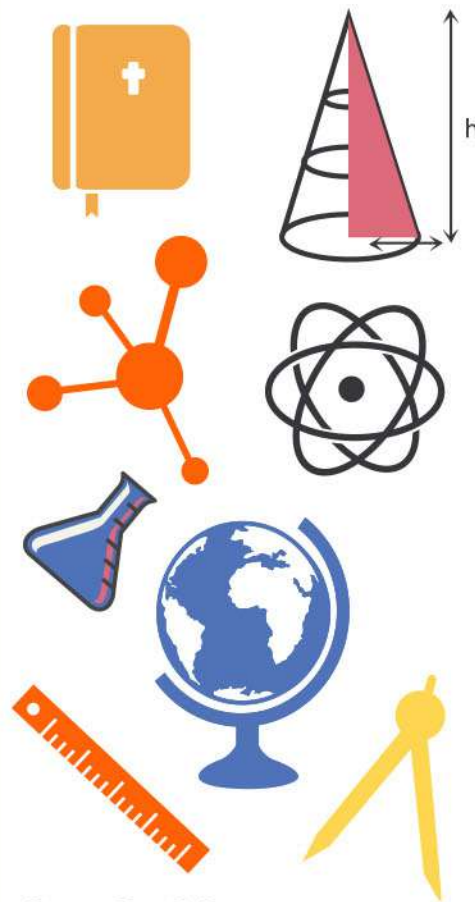
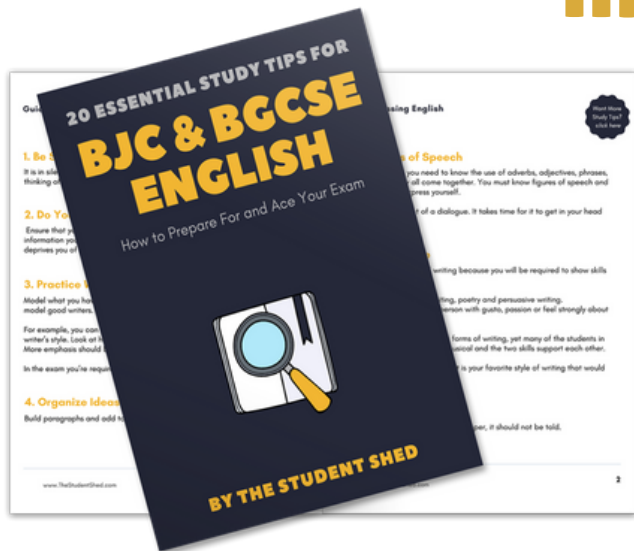


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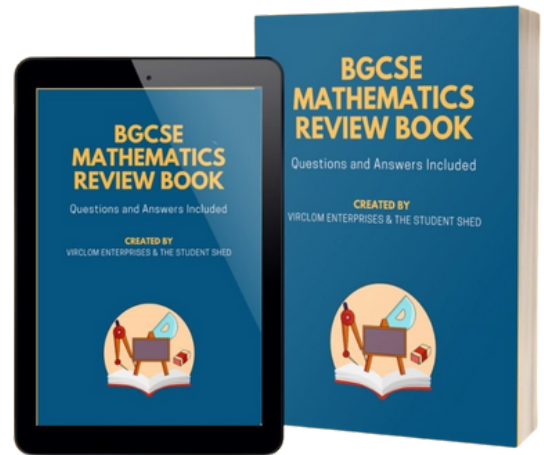


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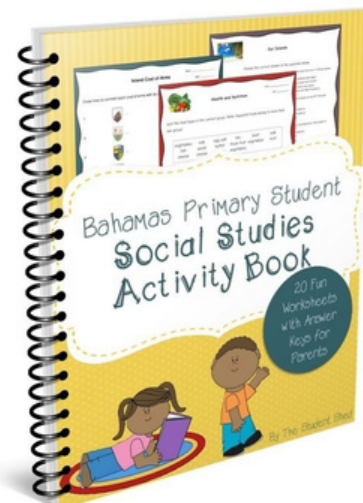
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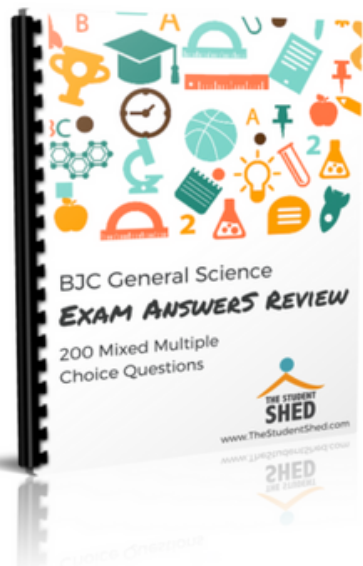
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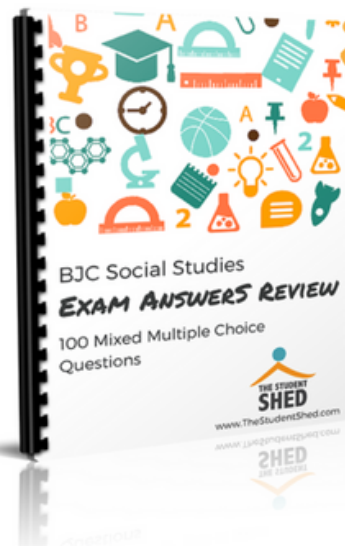
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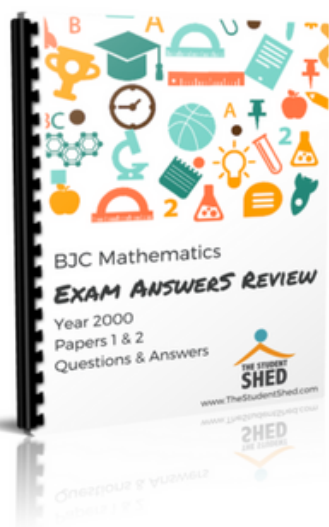
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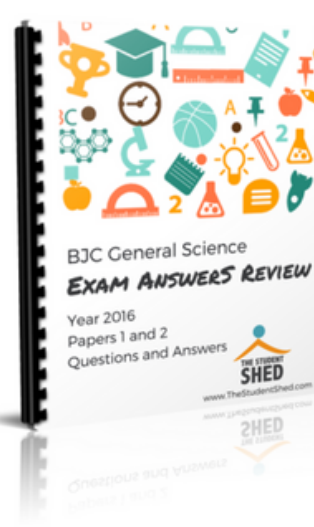
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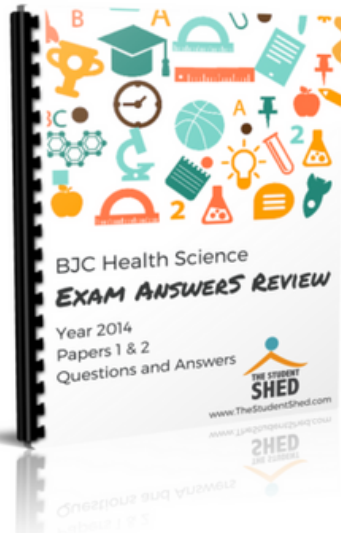
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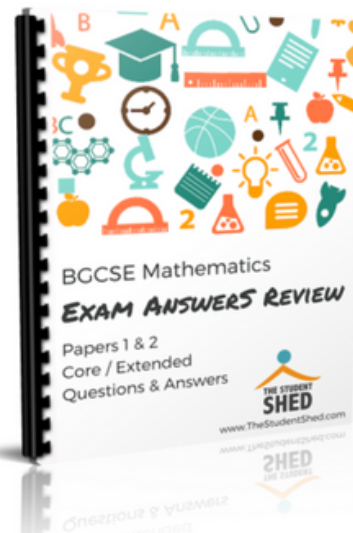
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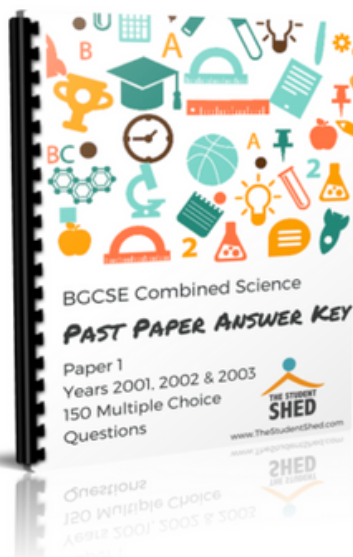
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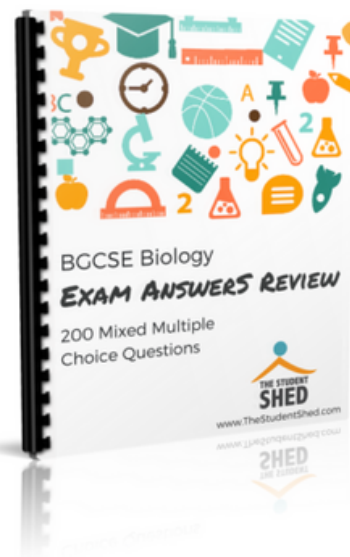
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# PHYSICS

PAPER 1 3117/1

Wednesday **30 MAY 2018** 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 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.**

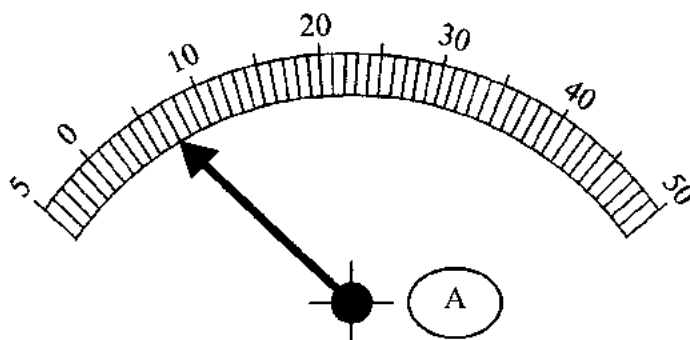
Rough work paper should not be handed in.



This question paper consists of 22 printed pages and 2 blank pages.



1. The diagram shows a reading on an ammeter.



What is the reading on the ammeter?

- A. 0.7 A
  - B. 1.2 A
  - C. 7.0 A
  - D. 12.0 A
2. An athlete completed a 400 m race in 47.6 seconds.

What is her average speed during the race?



- A. 8.00 m/s
  - B. 8.33 m/s
  - C. 8.40 m/s
  - D. 9.00 m/s
3. Which pair of quantities has the same units?

- A. acceleration and speed
- B. power and work
- C. weight and drag
- D. moment and momentum



4. To get to his office from the entrance of the building, a man has to walk up six flights of stairs. The height of each flight is 2.5 m and the man has a mass of 80 kg.

What is the approximate gain in the man's gravitational potential energy during the climb?

