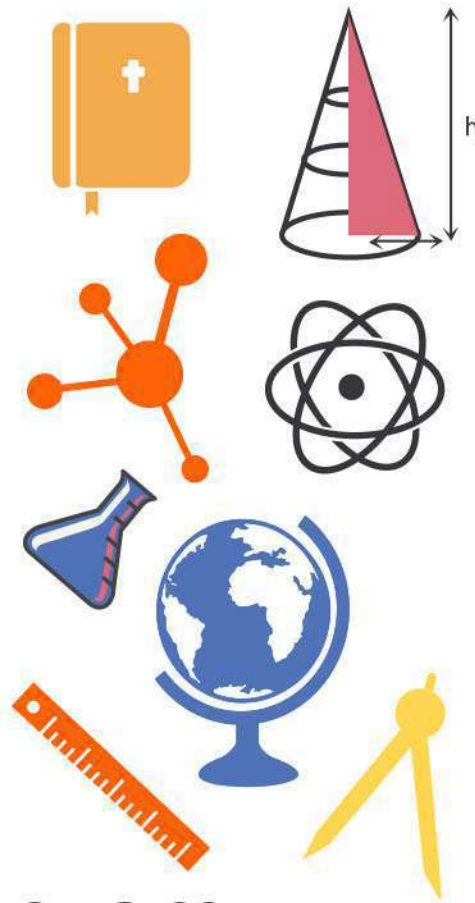


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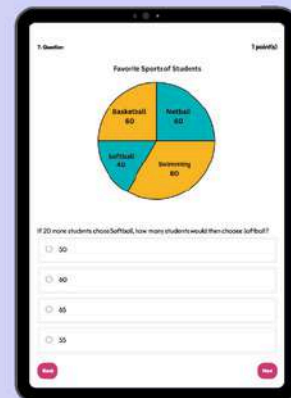
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PHYSICS

PAPER 1 3117/1

Thursday **30 MAY 2024** 12:00 NOON–1:15 P.M.

Additional materials:
None

MINISTRY OF EDUCATION NATIONAL EXAMINATIONS

BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION

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

All answers are to be recorded in this booklet.

Calculators may be used.

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

Answer as many questions as you can. For each question, four possible answers, **A**, **B**, **C** and **D** are given.

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

Rough work paper should not be handed in.

FOR EXAMINER'S USE ONLY

Total marks

This question paper consists of 18 printed pages and 2 blank pages.

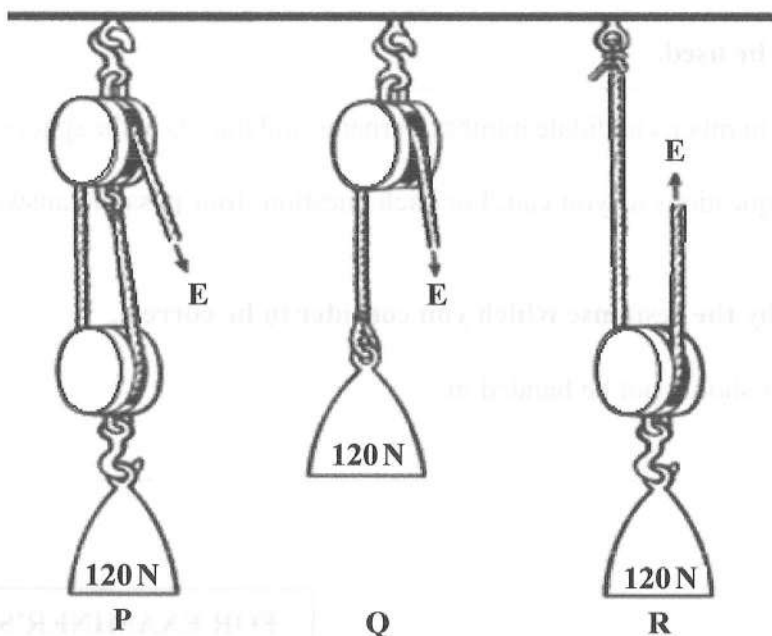
1. What is the atomic number of an element?
 - A. the number of electrons in an atom of the element
 - B. the number of neutrons in a nucleus of an atom of the element
 - C. the number of protons in a nucleus of an atom of the element
 - D. the number of protons and neutrons in a nucleus of an atom of the element

2. The table shows physical quantities and units commonly used in physics.

Which row of the table shows a physical quantity correctly matched with its S.I. base unit?

	Physical Quantity	S.I. unit
A.	length	metre
B.	mass	newton
C.	temperature	degree fahrenheit
D.	time	kilowatt hour

3. Three pulleys **P**, **Q** and **R** were used to lift 120 N loads.

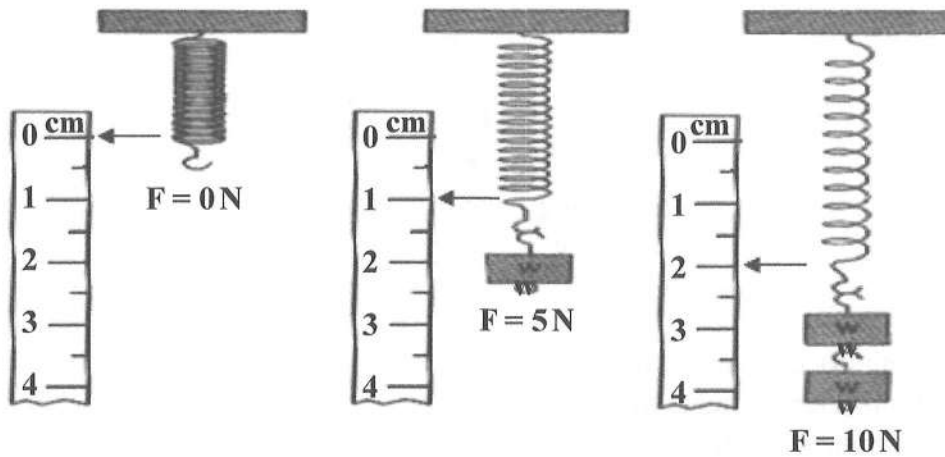


Which pulleys would require an effort (E) of 60 N to lift the 120 N load, if friction and weight of the moveable pulley are negligible?

- A. P and Q only
- B. P and R only
- C. Q and R only
- D. P, Q and R



4. A spiral spring which obeys Hooke's Law is used in an experiment to investigate the effect of force on extension.

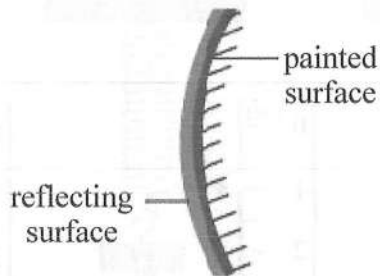


The spring used in this experiment has an original length of 1.5 cm.

What is the length of the spring when a force of 25 N is suspended on it?

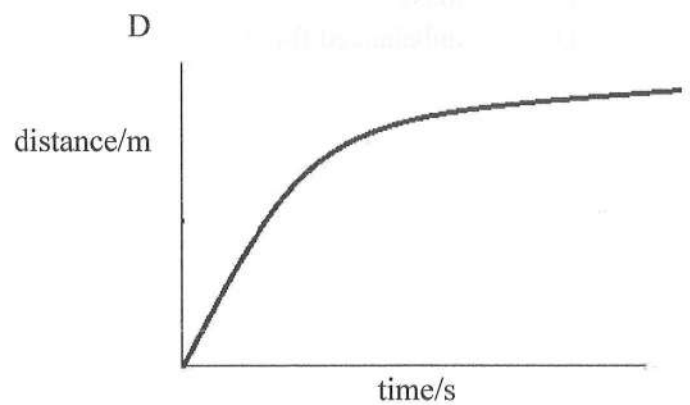
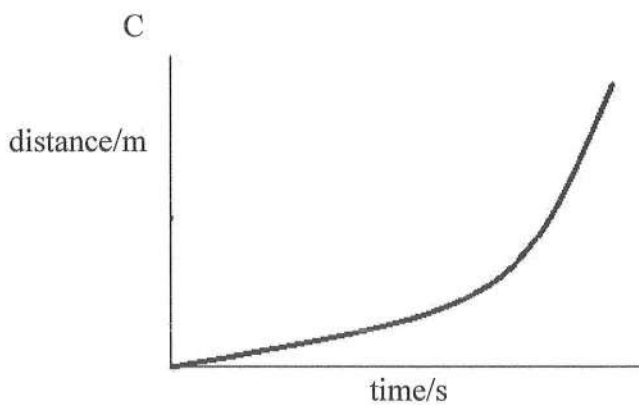
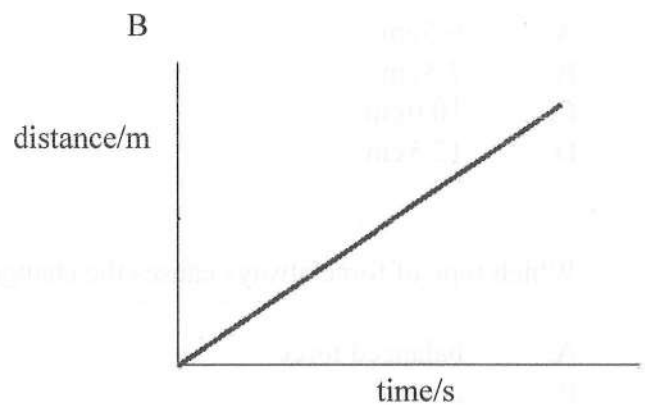
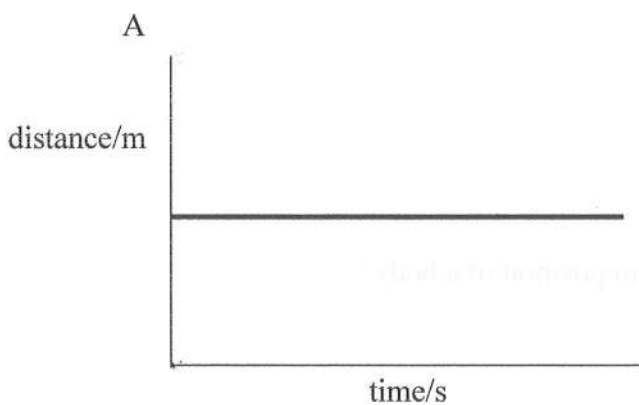
- A. 6.5 cm
 - B. 7.5 cm
 - C. 10.0 cm
 - D. 12.5 cm
5. Which type of force always causes the change in position of a body?
- A. balanced force
 - B. gravity
 - C. mass
 - D. unbalanced force

