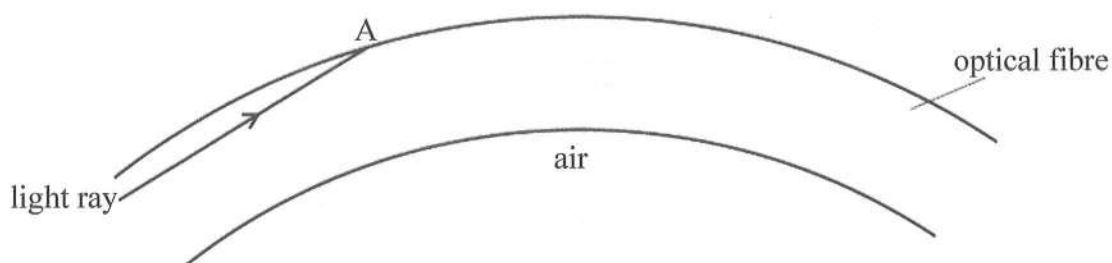


Fig. 6.4

- (i) Calculate the critical angle of the optical glass fibre. [2]
- (ii) On **Fig. 6.4**, complete the path of the light ray in the optical fibre until it reaches the end of the fibre. [1]
- (iii) Name the process the light ray is undergoing in the optical fibre. [1]
- (iv) State **TWO** uses of optical fibres. [2]

TOTAL MARKS [20]

[Turn over]

7. This question is about radioactivity

Fig. 7.1 shows an experiment set up in a vacuum used to investigate the composition of gold atoms. A thin sheet of gold foil is surrounded by a circular fluorescent screen and bombarded with alpha particles from a radioactive source.

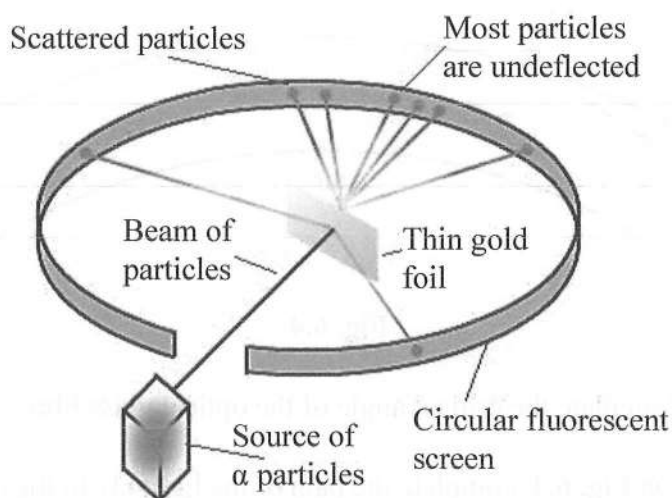


Fig. 7.1

(a) The following observations were made during the experiment.

- 1 *Most alpha particles pass through the gold foil undeflected.*
- 2 *A small number of alpha particles are deflected through large angles.*

- (i) Name **one** of the scientists responsible for these experimental observations. [1]
- (ii) State **two** properties of the gold atom that can be inferred based on these experimental observations. [2]



(b) Uranium-238 is a source of alpha particles.

(i) State **two** properties of an alpha particle. [2]

(ii) Complete the decay equation in **Fig. 7.2** for the alpha decay of Uranium-238.



Fig. 7.2

[2]

(c) Radioactive isotopes are used in medicine to diagnose and treat some medical conditions.

(i) Name **one** use of radioisotopes in medicine. [1]

(ii) State **two** (2) properties of a radioactive isotope that should be considered when planning for its use in a medical treatment.

Give a reason for each property that you suggest. [4]

(d) A Geiger-Muller tube is used to measure the count rate of a radioactive sample over time. The measurements obtained are shown in **Fig. 7.3**.

Count rate (cpm)	8000	6000	3500	1000	600	260	150
Time (minutes)	0	50	130	340	425	510	580

Fig. 7.3

(i) Plot a graph of count rate (*y*-axis) against time (*x*-axis). [5]

(ii) Using the graph, determine the half-life of the sample.

Indicate on your graph how you arrived at your answer. [2]

(iii) Using the graph, determine the count rate of the sample after 400 minutes. [1]

TOTAL MARKS [20]

Question

Write on both sides of the paper

1. The first step in the process of the scientific method is to make an observation or ask a question.

2. Next, a hypothesis is made, which is an educated guess or prediction about what will happen.

3. Then, an experiment is designed and carried out to test the hypothesis.

4. After the experiment, the results are analyzed to see if they support the hypothesis.

5. Finally, a conclusion is drawn based on the results of the experiment.

Question

Write on both sides of the paper

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Question

Write on both sides of the paper

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.