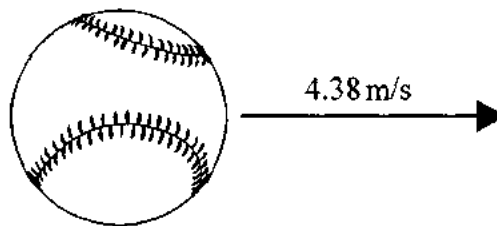
- A. 1 200 J
- B. 2 000 J
- C. 4 800 J
- D. 12 000 J

5. A rock is taken from the Earth to the Moon.

Which row shows what happens to the **mass** and **weight** of the rock on the moon compared to Earth?

|    | mass           | weight    |
|----|----------------|-----------|
| A. | decreases      | decreases |
| B. | increases      | increases |
| C. | stays the same | decreases |
| D. | stays the same | increases |

6. A baseball moving with a velocity of 43.8 m/s has a momentum of 6.22 kg m/s.



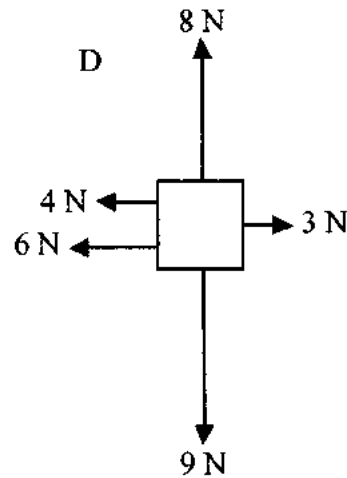
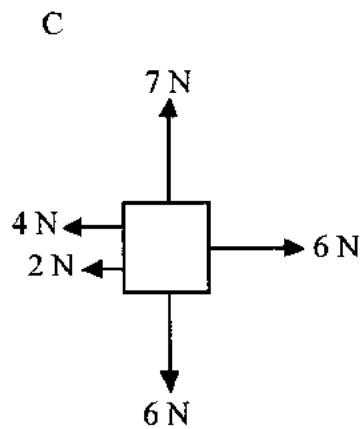
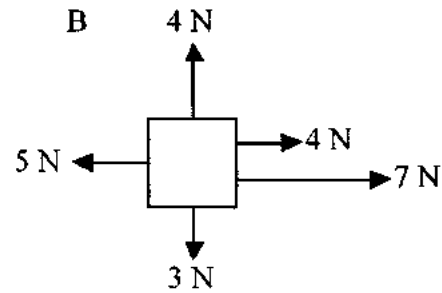
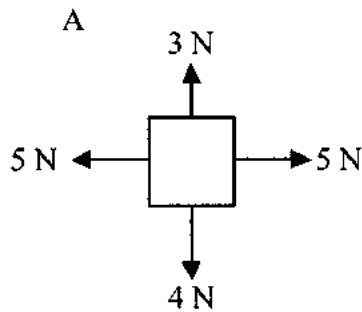
What is its mass?

- A. 0.142 kg
- B. 0.161 kg
- C. 3.831 kg
- D. 7.042 kg

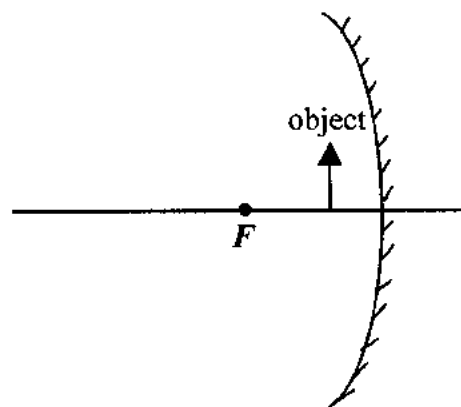


7. The diagrams show the forces acting on four objects A, B, C and D.

Which diagram shows the object that only has a net force of 1 N acting downwards?



8. Which of the descriptions best describe the image formed in a concave mirror, when an object is placed between the focal point and the mirror?



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

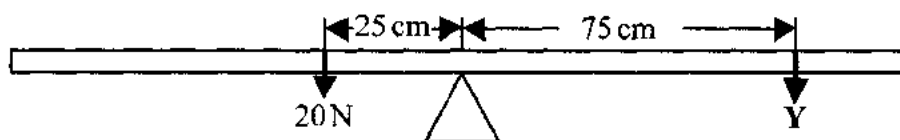


9. The diagram shows a submarine moving in the direction shown by the arrow.



What term is used for the force acting against the motion of the submarine?

- A. drag  
B. thrust  
C. upthrust  
D. weight
10. A student investigates the principle of moments by hanging two weights, a 20 N and an unknown weight Y from either ends of a ruler. The 20 N weight is hung 25 cm from the pivot and the unknown weight Y is placed 75 cm from the pivot. The weight of the ruler is negligible.

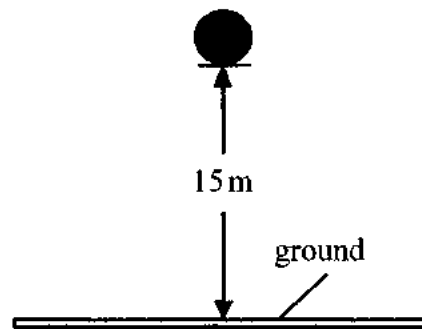


If the ruler is in equilibrium, what is the weight of Y?

- A. 0.6 N  
B. 2.5 N  
C. 5.9 N  
D. 6.7 N

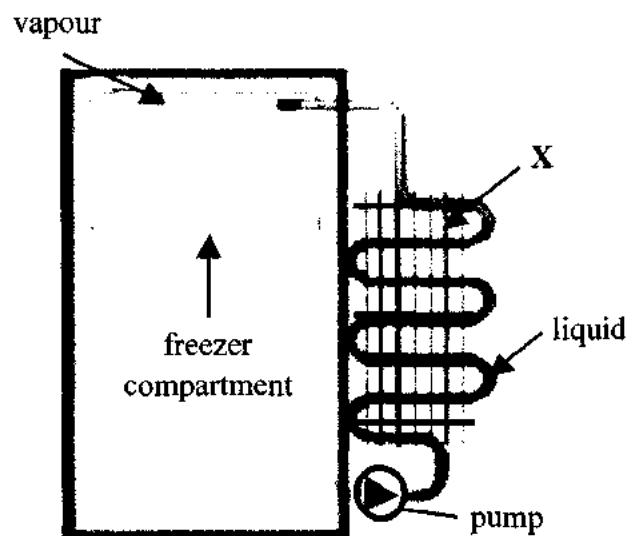


11. A ball of mass 4 kg is dropped from a height of 15 m to the ground.



If the energy lost in overcoming air resistance is negligible, what is the approximate velocity of the ball just before it strikes the ground?

- A. 10 m/s
  - B. 15 m/s
  - C. 17 m/s
  - D. 60 m/s
12. The diagram shows a simplified drawing of a refrigerator.

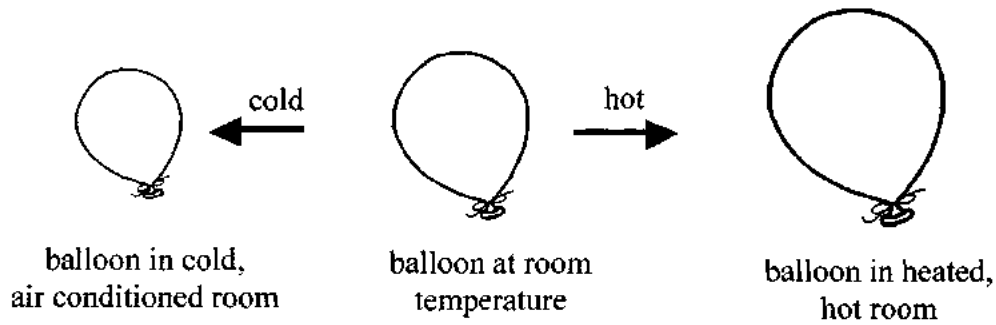


Which change of state is occurring at X?

- A. evaporation
- B. freezing
- C. condensation
- D. melting



13. The diagram represents the effect of heat and cold on the volume of air in a balloon.



Which law best explains what happens to the volume when the balloon is placed in a hot, heated room?

- A. Boyle's Law
  - B. Charles' Law
  - C. Pressure Law
  - D. Newton's First Law
14. Which diagram shows a machine using a 2nd class lever?

A.



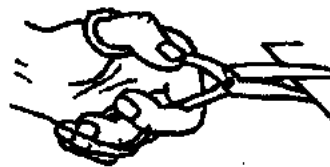
B.



C.



D.



15. Which of the following is a vector quantity?

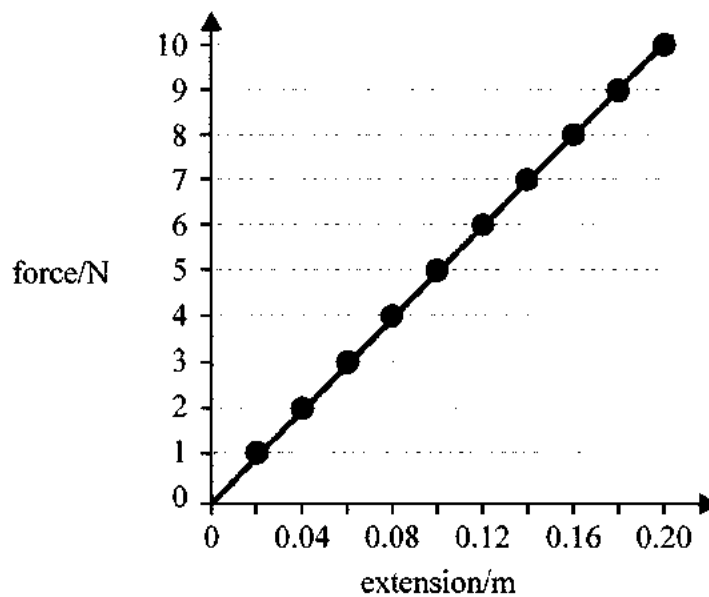
- A. time
- B. displacement
- C. speed
- D. volume

16. A family of five with a combined weight of 4000 N, stand in an elevator. Together they apply a pressure of 20 000 Pa on the floor.

What is the total area of contact on the floor of the elevator by the family?

- A.  $0.2\text{ m}^2$
- B.  $1.0\text{ m}^2$
- C.  $5.0\text{ m}^2$
- D.  $25.0\text{ m}^2$

17. A student applies various weights to a spring and records its extension for each weight. The results are plotted on the graph shown.



Which weight will cause a spring to stretch from 0.14 m to 0.20 m?

- A. 3 N
- B. 7 N
- C. 10 N
- D. 17 N



18. A student investigates the behaviour of light in four transparent materials A, B, C and D.

Which material has the highest optical density?

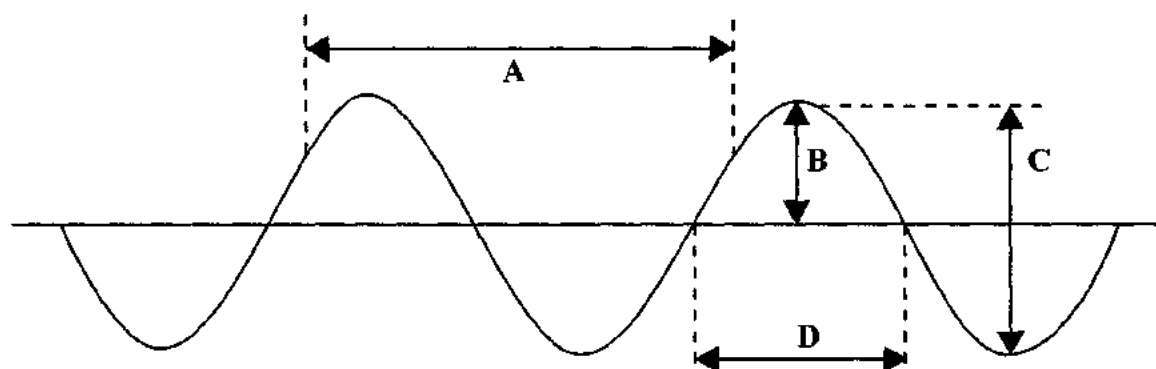
|    | angle of incidence/ $^{\circ}$ | angle of refraction/ $^{\circ}$ |
|----|--------------------------------|---------------------------------|
| A. | 40                             | 30                              |
| B. | 40                             | 25                              |
| C. | 40                             | 20                              |
| D. | 40                             | 10                              |

19. A performer is wearing a blue and red striped shirt on a stage. The lighting technician is using blue stage lights.

What is the colour of the blue and red striped shirt as seen by the audience?