6. Which properties best describe the image formed when an object is placed on the left of the convex mirror shown?



- A. diminished, inverted, real
- B. diminished, upright, virtual
- C. magnified, inverted, real
- D. magnified, upright, virtual

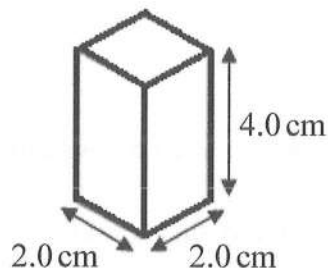
7. Which distance-time graph shows an object at rest?



8. An astronaut took a flask from the Earth to the Moon. The flask has a mass of 250 g on Earth. (The gravitational field strength on the earth and moon are 10 N/kg and 1.6 N/kg respectively.)

What is its weight on the Moon?

- A. 0.20 N
 - B. 0.25 N
 - C. 0.4 N
 - D. 2.5 N
9. Which quantity is a vector quantity?
- A. length
 - B. mass
 - C. temperature
 - D. velocity
10. The diagram shows a rectangular block made of lead.



The mass of the block is 180 g

What is the density of the block?

- A. 11 g/cm³
- B. 16 g/cm³
- C. 29 g/cm³
- D. 89 g/cm³

11. A skateboarder is skating on a horizontal surface, the combined mass of the skater and board is 65 kg. The skateboarder applies a force of 75 N parallel to the surface and experiences 25 N of frictional force.

What is the acceleration experienced by the skateboarder?

- A. 0.38 m/s²
- B. 0.77 m/s²
- C. 1.2 m/s²
- D. 2.6 m/s²

12. The momentum of a train is calculated as 1800 kg m/s.

The train travelling at a constant velocity, covers 600 m in 2 minutes.

What is the estimated mass of the train?

- A. 3 kg
- B. 60 kg
- C. 180 kg
- D. 360 kg

13. An eagle flaps its wings and pushes on the air below with a force X.

What is the value of the force exerted by the air on the eagle?

- A. equal to force X
- B. exactly twice as great as force X
- C. between one and two times larger than force X
- D. less than force X

14. A small steel ball is dropped from a low balcony.

Ignoring air resistance, which statement describes its motion?

- A. It falls with constant acceleration.
- B. It falls with constant speed.
- C. It falls with decreasing speed.
- D. It falls with increasing acceleration.



15. The slope of a speed-time graph represents which physical quantity?

- A. acceleration
- B. distance
- C. momentum
- D. speed

16. One type of glass does not expand when heated.

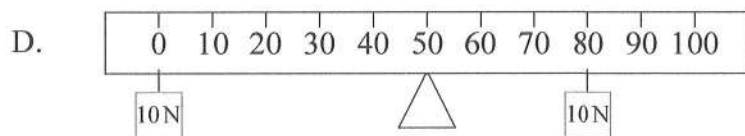
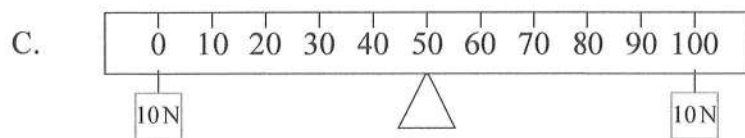
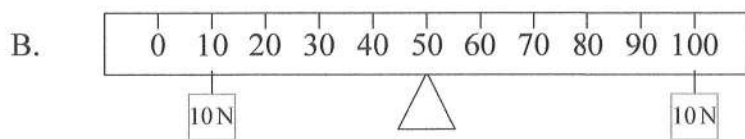
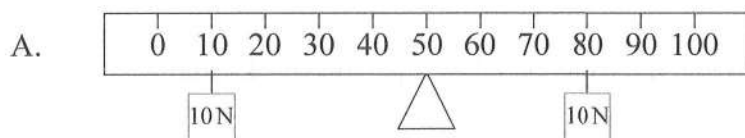
What happens to a gas in a container of this type of glass when the temperature of the gas increases?

- A. the volume decreases
- B. the volume increases
- C. the pressure decreases
- D. the pressure increases

17. The diagrams show a metre ruler which was originally balanced at the 50 cm mark.

Identical weights were then placed on either side of the pivot.

Which labelled diagram will have an overall moment of 200 N cm counterclockwise?



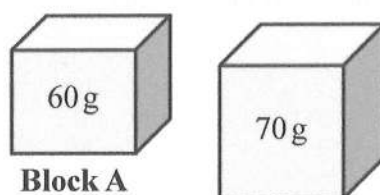
18. What is the name of the process when a gas turns into a liquid?
- A. condensation
 - B. evaporation
 - C. freezing
 - D. melting
19. Which factor does **not** affect the rate of diffusion of particles in a liquid through a membrane which has a fixed area?
- A. the concentration of the particles in the liquid
 - B. the size of the holes in the dividing membrane
 - C. the temperature of the liquid
 - D. the volume of the liquid
20. Which movement will require the greatest amount of work to be done?
- A. a force of 10 N moving an object a distance of 3 m
 - B. a force of 10 N moving an object a distance of 5 m
 - C. a force of 15 N moving an object a distance of 3 m
 - D. a force of 15 N moving an object a distance of 5 m
21. What energy changes take place in a microphone when a person speaks into it?
- A. electrical to kinetic
 - B. electrical to sound
 - C. kinetic to mechanical
 - D. sound to electrical
22. What is a unit of energy?
- A. ampere
 - B. joule
 - C. kelvin
 - D. watt



23. Why is the ice-point chosen as one of the fixed points of a thermometer scale?

- A. All ice has a temperature of 0°C .
- B. Ice has zero heat energy.
- C. It is an accurate, easily reproducible temperature.
- D. It is the coldest temperature that can exist.

24. A student heats two blocks of aluminum **P** and **Q** of masses 60 g and 70 g respectively from 28°C to 50°C .



Which row correctly explains the energy gains by the aluminum blocks P and Q and the average kinetic energy of their particles at 50°C ?

	Energy gained by blocks	Average Kinetic Energy of Particles in blocks
A.	P gained less energy than Q	particles in P have less average kinetic energy than particles in Q
B.	P gained less energy than Q	particles in P have the same average kinetic energy as particles in Q
C.	P gained more energy than Q	particles in P have more average kinetic energy than particles in Q
D.	P gained the same energy as Q	particles in P have the same average kinetic energy as particles in Q

25. The cooling fins of a refrigerator are painted black.

Which method of heat transfer does this improve?

- A. conduction only
- B. convection only
- C. radiation only
- D. all of the above

26. A thermistor is a non-ohmic resistor, whose resistance depends on its temperature.

In which piece of equipment can a thermistor best be used?

- A. automatic security lighting
- B. burglar alarm circuits
- C. digital cameras to control shutter speeds
- D. fire alarm circuits

27. Which type of wave involves the oscillation of matter?

- A. gamma ray
- B. radio
- C. sound
- D. visible light

28. Which of the following best describes the behaviour of a water wave after it passes through a gap?

- A. diffraction
- B. diffusion
- C. reflection
- D. refraction

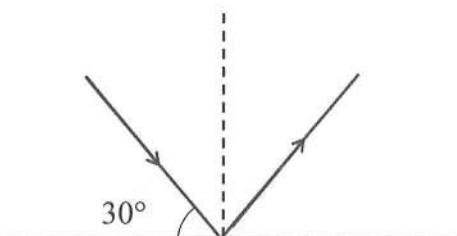
29. Which of the following is a characteristic of **both** a sound and a visible light wave?

- A. They are transverse waves.
- B. They can exhibit diffraction.
- C. They need a medium to travel.
- D. They travel at the same speed.



30. A ray of light is reflected as shown.

What is the angle of reflection?



- A. 30°
B. 40°
C. 60°
D. 180°
31. When light moves from glass to air, which statement is true?
- A. frequency increases
B. speed decreases
C. wavelength increases
D. wavelength stays the same
32. Why does a ceiling fan have a cooling effect on people?
- A. Condensation can take place more readily.
B. Evaporation can take place more readily.
C. Hot air rises.
D. The temperature of the air is lowered.
33. Which property of images produced by plane mirrors, is the main reason for the word AMBULANCE being written as shown in the diagram?



- A. Image distance is the same as object distance.
B. Image size is the same as object size.
C. The images produced are laterally inverted.
D. The images produced are real images.

34. Which is the best material for creating a shield from nuclear radiation?

- A. aluminium
- B. copper
- C. lead
- D. plastic

35. Which of the colours shown has the longest wavelength?

- A. blue
- B. red
- C. violet
- D. yellow

36. A person claps their hands while standing 100 m from a tall cliff.

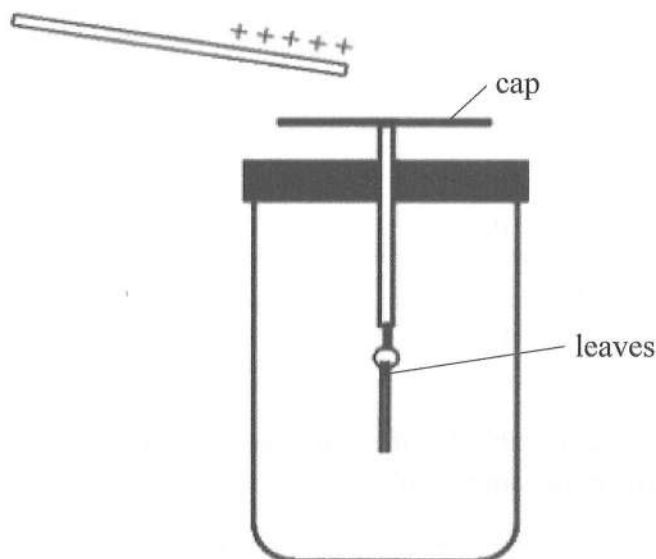
The speed of sound in air is 330 m/s.

What is the time taken to hear the echo?

- A. 0.30 s
- B. 0.61 s
- C. 3.3 s
- D. 6.6 s



37. A positively charged rod is brought near to an uncharged electroscope. The rod does not touch the electroscope.



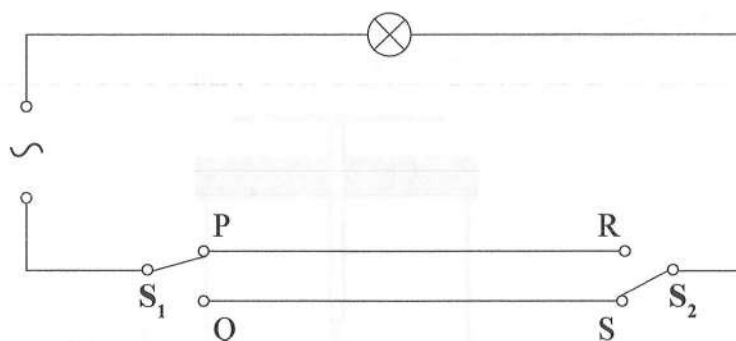
What are the charges on the cap and the leaves of the electroscope?

	Charge on cap of Electroscope	Charge on leaves of Electroscope
A.	negative	negative
B.	negative	positive
C.	positive	negative
D.	positive	positive

38. Why should the lights in a house be connected in parallel rather than in series?

- A. It is cheaper.
- B. Less electric current is used.
- C. The lights are dimmer.
- D. When one light goes out the rest of the lights stay on.

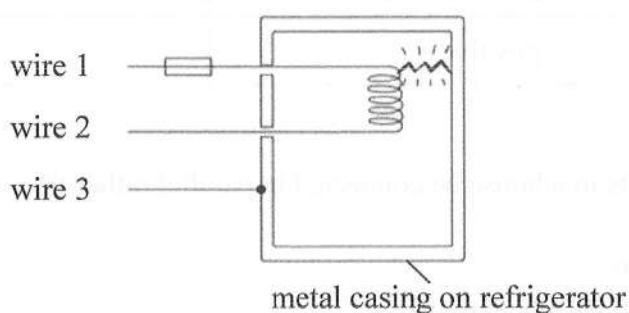
39. A simplified circuit with two switches, S_1 and S_2 , is used to operate a lamp from different points of a room, as shown in the diagram below.



Which row in the table correctly identifies the type of current used in homes and the positions of switches S_1 and S_2 when the lamp is on?

	Current	S_1	S_2
A.	alternating	P	R
B.	alternating	P	S
C.	direct	Q	R
D.	direct	Q	S

40. Wires 1, 2 and 3 are connected to a three-pin plug of a refrigerator which is in use.

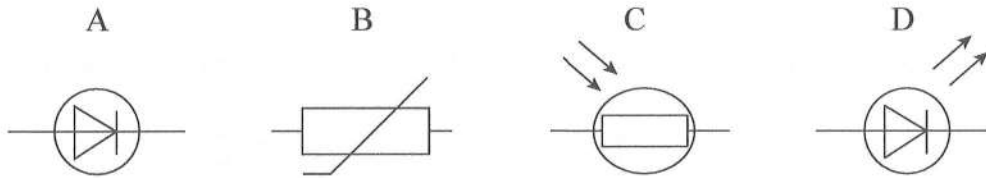


What are the names of wires 1, 2 and 3?

	Wire 1	Wire 2	Wire 3
A.	earth	live	neutral
B.	live	earth	neutral
C.	live	neutral	earth
D.	neutral	earth	live



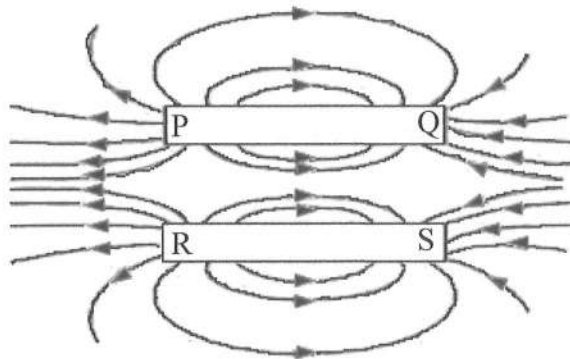
41. Which symbol shows a light emitting diode?



42. In an electrical circuit, what is the purpose of a fuse?

- A. to connect the metal case of an appliance to the earth
- B. to keep an electrical appliance dry in damp conditions
- C. to maintain a steady voltage as the current varies
- D. to turn off the electrical supply if the current is too large

43. The diagram below shows the magnetic field lines around two bar magnets close to each other.

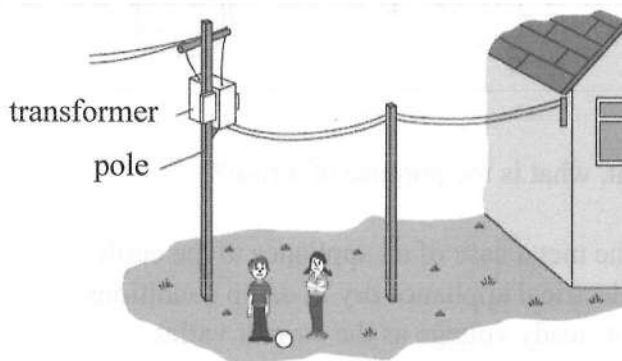


What is the name of the poles labelled P, Q, R and S?

	P	Q	R	S
A.	North	North	South	South
B.	North	South	North	South
C.	South	North	South	North
D.	South	South	South	South

44. The diagram shows a standard transformer used in electrical distribution. The input voltage is 960V.

What is the output voltage given that the ratio of turns on the primary and secondary coils is 4:1?



- A. 96 V
 B. 120 V
 C. 240 V
 D. 1920 V
45. Which particle has a negative charge?

- A. alpha particle
 B. electron
 C. neutron
 D. proton

46. Uranium-238 decays to thorium by alpha decay as shown in the equation below.

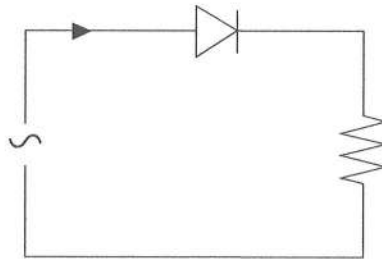


What is the mass number and atomic number of thorium in the equation?

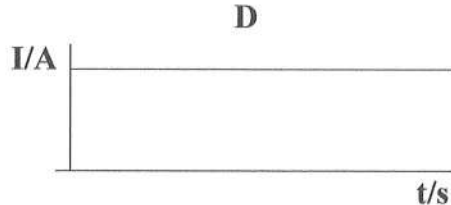
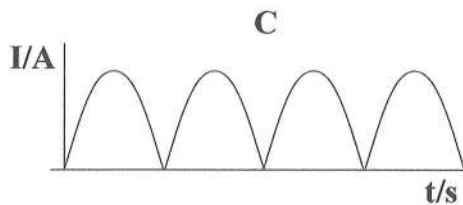
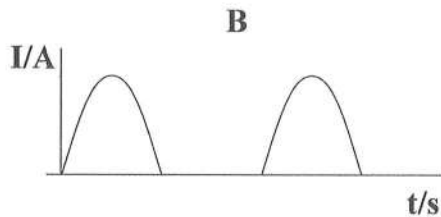
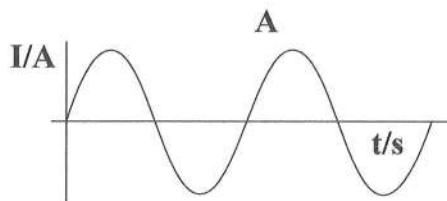
	Mass number of Thorium	Atomic number of Thorium
A.	234	90
B.	234	92
C.	240	88
D.	240	90



47. Which of the following is not a use of radioactive isotopes?
- A. as tracers in medical examinations
 - B. dating dinosaur remains
 - C. generating hydroelectric power
 - D. radiotherapy
48. Which properties of a radioactive tracer, are most suitable for use in the human body?
- A. alpha emitter, long half-life
 - B. alpha emitter, short half-life
 - C. beta emitter, long half-life
 - D. beta emitter, short half-life
49. The diagram shows one use of a semiconductor diode.