- A. blue and black
- B. black and red
- C. blue and red
- D. solid blue

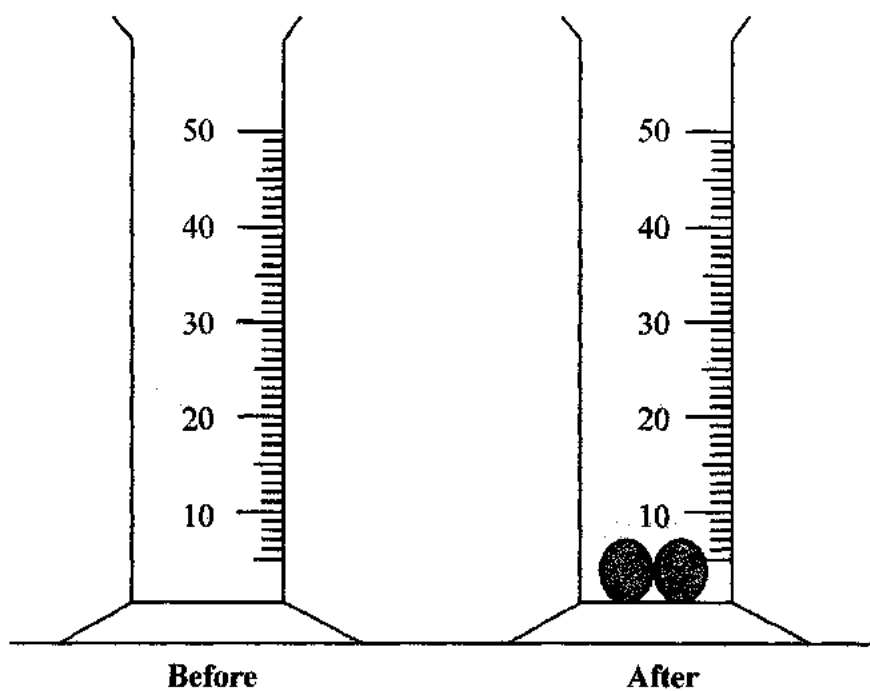
20. The diagram shows the parts of a wave labelled A, B, C and D.



Which two letters label the amplitude and wavelengths respectively?

- A. C and D
- B. B and A
- C. C and A
- D. B and D

21. Two identical stones with a total mass of 50 grams were placed in 30 cm<sup>3</sup> of water in a measuring cylinder. The water level increases to 40 cm<sup>3</sup>.



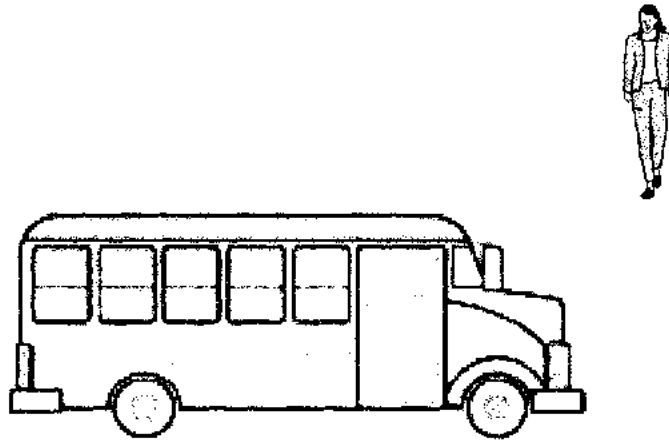
What is the density of the stones?

- A. 1.25 g/cm<sup>3</sup>
- B. 1.7 g/cm<sup>3</sup>
- C. 5.0 g/cm<sup>3</sup>
- D. 10 g/cm<sup>3</sup>



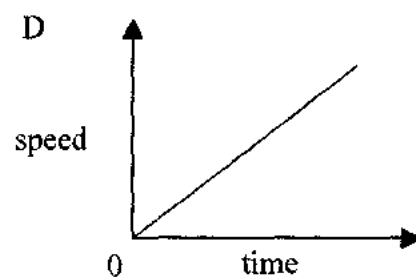
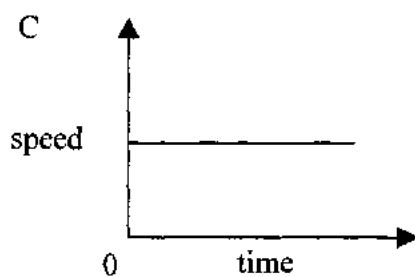
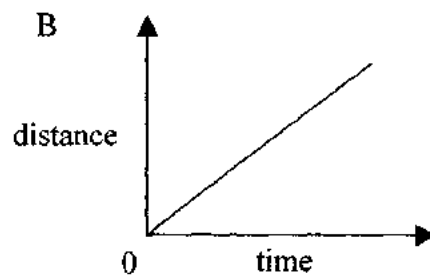
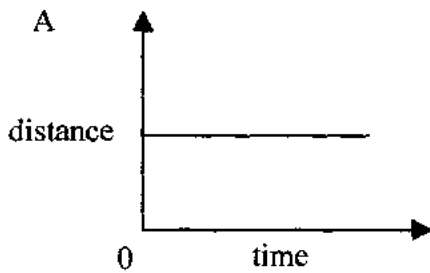


22. A woman is standing on the side of the road waiting for a bus to pass. The bus is 4 m long, and is travelling at a constant velocity of 6 m/s.

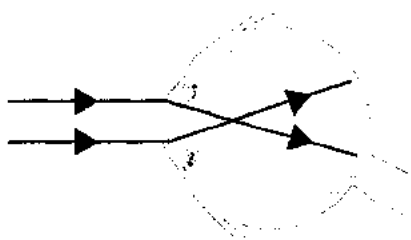


How long will the bus take to completely pass by her?

- A. 0.67 s  
B. 1.5 s  
C. 2.0 s  
D. 20.0 s
23. Which motion time graph shows an object at rest?



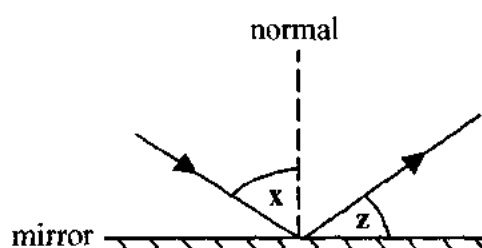
24. An eye defect is shown in the diagram.



Which term describes the defect shown and what type of lens should be used for its correction?

|    | eye defect      | corrective lens |
|----|-----------------|-----------------|
| A. | farsightedness  | concave         |
| B. | farsightedness  | convex          |
| C. | nearsightedness | concave         |
| D. | nearsightedness | convex          |

25. The diagram shows a light ray striking a plane mirror and reflecting off its surface.



What is the value of angle  $x$  if angle  $z$  is  $25^\circ$ ?

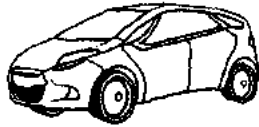
- A.  $25^\circ$
- B.  $35^\circ$
- C.  $50^\circ$
- D.  $65^\circ$



26. Which vehicle has the least momentum?

A

$$m = 500 \text{ kg}$$
$$v = 20 \text{ m/s}$$



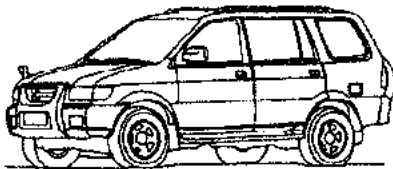
B

$$m = 600 \text{ kg}$$
$$v = 15 \text{ m/s}$$



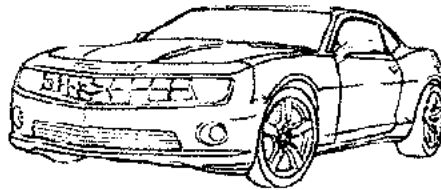
C

$$m = 2000 \text{ kg}$$
$$v = 10 \text{ m/s}$$



D

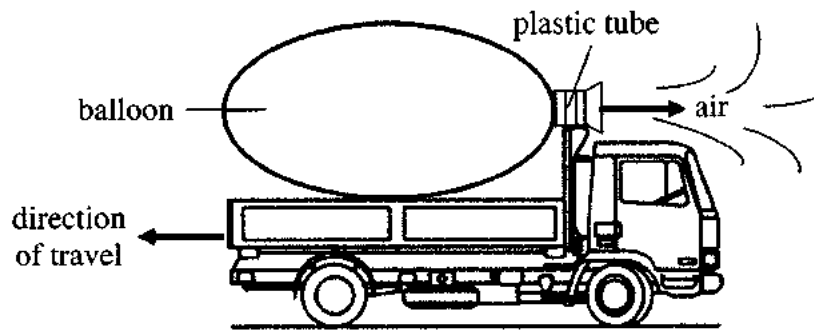
$$m = 5000 \text{ kg}$$
$$v = 5 \text{ m/s}$$



27. Which of the following is a magnetically soft material?

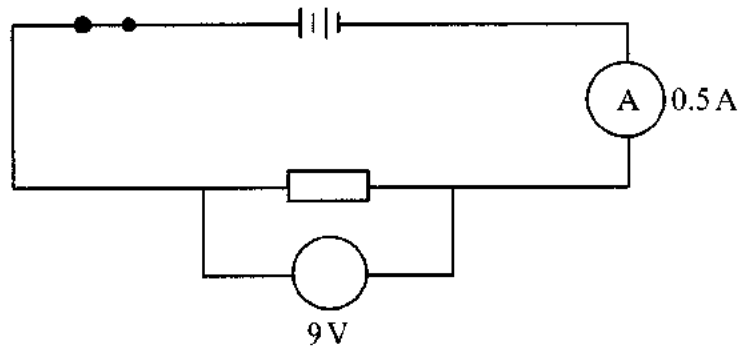
- A. aluminium
- B. iron
- C. steel
- D. zinc

28. An inflated balloon is attached to a toy truck as shown. The mouth of the balloon is opened so that the air is released. The toy truck starts to move in the opposite direction.



Which law of physics is illustrated by the moving toy truck?

- A. Hooke's Law
  - B. Ohm's Law
  - C. Boyle's Law
  - D. Newton's Third Law
29. When the voltage across a resistor is 9 V, the current through it is 0.5 A.



What is the resistance of the resistor used?

- A. 4.5  $\Omega$
- B. 4.5 W
- C. 18.0  $\Omega$
- D. 18.0 W

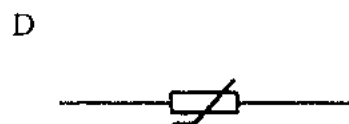
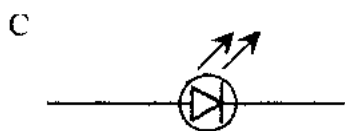
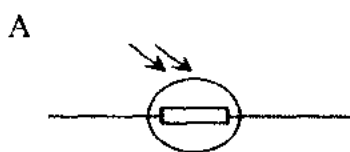


30. A 200 N crate is pushed through a horizontal distance of 3 m by a force of 10 N.

What is the work done?

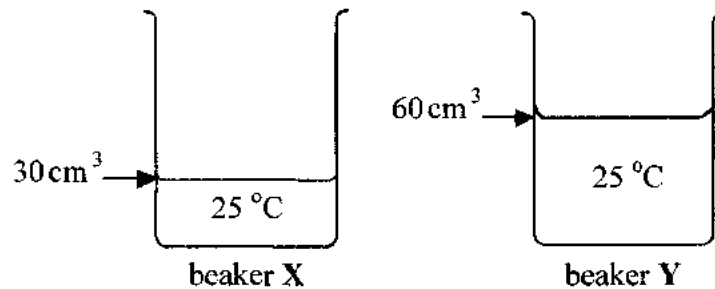
- A. 3.3 J
- B. 13 J
- C. 30 J
- D. 600 J

31. Four common circuit symbols are shown in the diagram.



Which symbol represents a thermistor?

32. The diagram shows two similar beakers, X and Y containing different volumes of water at the same temperature as shown. The temperature and volume of water in each beaker is labelled on the diagram.



Which row describes the average kinetic energy of the water molecules and a comparison of the thermal energy in each beakers?

|    | average kinetic energy | thermal energy      |
|----|------------------------|---------------------|
| A. | same for both          | greater in beaker X |
| B. | same for both          | greater in beaker Y |
| C. | greater in beaker X    | same for both       |
| D. | greater in beaker Y    | same for both       |

33. What is the frequency of a sound wave of wavelength of 10m and speed of 300 m/s?

- A. 0.003 Hz
- B. 3 Hz
- C. 30 Hz
- D. 3000 Hz

34. Which wave has the shortest wavelength?

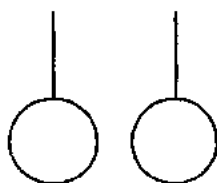
- A. infra-red
- B. radio
- C. ultra-violet
- D. x-rays

35. Which is a longitudinal wave?

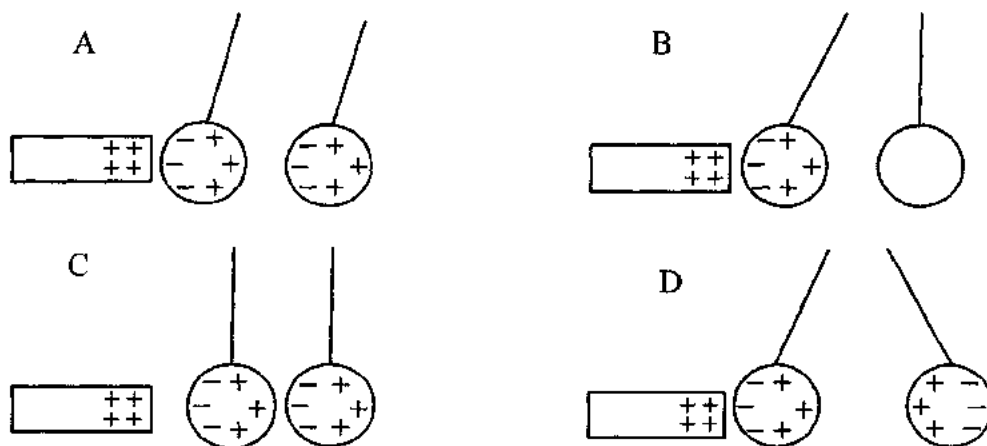
- A. light
- B. sound
- C. water waves
- D. x-rays



36. Two neutral metal spheres are suspended freely by a thin, cotton thread. The two spheres are close together but not touching.



A positively charged rod is brought close to one of the neutral metal spheres as shown in the diagram.



Which best represents what would occur?

37. The half-life of radioactive thorium-234 is 24 days.  
A sample contains 8 g of thorium-234.

How many days will it take for the sample to contain 1 g of thorium-234?

- A. 24
- B. 48
- C. 72
- D. 96



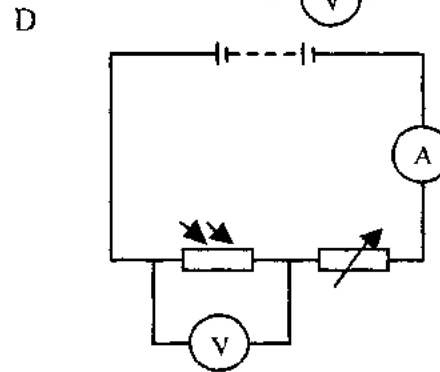
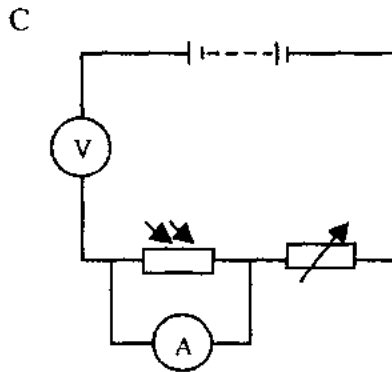
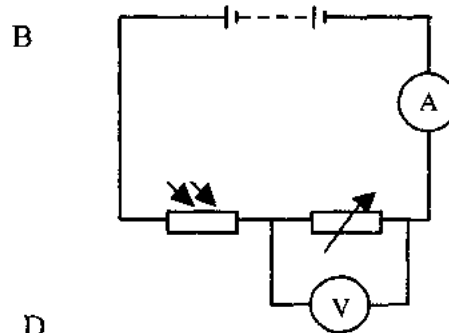
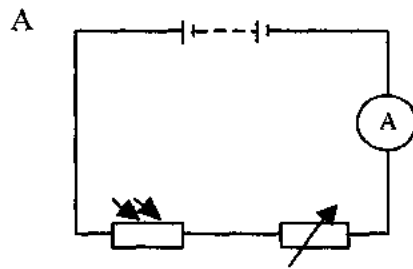
38. A radioactive tracer is a radioactive isotope that is injected into the body to investigate the function of an organ.

Which **two** properties best describe an isotope used as a tracer in this way?

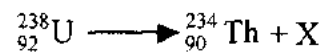
- A. a long half-life and an alpha emitter
  - B. a short half-life and a gamma emitter
  - C. a long half-life and a gamma emitter
  - D. a short half-life and an alpha emitter
39. What is the function of the control rods, in a nuclear fission reactor?
- A. to absorb neutrons
  - B. to cool the reactor
  - C. to slow down neutrons
  - D. to increase the number of neutrons produced
40. How many protons are in this nucleus  $^{238}_{92}\text{U}$ ?
- A. 92
  - B. 119
  - C. 146
  - D. 238
41. Which list show the types of radiation in order of increasing penetrative power?
- A. alpha, gamma, beta
  - B. alpha, beta, gamma
  - C. beta, alpha, gamma
  - D. gamma, beta, alpha



42. Which circuit should be used to measure the resistance of a LDR?



43. Uranium-92 decays into Thorium-90 as shown in the equation.

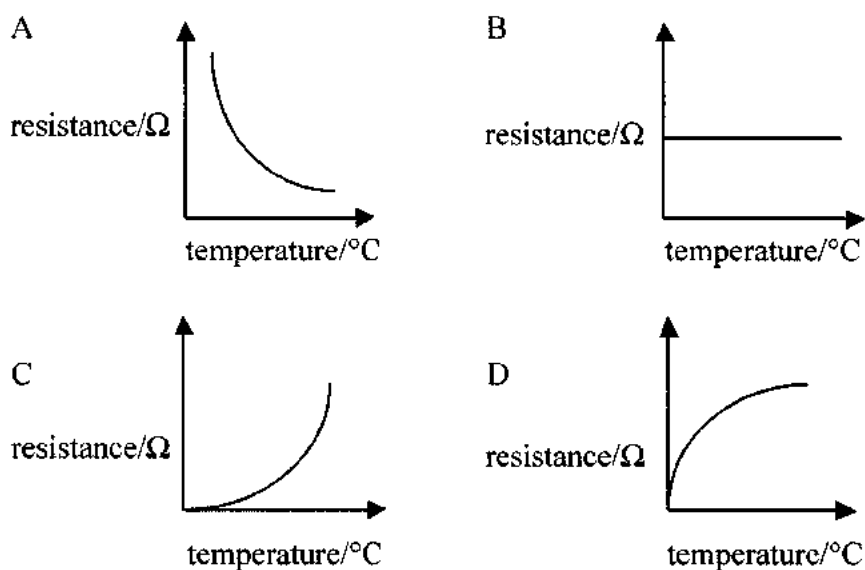


What is X?

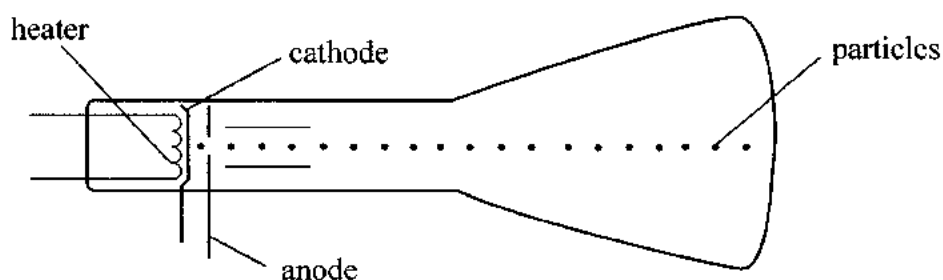
- A. an alpha particle
- B. a beta particle
- C. a gamma ray
- D. a neutron



44. Which graph shows how the resistance of a thermistor changes with temperature?



45. Particles are emitted by a heated cathode in a cathode-ray tube.



What are these particles called?

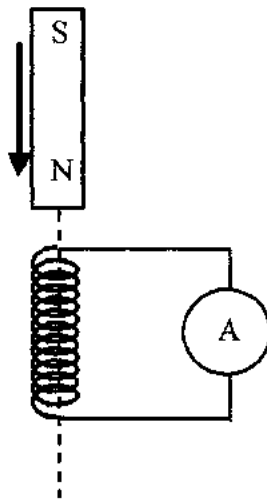
- A. atoms
  - B. electrons
  - C. neutrons
  - D. protons
46. Which row in the table is **TRUE** about the current and voltage in the secondary coil of a step-down transformer, compared to the primary coil?

|    | current   | voltage   |
|----|-----------|-----------|
| A. | decreases | increases |
| B. | decreases | increases |
| C. | increases | decreases |
| D. | decreases | decreases |

47. A plastic rod acquired a positive charge after rubbing it with dry cloth.

How did the rod acquire this positive charge?

- A. gained electrons
  - B. lost electrons
  - C. gained protons
  - D. lost protons
48. When a magnet is moved into a solenoid, in the direction shown in the diagram, a voltage is induced and the zero centre galvanometer's needle move to the left.



What change can be done to move the galvanometer needle to the right?

- A. holding the magnet stationary in the solenoid
  - B. flipping the poles and moving the magnet in the same direction
  - C. flipping the poles and moving the magnet in the opposite direction
  - D. pushing the north pole in the same direction but faster
49. Where does nuclear fusion occur?
- A. in a hydroelectric power plant
  - B. in a nuclear power plant
  - C. in a coal burning power plant
  - D. in the core of the sun



50. Which electrical device is placed on street lamps to switch them on automatically at night?
- A. a light emitting diode
  - B. a thermistor
  - C. a light dependent resistor
  - D. a variable resistor



| School Number  | Candidate Number |  |  |  |  |  |  |  |  |
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# PHYSICS

PAPER 2 3117/2

Wednesday

**30 MAY 2018**

1:30 P.M.–3:00 P.M.

Additional materials:

None

|  |
|--|
| <b>MINISTRY OF EDUCATION<br/>NATIONAL EXAMINATIONS</b> |
|--|

BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION

**INSTRUCTIONS AND INFORMATION FOR 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** questions in 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 [ ].

---

**This question paper consists of 16 printed pages.**

1. This question is about common physical quantities used in Physics.

- (a) Complete the following table for physical quantities, the name of the SI unit and the symbol for the SI units.

| physical quantity | name of SI derived unit   | symbol of SI unit |
|-------------------|---------------------------|-------------------|
| speed             |                           | m/s               |
|                   | kilogram metre per second |                   |
|                   |                           | K                 |

[5]

- (b) Explain the difference between **mass** and **weight**.

---

---

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[2]

- (c) The surface gravity of Mars is 3.7 N/kg. On Earth it is 9.81 N/kg.  
Beagle 2, the unsuccessful British space probe, had a mass of 30 kg.

Calculate the weight of beagle 2

- (i) on the Earth before launch;

[2]

- (ii) on the surface of Mars.

[1]

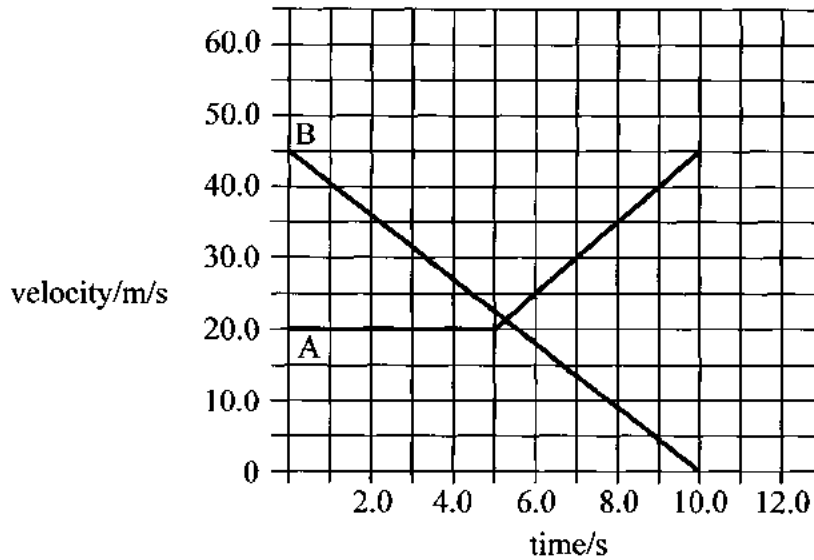
**TOTAL MARKS [10]**





2. This question is about linear motion.

The velocity-time graphs of two cars, **A** and **B**, are shown in Fig. 2.1.