Which graph correctly represents the output current?



50. Which group shows only good electrical conductors?
- A. air, carbon (graphite), plastic
 - B. air, gold, mercury
 - C. carbon (graphite), copper, mercury
 - D. copper, gold, plastic



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School Number	Candidate Number
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PHYSICS

PAPER 2 3117/2

Thursday **30 MAY 2024** 1:30 P.M.–3:00 P.M.

Additional materials:

None

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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.

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 [].

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1	
2	
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Total	

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

1. **Fig. 1.1** shows particles of a gas inside a closed container.

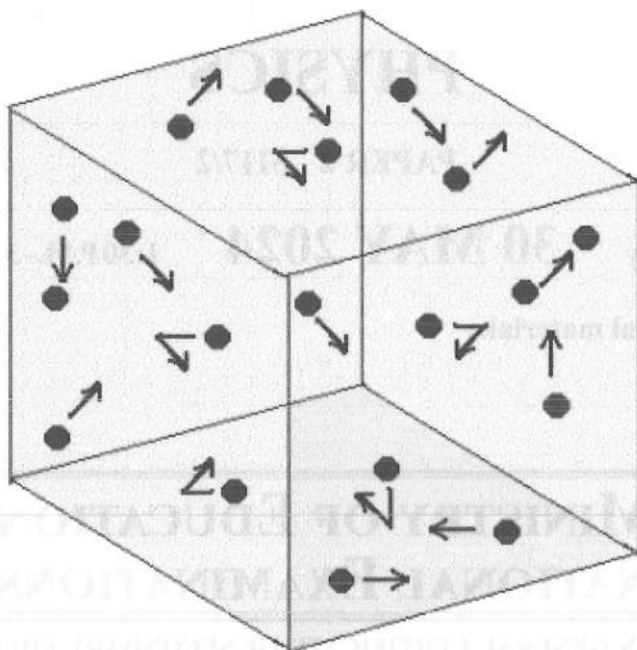


Fig. 1.1

The arrows indicate the movement of the particles inside the closed container.

- (a) The gas exerts a pressure on the container.

Describe the movement of the particles in the gas that causes this pressure.

[2]

- (b) The gas has a mass of 0.20 g and the container is a cube with sides having a length of 5.0 cm.

Calculate the density of the gas inside the block in g/cm^3 .

[3]



- (c) Name the process in which the gas is changed to a liquid.

_____ [1]

- (d) State two ways in which the pressure of the gas in **Fig. 1.1** can be increased.

1 _____

2 _____

[2]

- (e) Define diffusion.

_____ [2]

TOTAL MARKS [10]

2. Trina leaves home and travels to her friend's house. Her journey is described in the table.

Part A	She accelerates from rest to a speed of 25 m/s in 20 s.
Part B	She continues to travel at this constant speed for 30 seconds.
Part C	Finally, she slows to a stop in 5 seconds and arrives at her friend's house.

- (a) Draw a speed-time graph to represent each part of Trina's journey on the grid.

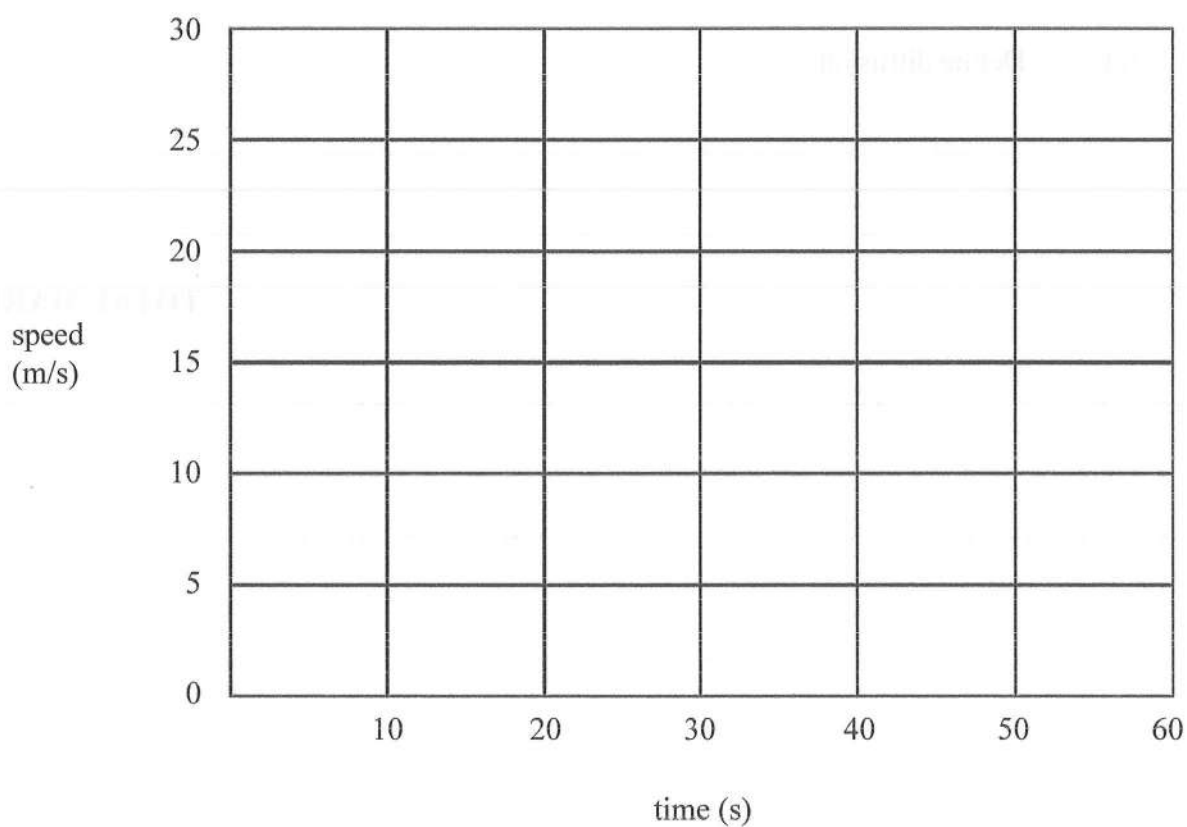


Fig. 2.1

[3]



- (b) Calculate the total distance Trina travelled from her home to her friend's house.

[4]

- (c) Calculate the average speed for the entire journey.

[3]

TOTAL MARKS [10]

3. **Fig. 3.1** shows a simplified diagram of a mount designed for moving a 0.50 kg camera smoothly over short vertical distances.

When in operation, the camera is placed between a pair of sliding rails and hung from a spring that obeys Hooke's Law. There is no friction between the camera and the rails. The length of the spring is 3.0 cm, when no load is attached.

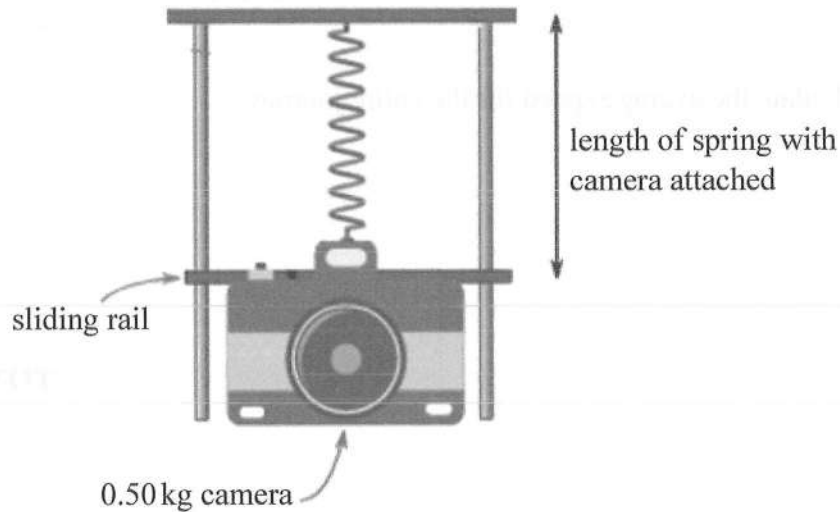


Fig. 3.1

- (a) (i) Calculate the weight of the camera if the gravitational field strength acting on it is 10 N/kg.

[2]

- (ii) State **two** differences between mass and weight.

1 _____

2 _____

[2]



(b) The camera is suspended from the spring. The new length of the spring is 5.0 cm.

(i) Calculate the extension of the spring.

[1]

(ii) If the spring obeys Hooke's Law, determine the force needed to produce an extension of 5.5 cm.

[2]

(iii) The old camera is replaced by a new camera weighing 6.5 N.

Calculate the total length of the spring when the new camera is attached.

[3]

TOTAL MARKS [10]

4. **Fig. 4.1** shows a swimming complex with two diving boards, **A** and **B** placed at different heights above a pool. Divers can climb stairs to get to each diving board.