**Fig. 2.1**

- (a) Describe the motion of **car A**

- (i) between 0 and 5 seconds;

\_\_\_\_\_

- (ii) between 5 seconds and 10 seconds.

\_\_\_\_\_ [2]

- (b) Describe the motion of **car B** during its journey.

\_\_\_\_\_ [1]

- (c) State the time at which both cars are travelling at the same velocity.

\_\_\_\_\_ [1]

- (d) Calculate the rate at which the velocity of **car B** changes during its 10 second journey.

[2]

- (e) Calculate the total distance covered by **car A** during its entire journey.

[3]

- (f) Describe an action taken by the driver of **car B**, which could have resulted in the change in the car's velocity.

[1]

**TOTAL MARKS [10]**



3. This question is about simple machines and moments.

Fig. 3.1 shows an example of a simple machine which can be used to raise the lid of a can of paint.

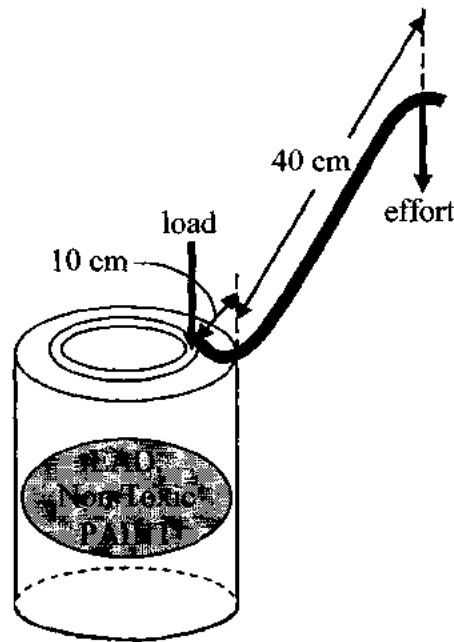


Fig 3.1

- (a) (i) Give the class and name of simple machine shown.

class \_\_\_\_\_ [1]

name \_\_\_\_\_ [1]

- (ii) Give a reason why this simple machine is classed as given in (a) (i).

\_\_\_\_\_  
\_\_\_\_\_ [2]

- (b) (i) State the principle of moments.

\_\_\_\_\_  
\_\_\_\_\_ [1]

- (ii) The force of friction between the lid and the can is 25 N.

Calculate the minimum effort needed to overcome this frictional force, using the principle of moments.

[3]

- (iii) If the lid of the paint can weighs 2 N, state what effect, if any, this will have on the minimum force calculated in (a) (i). Please explain your answer.

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[2]

**TOTAL MARKS [10]**

4. This question is about sound waves.

A student uses the cathode ray oscilloscope, shown in Fig. 4.1 to view the waveform of sound coming into a microphone from a guitar.

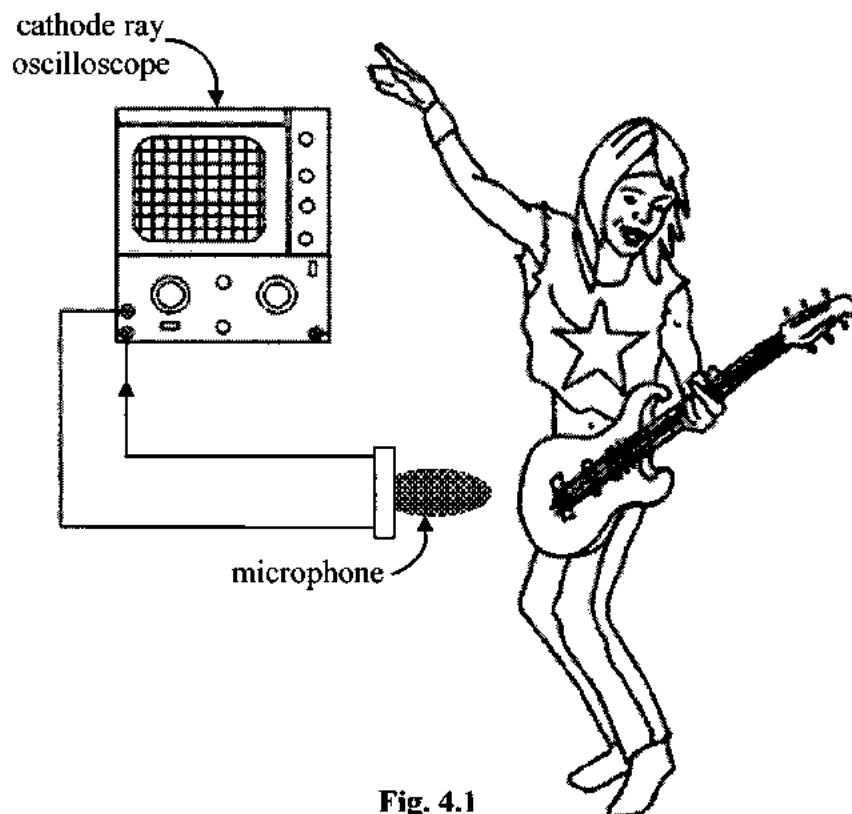


Fig. 4.1

Fig. 4.2 shows the waveform displayed on the CRO when one of the guitar's strings is plucked.

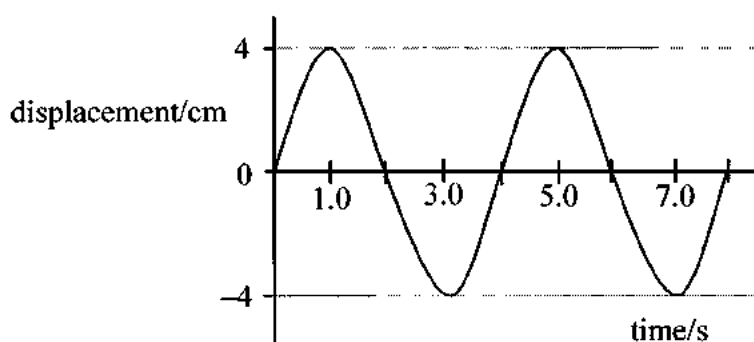


Fig. 4.2

- (a) (i) Find the period of the wave.

[2]

- (ii) Using your answer in (a) (i), calculate the frequency of the wave. Use the equation:  $\text{frequency} = \frac{1}{\text{period}}$

[2]

- (iii) Given that the velocity of sound in air is 330 m/s, calculate the wavelength of the waves.

[3]

- (iv) State the amplitude of the wave.

\_\_\_\_\_ [1]

- (b) State a way to increase the amplitude of the sound reaching the microphone.

\_\_\_\_\_  
\_\_\_\_\_ [1]

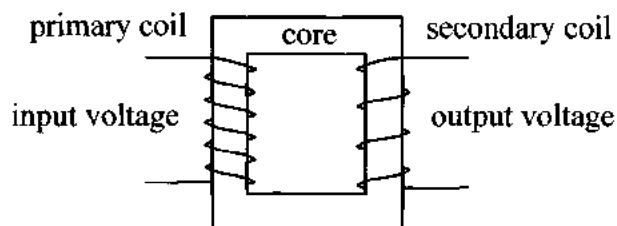
- (c) Explain a use of high frequency sound waves which are above the range of human hearing.

\_\_\_\_\_  
\_\_\_\_\_ [1]

**TOTAL MARKS [10]**



5. The diagram in Fig. 5.1 shows a simple transformer.



**Fig. 5.1**

- (a) Name a suitable material for the core and explain why this material is suitable.

name of material \_\_\_\_\_

explanation \_\_\_\_\_

[2]

- (b) An alternating current used in the input induces an output voltage.

- (i) Explain the term alternating current.

\_\_\_\_\_

[1]

- (ii) Describe how an alternating current in the primary coil induces a voltage in the secondary coil.

\_\_\_\_\_

\_\_\_\_\_

[2]



- (c) (i) A transformer is being used to change the voltage from 240 V to 12 V.  
The primary coil of this transformer has 2000 turns.

Find the number of turns that are needed on the secondary coil.

[2]

- (ii) Using your knowledge of electrical power and the potential differences given in part (c) (i) calculate the current transmitted to an electrical clock, connected to the secondary coil when the current on the primary coil is 15 mA.

[3]

**TOTAL MARKS [10]**



6. This question is about density, the kinetic theory and changes of state.

Fig. 6.1 shows the cooling curve of wax as it is cooled from 140 °C to 30 °C.

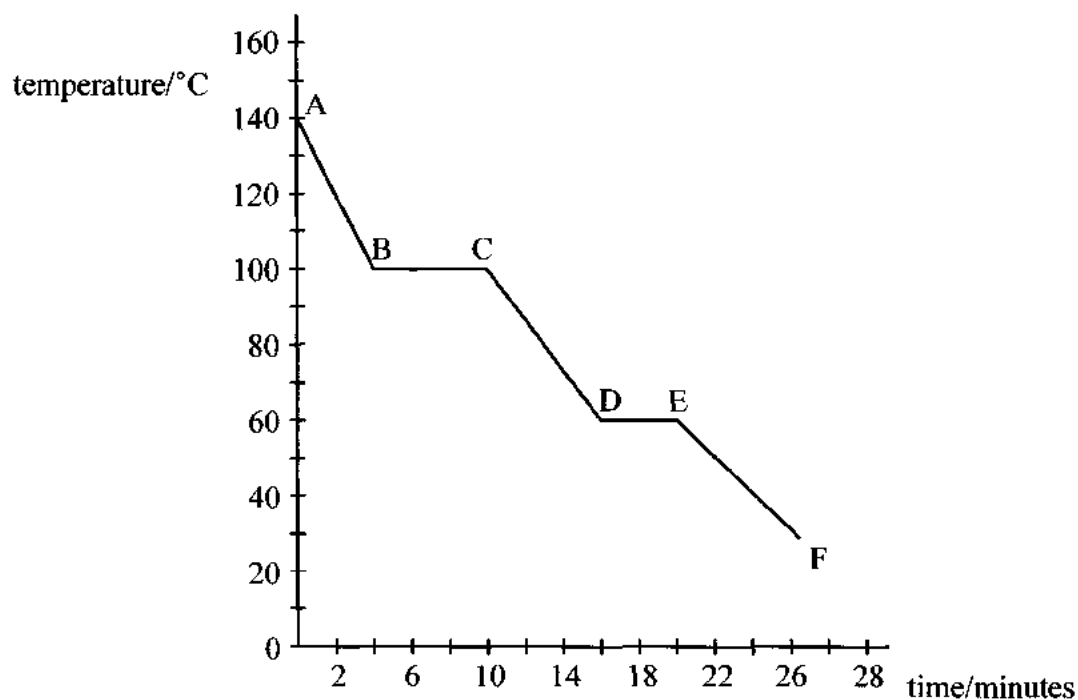


Fig. 6.1

- (a) State and explain, in terms of the movement of particles why the temperature of the wax remains constant from B to C and from D to E.

**B to C** \_\_\_\_\_  
 \_\_\_\_\_

**D to E** \_\_\_\_\_  
 \_\_\_\_\_ [2]

- (b) (i) Name the process occurring from D to E.

\_\_\_\_\_ [1]

- (ii) Name the state of the wax from E to F.

\_\_\_\_\_ [1]

- (c) At the beginning of the cooling process, the external pressure is increased to a greater.

State what would happen to the temperature at which the process happening between **B** and **C** occurs.