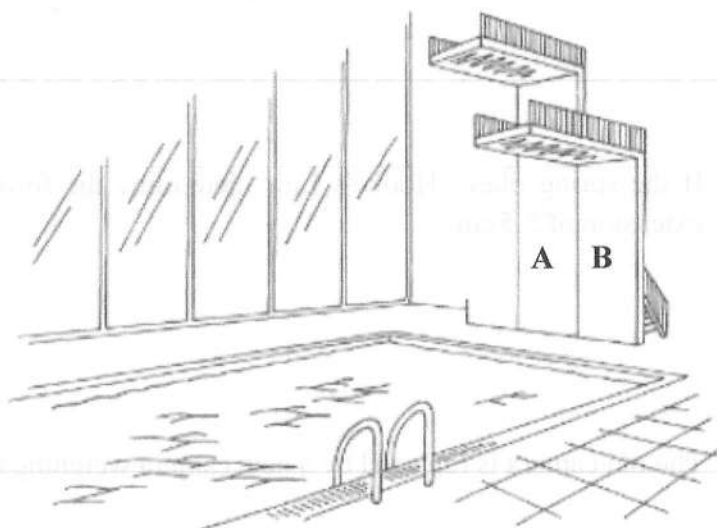


Fig. 4.1

While training, a diver with a mass of 60 kg routinely dives from the lower diving board **B**, and then from the higher diving board **A**. Gravitational field strength on the diver is 10 N/kg. Assume the effects of friction and air resistance acting on the diver are negligible.

- (a) The diver climbs the stairs in 8.0 s to diving board **B**, which is at a height of 7.5 m.
- (i) Calculate the gravitational potential energy of the diver when he is on diving board **B**.
- [2]
- (ii) Calculate the power developed by the diver in climbing the stairs onto diving board **B**.
- [2]
- (iii) State the energy change that take place as the diver dives from diving board **B**.

[1]



- (iv) Using the gravitational energy in (i) and the formula for kinetic energy, calculate the speed of the diver just before hitting the water.

[3]

- (b) The diver then climbs from the pool onto diving board **A**. The useful work done by the diver in climbing onto diving board **A** is 6000 J.

Calculate the difference in heights of diving boards **A** and **B**.

[2]

TOTAL MARKS [10]

5. When white light passes through a glass prism, it splits into its constituent colours.

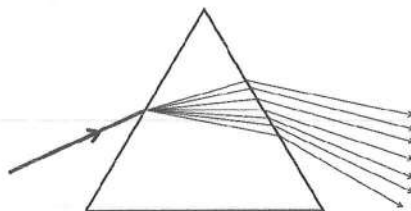


Fig. 5.1

- (a) State the name given to this phenomenon.

_____ [1]

- (b) Of the visible colours that emerge after the process described in (a), name the:

- colour that has the smallest wavelength.

_____ [1]

- colour that has the lowest frequency.

_____ [1]

- (c) State **two** applications of sound waves.

1 _____

2 _____

[2]

- (d) All electromagnetic waves travel at the speed of light (3×10^8 m/s).

- (i) State **two** other properties of all electromagnetic waves.

1 _____

2 _____

[2]

- (ii) The frequency of one such wave found to be is 300 kHz.

Calculate the wavelength of this wave.



[3]

TOTAL MARKS [10]

6. The diagram below shows the atomic arrangement of the particles in and around the nucleus of an atom.

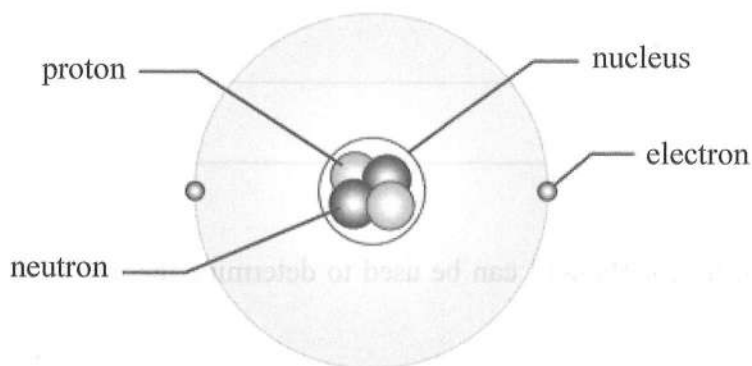


Fig. 6.1

- (a) Complete the table below for each of the elements or isotopes listed. The atomic number of carbon is 6.

Element/Isotope	number of protons	number of electrons	number of neutrons
carbon-12			
carbon-14			

[3]

- (b) Carbon-14 undergoes beta decay to form nitrogen-14 as shown in the equation.



Complete the table below identifying the value of each of the letters shown.

a	b	c	d	e	f

[3]

- (c) The half-life of carbon-14 is 5700 years. Explain the meaning of the word half-life.

[2]

- (d) Explain how carbon-14 can be used to determine the age of fossils containing organic matter.

[2]

TOTAL MARKS [10]



7. This question is about simple electronic devices.

Fig. 7.1 shows a simplified circuit which uses a light dependent resistor (LDR) to operate a security lamp.

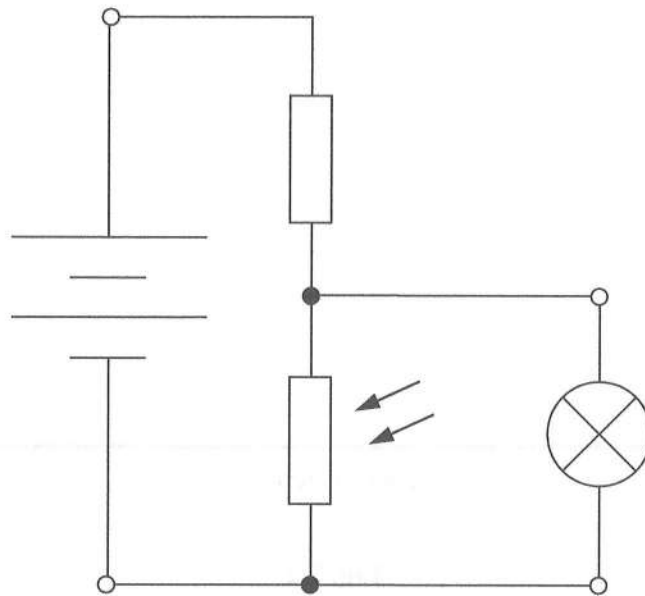


Fig. 7.1

- (a) In dark conditions, state what happens to the:

- resistance of the LDR.

_____ [1]

- potential difference across the LDR.

_____ [1]

- current through the LDR.

_____ [1]

- current through the security lamp parallel to the LDR.

_____ [1]

- (b) On Fig. 7.2 below, sketch a graph which shows how the resistance of a light dependent resistor varies with light intensity.

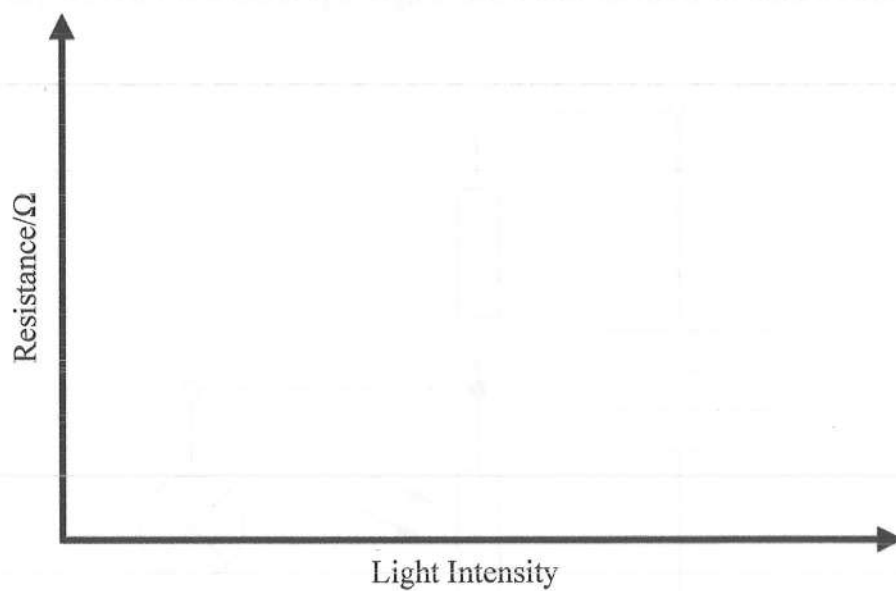


Fig. 7.2

[2]

- (c) Fig. 7.3 shows a circuit with a fixed resistor of resistance $2.0\text{ k}\Omega$ in series with a LDR, whose resistance is $25\text{ k}\Omega$, at a particular light intensity. The 6.0 V battery used in the circuit has negligible resistance.

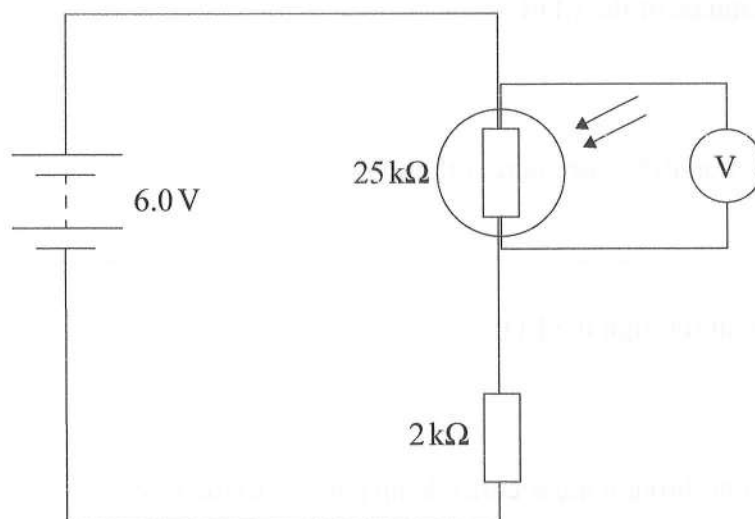


Fig. 7.3



At this light intensity, calculate the

- current in the circuit.

[2]

- voltmeter reading.

[2]

TOTAL MARKS [10]

8. (a) **Fig. 8.1** shows two conducting plates **A** and **B** which are parallel to each other and connected to a steady voltage. A steady beam of electrons is passed between the plates and aimed at a fluorescent screen, which illuminates when the beam strikes it.

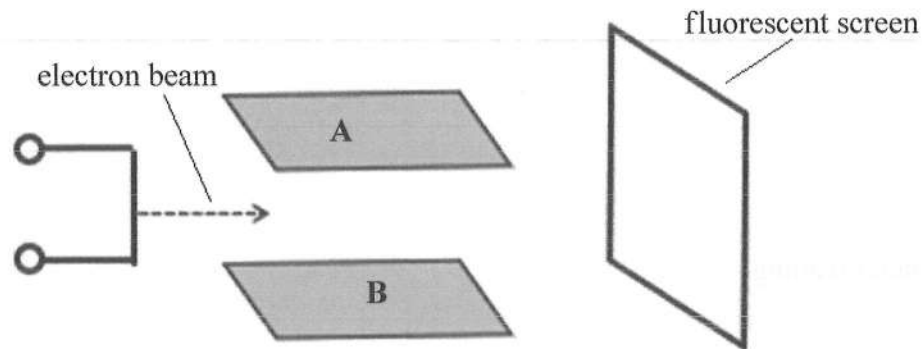


Fig. 8.1

- (i) On **Fig. 8.1** draw the path of a beam of electrons which passes between plate **A** which is positively charged, and plate **B** which is negatively charged.

Indicate where the beam strikes the fluorescent screen.

[1]

- (ii) Explain why this path is observed.

[2]

- (iii) Describe what would happen to the path of the beam when the potential difference across the plates is zero.

[1]



- (b) A student connects four resistors as shown in **Fig. 8.2**.

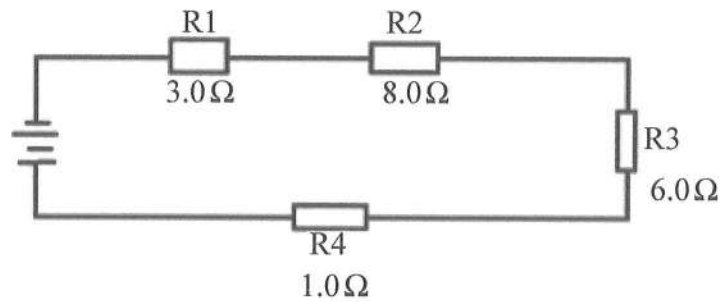


Fig. 8.2

- (i) Determine the total resistance.

[2]

- (ii) The student then connects an ammeter in the circuit. The reading is shown in **Fig. 8.3**.

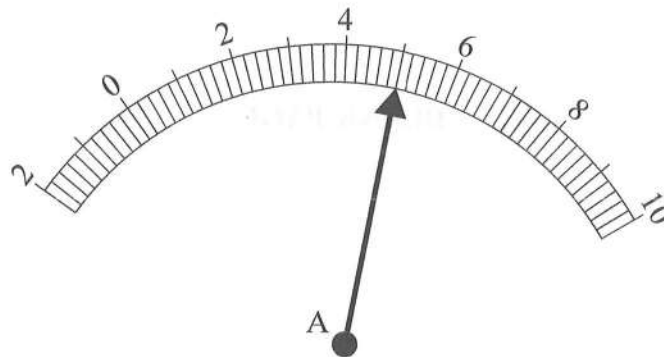


Fig. 8.3

State the reading on the ammeter.

[1]

- (iii) Calculate the smallest possible resistance that can be made by connecting two of the resistors in parallel.

[3]

TOTAL MARKS [10]

End]

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School Number	Candidate Number
Surname and Initials	

PHYSICS

PAPER 3 3117/3

Thursday **6 JUNE 2024** 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 16 printed pages and 4 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, $m = \frac{\text{image distance}}{\text{object distance}}$

$w = mg$

$F = ma$

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

$p = hgp$

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

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

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

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

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

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

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

$PE = wh$

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

$v = f\lambda$

$W = mc\Delta\theta$

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

$Q = It$

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

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

$R_T = R_1 + R_2$

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

$P = VI$

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

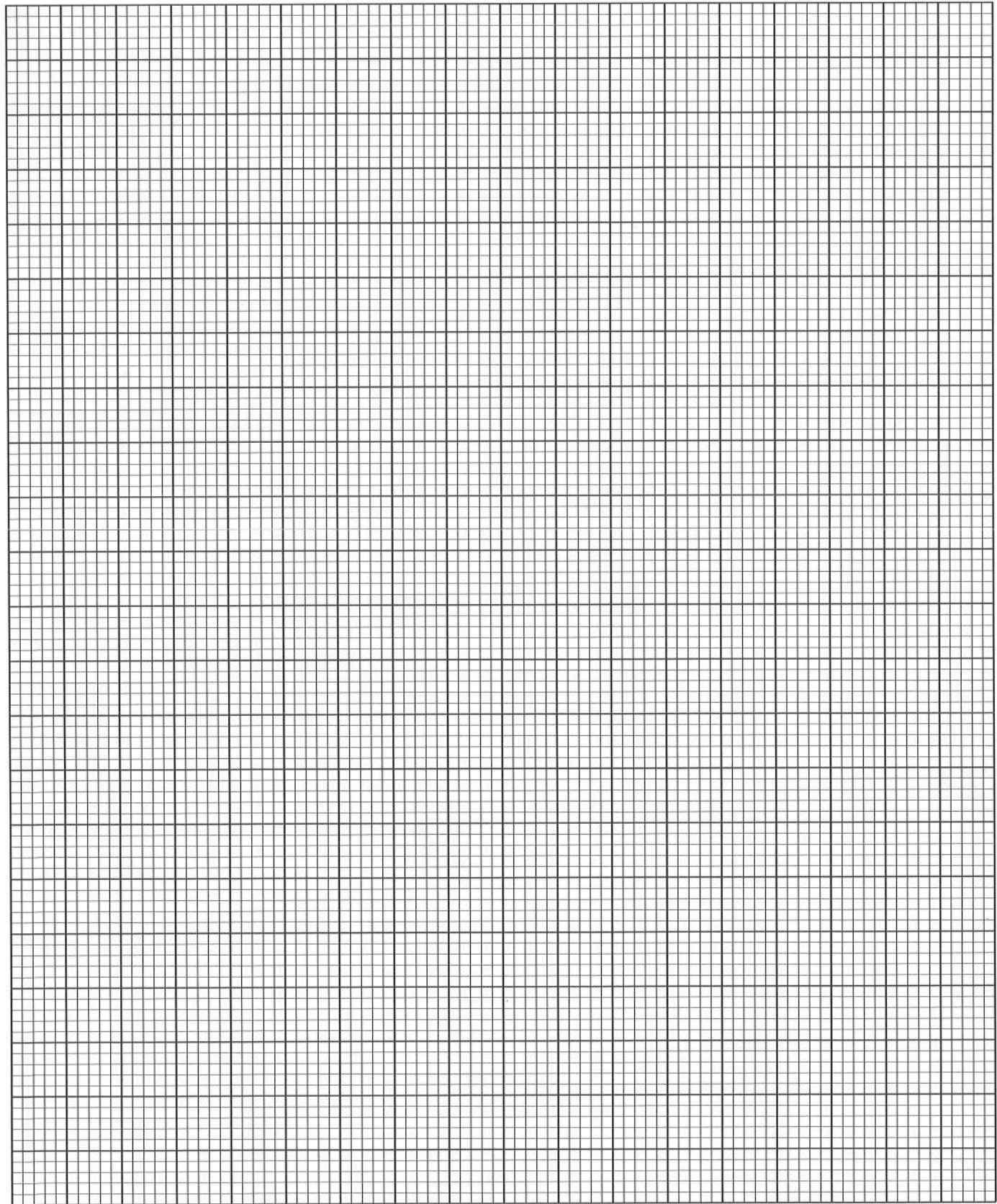
$n = \frac{\sin i}{\sin r}; n = \frac{\text{real depth}}{\text{apparent depth}}$

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



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.	



This image shows a full page of blank graph paper. The grid consists of small, equal-sized squares formed by thin black lines. There are no margins, text, or other markings on the page.

SECTION A

Answer **all** questions in this section.

1. The National Grid is a system of devices that is responsible for safely delivering electricity to your home.

A summary of the power used in a home is shown in **Table 1.1**.

BIG POWER COMPANY		
Bill to: John Kemp	Meter Number: #123456	Billing Period: Jun 1st – Jun 30th
Consumer Type:	Domestic (House)	
Previous Reading (kWh)	110440	
Previous Reading (kWh)	111360	
Total number of kWh used for billing period (kWh)		
Total Amount Due:		

Table 1.1

Big Power Company charges customers \$0.05 per kilowatt hour for electricity use.