\_\_\_\_\_ [1]

- (d) The table shows the densities of two liquids.

| type of liquid | density ( $\text{g/cm}^3$ ) |
|----------------|-----------------------------|
| honey          | 1.4                         |
| mineral oil    | 0.8                         |

- (i) A flask contains  $250 \text{ cm}^3$  of honey. If the mass of the flask and honey is 586 g, calculate the mass of the flask.

[3]

- (ii) When the mass of the same flask containing  $250 \text{ cm}^3$  of mineral oil is measured, it is less than 586 g. Explain why.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [2]

**TOTAL MARKS [10]**



7. This question is about a light dependent resistor (LDR).

- (a) The resistance of a light dependent resistor (LDR) depends on the intensity of light shining on it.

Suggest one practical uses for a LDR using this property.

\_\_\_\_\_ [1]

- (b) Fig. 7.1 shows the apparatus that can be used to investigate the relationship between resistance and light intensity of a LDR.

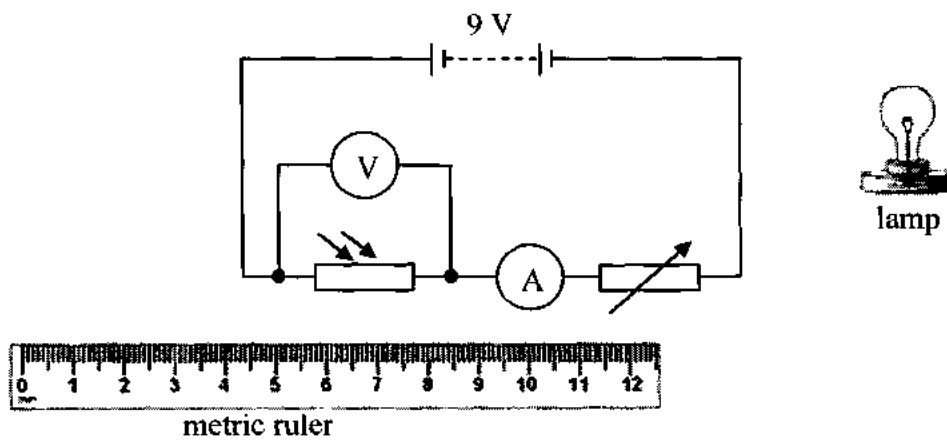


Fig. 7.1

- (i) Explain how the resistance of the LDR can be calculated using the apparatus in Fig. 7.1.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [2]

- (ii) When the lamp was placed 70 cm from the LDR the resistance in the variable resistor was  $60\ \Omega$ . The current in the circuit was 100 mA.

Calculate the resistance of the LDR.

[3]

- (c) (i) If the lamp is then placed 30 cm from the LDR and the variable resistor remains set at  $60\ \Omega$ , the current in the circuit increases to 120 mA.

Explain the increase in current.

\_\_\_\_\_  
\_\_\_\_\_ [2]

- (ii) The variable resistor is increased to  $80\ \Omega$ .

State and explain the effect this will have on the current in the circuit.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ [2]

**TOTAL MARKS [10]**



8. This question is about radioactivity.

(a) (i) List **two** characteristics of isotopes.

1 \_\_\_\_\_  
\_\_\_\_\_ [1]

2 \_\_\_\_\_  
\_\_\_\_\_ [1]

(ii) Explain what is meant by half-life.

\_\_\_\_\_  
\_\_\_\_\_ [1]

(b) Fig. 8.1 is a graph that shows how the count-rate measured by a detector changes with time when it is placed close to a radioactive isotope. The detector shows an average reading of 25 counts/minute when the radioactive isotope is removed from the experiment.

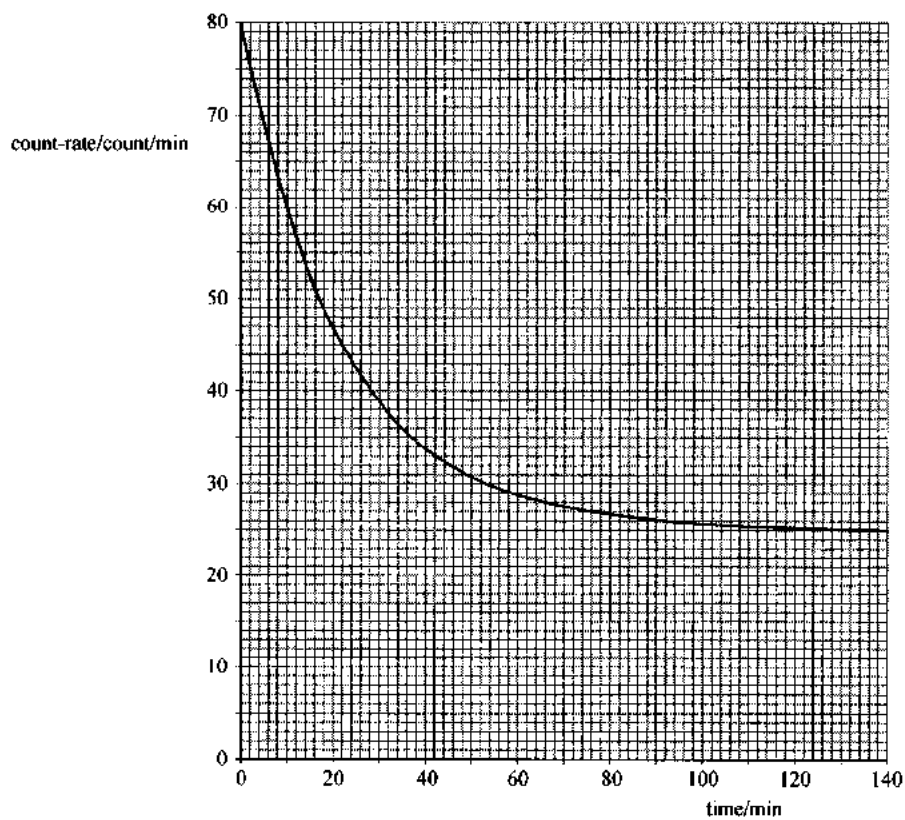


Fig. 8.1

(i) On Fig. 8.1, sketch the curve that might be obtained for a source with a shorter half-life. [2]

(ii) At zero minutes, the measured count-rate of the source and background together is 80 counts/minute.

Calculate the count-rate due to the source alone.

[1]

(iii) State the time that the radiation detected was 50 counts/min.

[1]

(iv) Use the graph to find the half-life of the radioactive source.

[2]

(v) Suggest a reason why the count rate on the graph does not drop below the 25 count/minute level.

[1]

**TOTAL MARKS [10]**



|                      |                  |
|----------------------|------------------|
| School Number        | Candidate Number |
| <div></div>          | <div></div>      |
| Surname and Initials |                  |

# PHYSICS

PAPER 3 3117/3

Thursday **7 JUNE 2018** 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 [ ].

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This question paper consists of 16 printed pages and 4 lined pages.



## LIST OF FORMULAE

$$\text{weight} = \text{mass} \times \text{gravitational field strength}$$

$$\text{force} = \text{mass} \times \text{acceleration}$$

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

$$\text{pressure due to a liquid} = \text{depth} \times \text{density} \times g$$

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

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

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

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

$$\text{ideal gas equation}$$

$$\text{Charles' law equation}$$

$$\text{kinetic energy} = \frac{1}{2} \text{ mass} \times \text{speed}^2$$

$$\text{change in gravitational potential energy} = \text{weight} \times \text{change in height}$$

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

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

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

$$\text{wave speed} = \text{frequency} \times \text{wavelength}$$

$$\text{energy} = \text{mass} \times \text{specific heat capacity} \times \text{temperature change}$$

$$\text{charge} = \text{current} \times \text{time}$$

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

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

$$\text{effective resistance of resistors in series}$$

$$\text{effective resistance of resistors in parallel}$$

$$\text{power} = \text{potential difference} \times \text{current}$$

$$\text{refractive index of a medium}$$

$$\text{magnification} = \frac{\text{image distance (v)}}{\text{object distance (u)}}$$

$$\text{weight} = mg$$

$$F = ma$$

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

$$p = hDg$$

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

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

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

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

$$\frac{p_1 V_1}{T_1} = \frac{p_2 V_2}{T_2}$$

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

$$\text{kinetic energy} = \frac{1}{2} mv^2$$

$$v = f\lambda$$

$$W = mc\Delta\theta$$

$$Q = It$$

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

$$\frac{V_p}{n_p} = \frac{V_s}{n_s}$$

$$R = R_1 + R_2$$

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

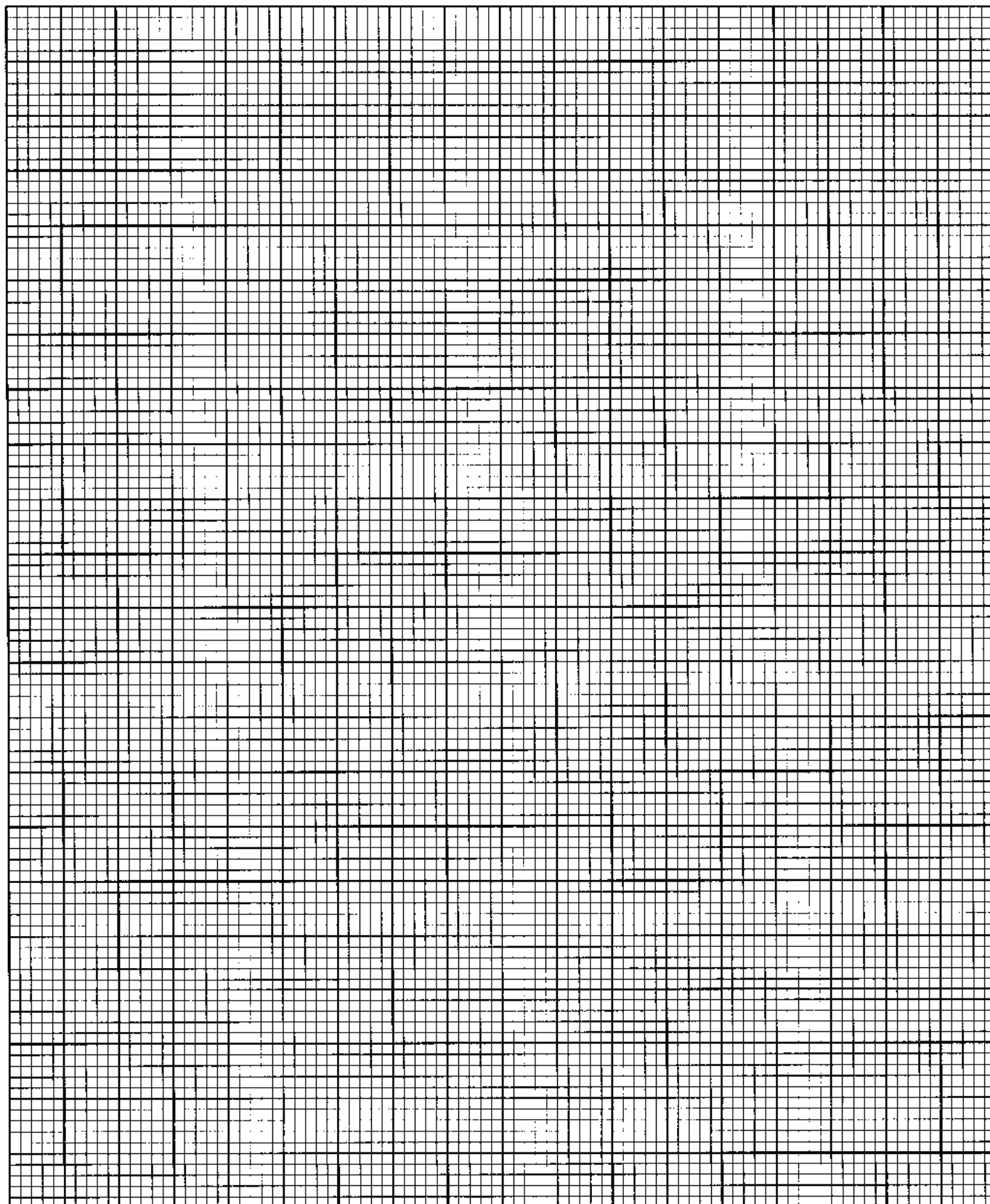
$$P = VI$$

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

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

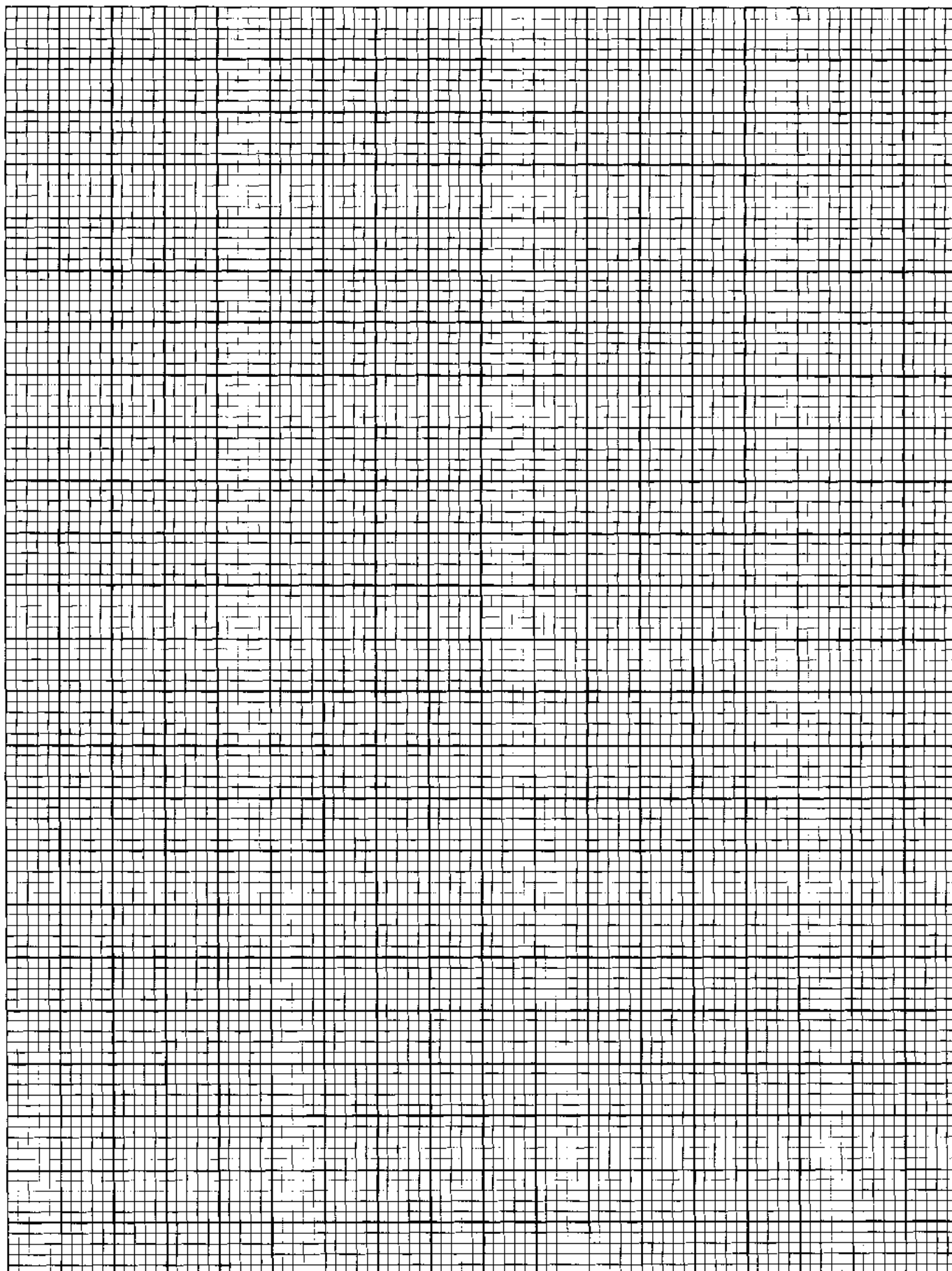
**BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION  
EXAMINATION**

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



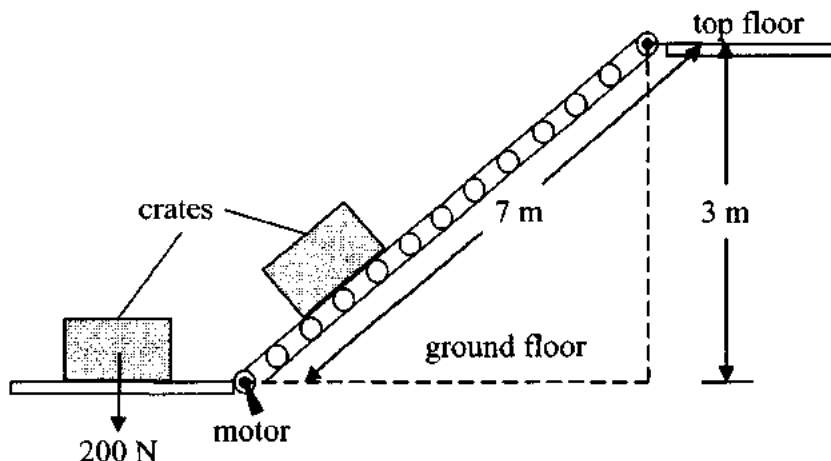
**EXAMINATION**

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



**Section A**  
Answer **ALL** questions

1. A worker uses a conveyor belt equipped with motors, to move crates from the ground floor to the top floor of a factory. Fig. 1.1 shows the conveyor belt in use. Each crate weighs 200 N.



**Fig. 1.1**

- (a) (i) Calculate the work done by a worker lifting a 200 N crate from the ground floor to the top floor.

[2]

- (ii) The motor works at 110 V with a current of 0.2 A. It takes the motor 1.0 minute to move each crate to the top floor.

Calculate the electrical energy transferred by the motor in 1.0 minute.

[3]

- (b) Suggest **TWO** reasons why your answer in part (a) (i) is less than your answer in part (a) (ii).

1. \_\_\_\_\_

2. \_\_\_\_\_ [2]

- (c) Calculate the % efficiency of the motor.

[2]

- (d) Suggest **ONE** modification to the motor or conveyor belt to ensure that the crate reaches the top floor in a shorter time.

[1]

**TOTAL MARKS [10]**

2. Strontium-89 is a radioactive isotope that emits beta radiation with a half-life of 50 days.

- (a) Give **TWO** reasons why this isotope is injected into the body instead of other isotopes for the long term treatment of cancer.

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[2]

- (b) Radioactive isotopes, such as carbon-14 are used to date archeological objects. This technique is called radiocarbon dating.

Explain how carbon-14 is used to date archaeological materials.

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[2]

- (c) A Geiger-Muller (GM) tube connected to a counter can be used to detect and count nuclear radiation. A cross section of a GM tube is shown in Fig. 2.1.

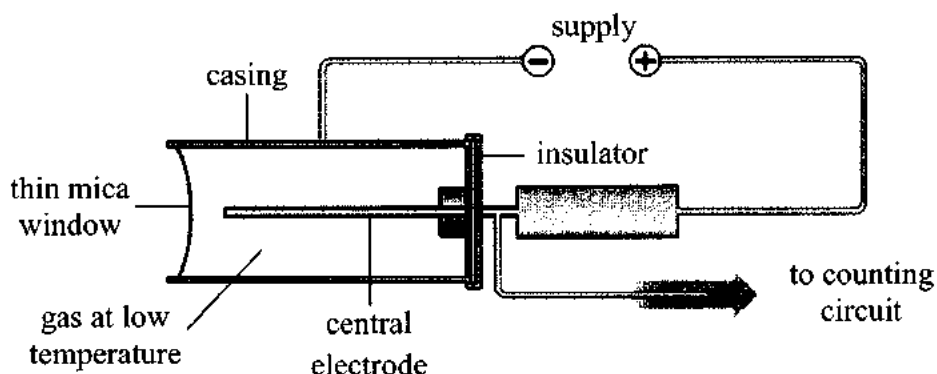


Fig. 2.1

Explain how a GM tube works to detect nuclear radiation.

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[3]

- (d) Four nuclides are shown.



- (i) One of the symbols represents the parent nuclide for an  $\alpha$  decay to another of the nuclides in the list.

Give the symbol for this parent nuclide.

\_\_\_\_\_ [1]

- (ii) Write out the decay equation representing the decay of the parent nuclide mentioned in (d) (i).

[1]

- (iii) From one of the nuclides shown name the daughter nuclide which could be produced by the emission of a  $\beta$ -particle.

\_\_\_\_\_ [1]

**TOTAL MARKS [10]**

3. This question is about work, energy and power.

Fig. 3.1 shows a man pushing a cart with a constant force of 26 N at an angle of  $50^\circ$ .

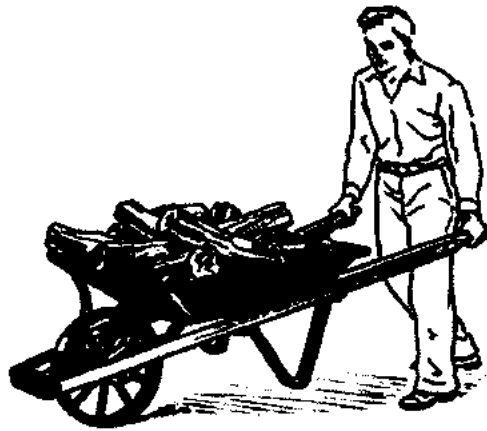


Fig. 3.1

- (a) (i) Calculate the horizontal component of the force exerted by the man pushing the cart.

[2]

- (ii) The man pushes the cart a distance of 5 m along a horizontal surface.

Calculate the work done by the man in pushing the cart

[2]

- (iii) There is a constant horizontal frictional force of 6 N acting on the wheels of the cart.

Calculate the magnitude and direction of the resultant force.

[1]



- (b) (i) If the cart's mass is 20 kg and is lifted by the man onto a ledge 1.2 m high.  
Determine the gain in potential energy of the cart if gravity is 9.81 N/kg.

[2]

- (ii) The cart accidentally falls 1.2 m vertically, from the ledge to the ground.  
Calculate the cart's velocity just before it hits the ground. Neglect drag.

[3]

**TOTAL MARKS [10]**

4. This question is about electrical circuits.

Fig. 4.1 shows a low-voltage circuit.

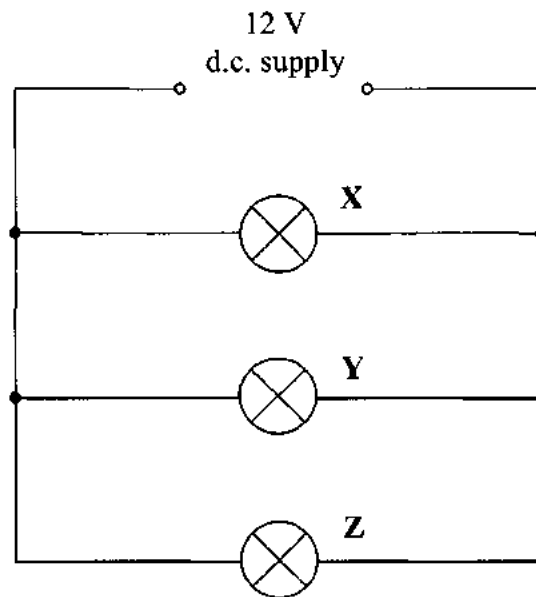


Fig. 4.1

- (a) On Fig. 4.1, indicate with the circuit symbol a point in the circuit where a switch could be placed that would turn off lamps Y and Z at the same time but would leave lamp X still lit. [2]
- (b) (i) Draw the circuit symbol for a component that would vary the brightness of lamp X. [1]
- (ii) On Fig. 4.1, mark with the letter R where this component should be placed. [1]
- (c) The current in lamp Z is 3.0 A. Calculate the resistance of this lamp.

[2]

(d) The lamp **Y** is removed.