- (a) Using the table determine:

- (i) the total number of kilowatt hours used for the billing period.

[1]

- (ii) the total amount due for the billing period. (Show working and give correct units.)

[2]

- (iii) the billing time in hours.

[1]

- (iv) the average power used in the home during the month of June. (Show working and give correct units.)

[3]

- (b) A simple toaster is fitted with a 10 A fuse.

- (i) The toaster conducts 2000 C of charge in 3 minutes. Determine the working current of the toaster.

[2]

- (ii) State whether or not the toaster will operate as intended.

[1]

TOTAL MARKS [10]

[Turn over]

2. (a) State Newton's First Law of Motion.

 [2]

- (b) A car of mass 1000 kg travels along a flat, straight road. A resultant force of 1900 N acts on the car.

- (i) Calculate the acceleration of the car. (Show working and give correct unit.)

[2]

- (ii) The car then climbs a hill at 30° to the horizontal.
The weight of the car acting downwards is 10 000 N.
Calculate the component of the weight of the car that acts at right angles to the surface of the hill. (Show working and give correct unit.)

[2]

- (c) The plane in **Fig. 2.1** begins taxiing from one end of a runway at 5.0 m/s and undergoes a uniform acceleration of 6.2 m/s^2 for 15 s just before taking off.

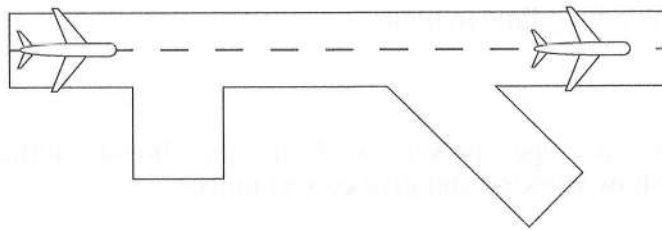


Fig. 2.1

- (i) Calculate the plane's speed at the time of take-off.

[2]



- (ii) Calculate the distance that the plane travelled just before take-off.

[2]

TOTAL MARKS [10]

3. A hot air balloon (which has a gondola attached with a man and equipment inside) is shown in **Fig. 3.1**. It is at sea level and contains 500 m^3 of air. The density of air at sea level is 1.2 kg/m^3 . The temperature of the air at sea level is 25°C . The atmospheric pressure is $1.0 \times 10^5\text{ Pa}$.

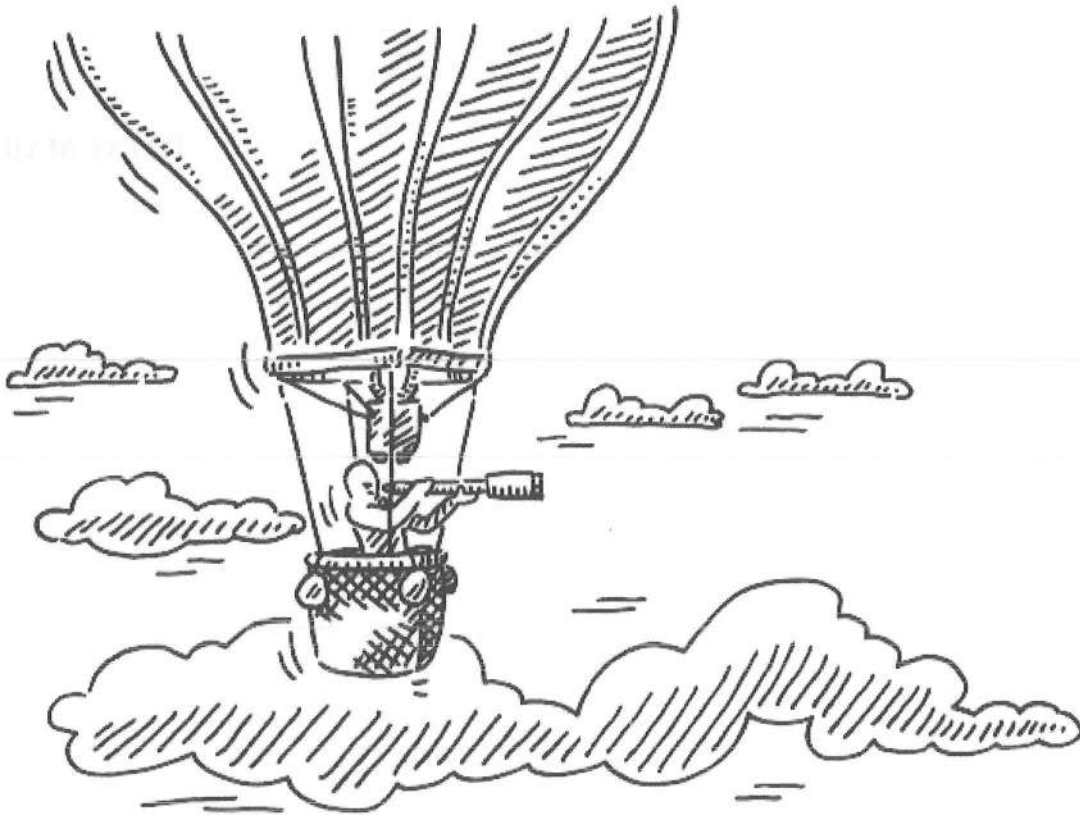


Fig. 3.1

- (a) Calculate the mass of air contained inside the balloon.

[1]

- (b) The air is heated by a propane heater causing the volume of the balloon to increase while keeping the pressure constant.

Calculate the new volume if 500 m^3 of air is heated from 25°C to 50°C .

[3]

- (c) Calculate the new density of the air in the balloon.

[1]

- (d) Give the name of the upward force exerted on the balloon.

[1]

- (e) Given that the balloon, the gondola and all of the equipment weighs 5000 N, calculate the mass in kg of the man operating the balloon assuming that the balloon is floating at equilibrium.

Assume that the upward force is equal to the weight of the displaced air calculated at (a). (When mass is 1 kg, $g = 10 \text{ N/kg}$.)

[4]

TOTAL MARKS [10]

4. A student puts 50 g of ice cubes at 0°C into a foam cup containing 1000 cm^3 of cola at room temperature of 25°C as shown in Fig. 4.1.

The specific latent heat of fusion of ice is $3.3 \times 10^5\text{ J/kg}$.

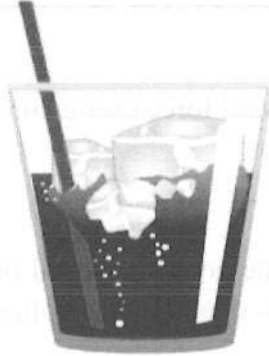


Fig. 4.1

- (a) Assuming the ice is at a temperature of 0°C , calculate the amount of energy needed to melt the ice.

[3]

- (b) The heat energy required to melt the ice is drawn from the cola.

Name the method of heat transfer that governs the transfer of heat in liquids.

[1]

- (c) Cola has the density of 1.0 g/cm^3 and a specific heat capacity of $4200\text{ J/(kg }^{\circ}\text{C)}$.

Calculate the new temperature of the soda after the ice melts.

(Assume that the heat needed to melt the ice is absorbed from the cola.)

[3]



- (d) Calculate the mass of ice needed to reduce the temperature of 1.0 kg of cola from 25 °C to 0 °C.

(Assume that no heat is absorbed from the surroundings and that the ice is initially at 0 °C.)

[3]

TOTAL MARKS [10]

SECTION B

Answer **two** questions from this section.

5. This question is about waves.

- (a) Waves may be either longitudinal or transverse.

Describe the difference between a longitudinal and a transverse wave. [2]

- (b) A tsunami is a giant water wave which may be caused by an earthquake below the ocean. Waves from a certain tsunami have a wavelength of $1.8 \times 10^5 \text{ m}$ and a speed of 245 m/s . Calculate the frequency of the tsunami wave. [2]

- (c) A student conducts an experiment to determine the refractive index of glass. **Fig. 5.1** shows the apparatus the student uses to find the refractive index of glass.

Glass blocks of different heights are progressively placed vertically over an object, which is an X marked on a sheet of paper.

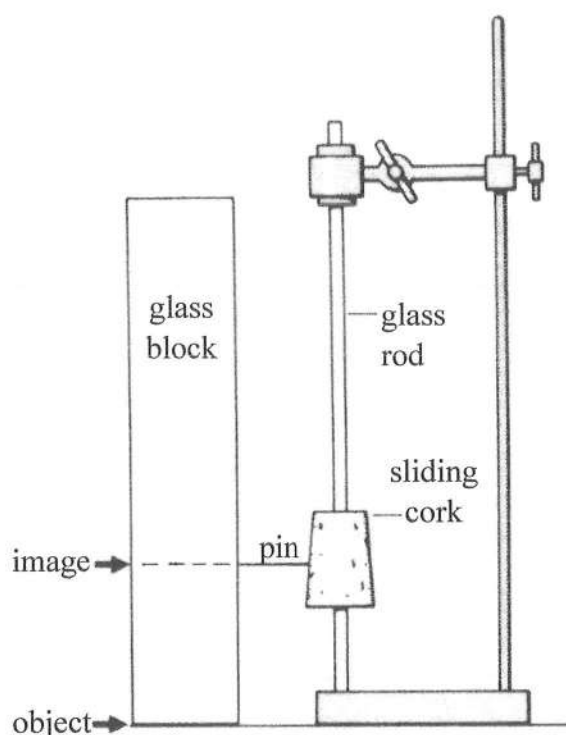


Fig. 5.1

- (i) Describe an appropriate method the student may have followed to determine the refractive index of glass using the apparatus in **Fig. 5.1**. [3]

- (ii) The following results were obtained by the student.

Real depth/cm	6.6	12.3	18.9	24.0	30.3	36.6
Apparent depth/cm	4.4	8.2	12.6	16.0	20.2	24.4

Plot a graph of the real depth (y -axis) against apparent depth (x -axis). [5]

- (iii) Find the gradient of your graph in (ii) and hence determine a value for the refractive index of glass [3]

- (d) In other practical studies, the student uses a ray box to direct light at different angles from a plastic semi-circular block in air as shown in **Fig. 5.2**.

The plastic semi-circular block has a refractive index of 1.45.

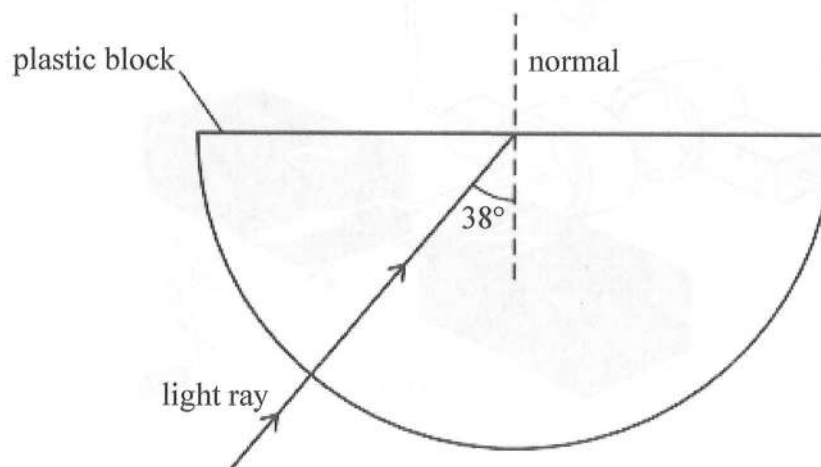


Fig. 5.2

- (i) Explain why the ray of light does not change direction as it enters the plastic block along the circular surface. [1]
- (ii) Calculate the angle of refraction of a light ray if it travels at an angle of incidence of 38° from air into the plastic block. [2]
- (iii) State the change, if any, that occurs to the frequency and wavelength of the light ray when it leaves the plastic block and enters air. [2]

TOTAL MARKS [20]

6. This question is about magnetism and electromagnetism.

In a Physics laboratory, students conduct several experiments to investigate the action of motors and generators.

- (a) State the useful energy transformation that occurs in:

(i) motors [1]

(ii) generators [1]

- (b) **Fig. 6.1** shows the first circuit built by the group of students.

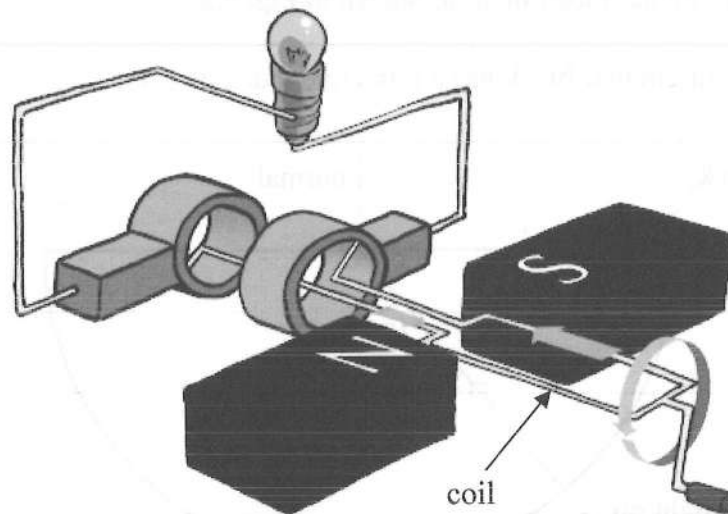


Fig. 6.1

- (i) Name the process occurring in the circuit when the coil is manually rotated in the magnetic field. [1]
- (ii) State what would happen if the coil is held stationary within the magnetic field. [1]
- (iii) Suggest **three** modifications that increase the current output from the apparatus shown in **Fig. 6.1**. [3]



- (c) In a second experiment, the students modified the circuit by replacing the slip rings, with a split ring commutator as shown in **Fig. 6.2**.

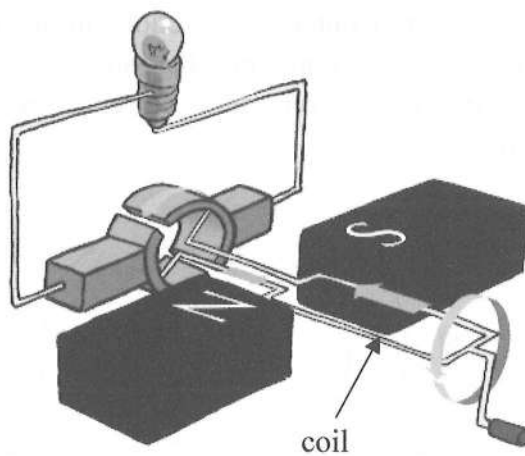


Fig. 6.2

Explain how this change affects the current output.

[2]

- (d) In a further experiment about electromagnetism, the students used a moving coil galvanometer to measure the current flowing through its coils.

Figure 6.3 shows a horizontal cross-section through the coil and the poles of the moving coil galvanometer. $\oplus$ represents the current moving into the plane of the diagram (away from you) and $\odot$ represents current moving out of the plane of the diagram (towards you).

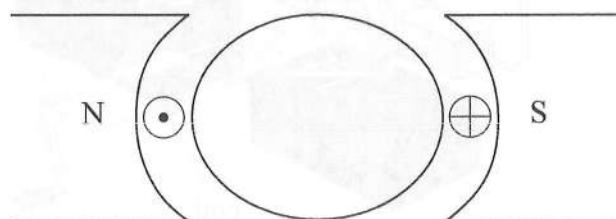


Fig. 6.3

- (i) State and explain the principle of operation of the moving coil galvanometer. [2]
- (ii) On **Fig. 6.3**, draw the magnetic field pattern between the pole pieces. [2]
- (iii) Draw long arrows to show the direction of the forces on the coil carrying current into and out of the plane of the diagram. [2]
- (iv) State the direction of the rotation of the coil. [1]
- (v) State **two** modifications that change the direction of rotation of the coil. [2]
- (vi) Give **two** applications in everyday life of the rotation of a coil caused by an electric current. [2]

TOTAL MARKS [20]



7. A construction worker uses the block and tackle pulley system as shown in **Fig. 7.1** to lift a concrete block off the ground onto an assembly belt using an effort force of 60 N.

The concrete block weighs 200 N.

The assembly belt is 0.75 meters above the ground.

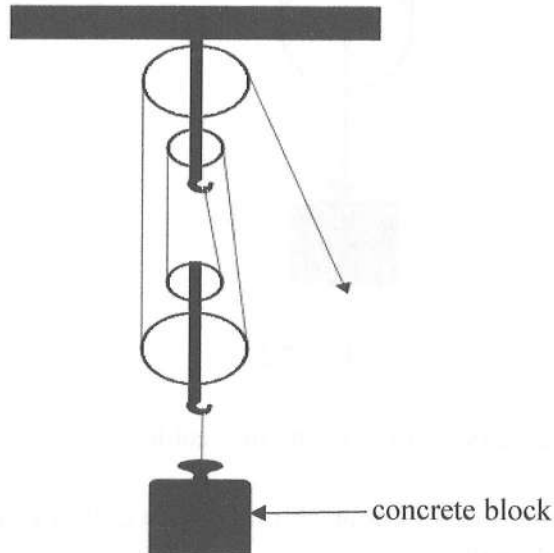


Fig. 7.1

- (a) Define the term velocity ratio. [2]
- (b) State the velocity ratio of the block and tackle pulley system shown in **Fig. 7.1** [1]
- (c) Calculate
- (i) the distance moved by the effort, in lifting the 200 N load through the height of 0.75 m. [2]
- (ii) the work done by the construction worker as the effort force moves through the distance calculated in (i). [2]
- (iii) the work done on the load as it is lifted through the height of 0.75 m. [3]
- (iv) the mechanical advantage of the block and tackle pulley system. [2]
- (v) the percentage efficiency of the block and tackle pulley system. [3]

- (d) Another worker tried to lift the same block using the moveable pulley shown in **Fig. 7.2**.

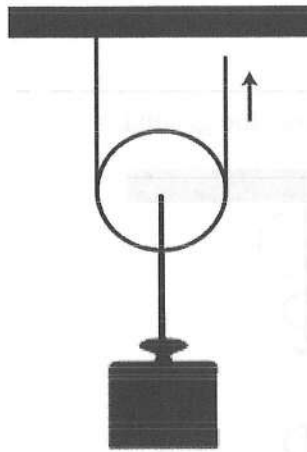


Fig. 7.2

- (i) State the velocity ratio of the moveable pulley. [1]
- (ii) Determine the minimum effort force required to move the 200 N block with a moveable pulley. [2]
- (iii) State one reason why the efficiency of a machine is never 100 %. [1]
- (iv) State one way the efficiency of machines can be increased. [1]

TOTAL MARKS [20]



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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.