(i) Explain why lamps **X** and **Z** still work normally.

\_\_\_\_\_ [2]  
\_\_\_\_\_

(ii) The current in lamp **X** is 1.0 A. Calculate the current supplied by the battery with lamp **Y** removed.

[2]

**TOTAL MARKS [10]**

### SECTION B

Answer any **TWO** questions from this section

5. This question is about specific heat capacity.

- (a) Define the term **specific heat capacity**. [2]

A student wishes to determine the specific heat capacity of cooking oil using an electrical immersion heater.

- (b) Describe an appropriate experiment to determine the specific heat capacity of the cooking oil. Include
- (i) the materials/apparatus needed;
  - (ii) an outline of the procedure to be followed;
  - (iii) any measurements that should be taken;
  - (iv) how these measurements can be used to determine the specific heat capacity of the oil. [8]
- (c) Diagram 1 and diagram 2 show the apparatus used to determine the specific heat capacity of zinc.

In Fig 5.1a, a 200 g sample of zinc is heated in boiling water at 100 °C.

– The Zn sample is quickly transferred to a calorimeter containing 150 g water at an initial temperature of 25 °C

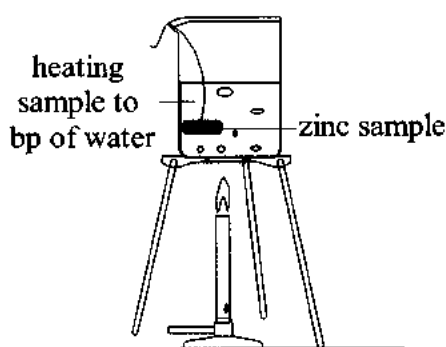


diagram 1

Fig. 5.1a

In Fig 5.1b, the mixture is stirred until the highest temperature reached is 30 °C.

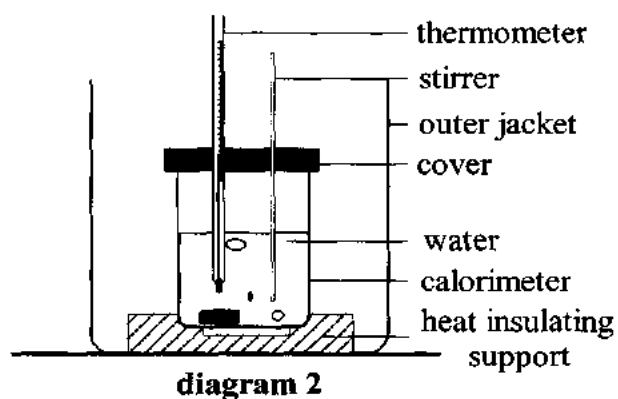


Fig. 5.1b

- (i) The specific heat capacity of water as 4.2 J/g °C.

Calculate the quantity of heat, in joules, absorbed by the 150 g of water after the zinc was placed in it. [3]

- (ii) Assuming all of the heat absorbed by the zinc when heated in the boiling water was transferred to the 150 g water.

Calculate the specific heat capacity of the zinc. [4]

- (iii) State the function of the outer jacket in **diagram 2**. [1]

- (d) The actual value of the specific heat capacity of zinc is 0.339 J/g °C.

Explain why your result, calculated in (c) (ii) is different from the actual value. [2]

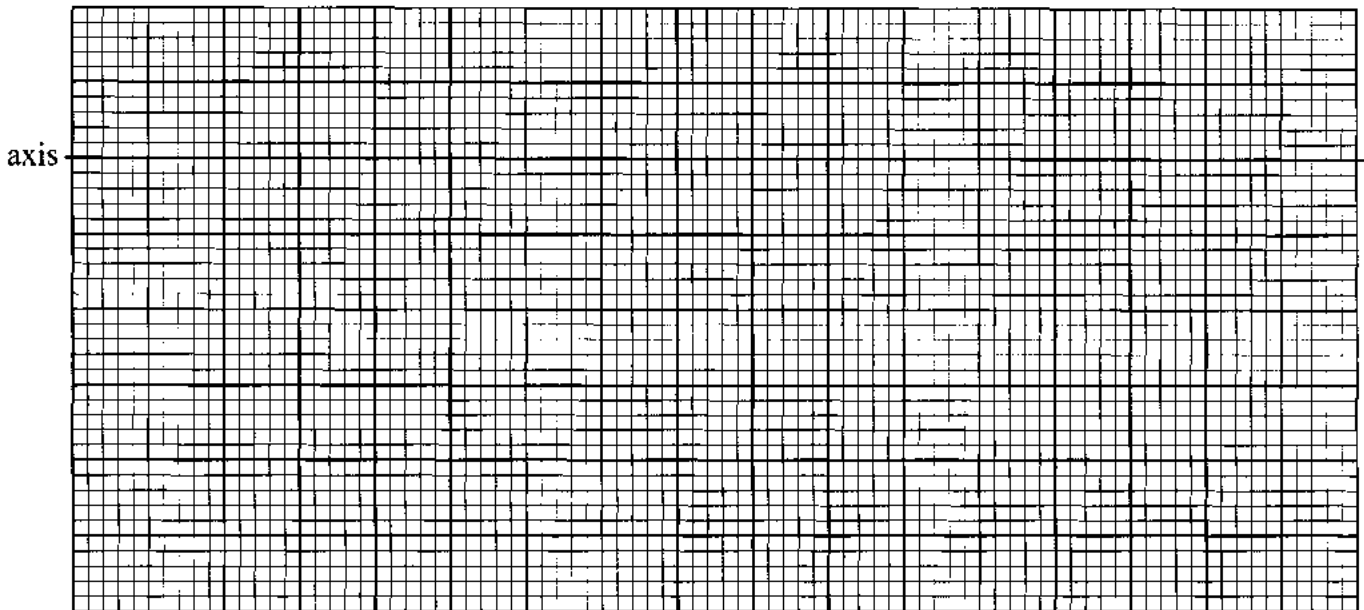
**TOTAL MARKS [20]**

6. This question is about curved mirrors and reflection.

(a) State one use of a concave and one use of a convex mirror. [2]

(b) A object 5 cm tall (use an arrow  $\uparrow$  to represent the object) is placed 15 cm in front of a concave mirror of focal length 10 cm.

(i) Draw a ray diagram to locate the image. [Scale: 2 cm = 5 cm] [3]



(ii) Use the ray diagram to determine the actual image distance and height from the mirror. [2]

(iii) State **ONE** property of the image. [1]

(c) A student performs an experiment to determine the focal length of a concave mirror. The diagram shows the apparatus used.

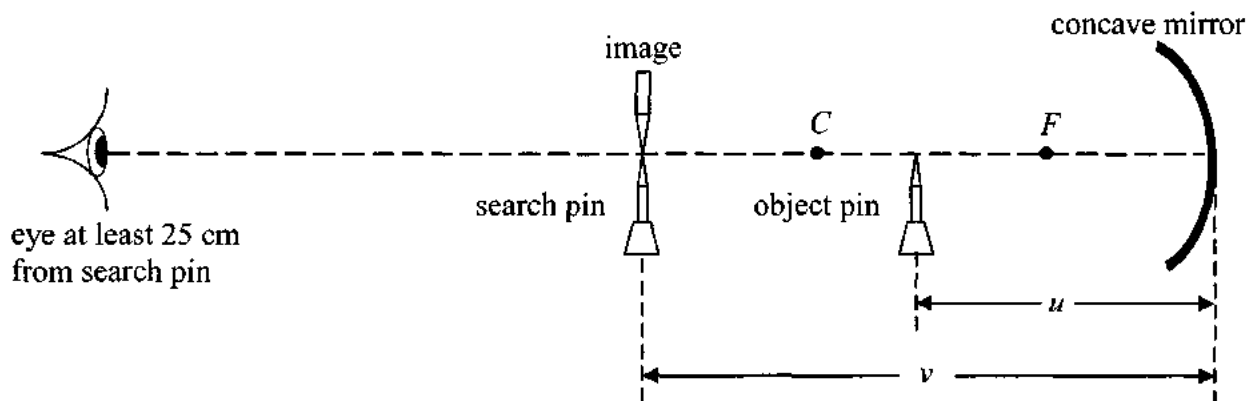


Fig. 6.1

The table shows the results.

| object distance<br>u (m) | image distance<br>v (m) | 1/u<br>(m <sup>-1</sup> ) | 1/v<br>(m <sup>-1</sup> ) |
|--------------------------|-------------------------|---------------------------|---------------------------|
| 0.63                     | 0.42                    |                           |                           |
| 0.60                     | 0.44                    |                           |                           |
| 0.58                     | 0.45                    |                           |                           |
| 0.55                     | 0.48                    |                           |                           |
| 0.50                     | 0.52                    |                           |                           |
| 0.47                     | 0.58                    |                           |                           |

- (i) Calculate the values of 1/u and 1/v to complete the table. [2]
- (ii) Draw a graph of 1/v (y-axis) versus 1/u (x-axis). Start both axes at 0,0. [5]
- (iii) Use your graph to determine the focal length of the concave mirror. [3]
- (iv) Use your graph to determine the image distance when the object is placed 40 cm from mirror. [2]

**TOTAL MARKS [20]**

7. The diagram shows an apparatus that can be used to investigate Boyle's Law. The apparatus has a gauge to measure the pressure and a scale that can be used to measure volume.

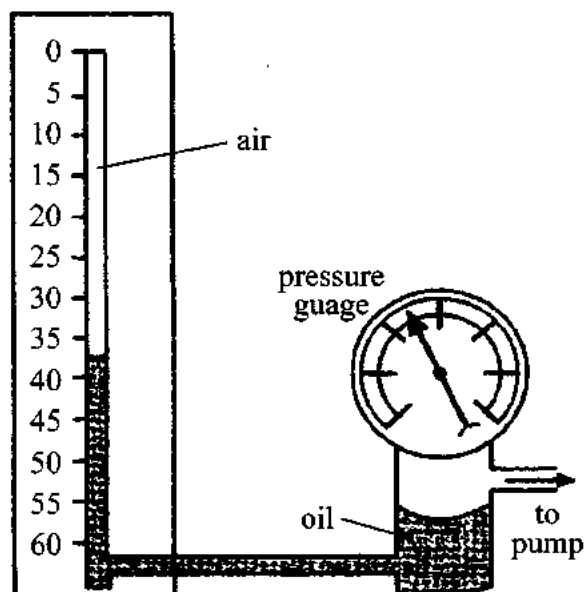


Fig. 7. 1

- (a) (i) The mass of air in the glass tube is kept constant throughout this investigation.  
Name another variable that must also be kept constant. [1]
- (ii) Sketch a graph of volume versus pressure that you would expect from this investigation. [2]
- (b) The combined gas law examines the behavior of a constant amount of gas when pressure, volume and/or temperature is allowed to change.

A can of air freshener is used until it is empty except for the propellant, a gas.

- (i) On the can is the warning "Store only at temperatures below 120°F (48.8°C). Do not incinerate."  
Explain why this warning is given. [2]
- (ii) The gas in the can is initially at 24°C and 360 kPa and the can has a volume of 360 mL. The can is left in a car that reaches 50°C on a hot day, find the new pressure in the can. [3]



- (c) An example of experimental pressure – temperature data is shown for a sample of air confined to a constant volume and under STP.

| temperature<br>(°C) | temperature<br>(K) | pressure<br>(kPa) |
|---------------------|--------------------|-------------------|
| –150                |                    | 36.0              |
| –100                |                    | 46.4              |
| –50                 |                    | 56.7              |
| 0                   |                    | 67.1              |
| 50                  |                    | 77.5              |
| 100                 |                    | 88.0              |

- (i) Convert °C temperatures to K temperatures to complete the table. [2]
- (ii) Use the information in the table to plot a graph of pressure versus temperature in K. [5]
- (iii) Determine the gradient of your graph, with units. [3]
- (iv) Use the value of the gradient of your graph to show the mathematical relationship between pressure and temperature. [2]

**TOTAL MARKS [20]**

[illegible]

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.

[illegible]

[illegible]