ZIMSEC

For Performance Measurement

ZIMBABWE SCHOOL EXAMINATION COUNCIL

GENERAL CERTIFICATE OF EDUCATION
ORDINARY LEVEL

QUESTION AND ANSWER BOOKLET FOR

PHYSICS – 4023

NOV 2015 – NOV 2019

Scanned with CamScanner

Vacc 60

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

PHYSICS 5055/1

PAPER 1 Multiple Choice

NOVEMBER 2015 SESSION 1 hour

Additional materials:
- Multiple Choice answer sheet
- Soft clean eraser
- Soft pencil (type B or HB is recommended)
- Electronic calculator and/or Mathematical tables

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Do not open this booklet until you are told to do so.
Write your name, Centre number and candidate number on the answer sheet in the spaces provided unless this has already been done for you.

There are **forty** questions in this paper. Answer **all** questions. For each question there are four possible answers, **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice in **soft pencil** on the separate answer sheet.

Read very carefully the instructions on the answer sheet.

INFORMATION FOR CANDIDATES

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

This question paper consists of 20 printed pages.

Copyright: Zimbabwe School Examinations council, N2015.

©ZIMSEC N2015

[Turn over

Scanned with CamScanner

1 Which row correctly gives the measuring instruments to measure the length of a wire of about 80 cm and diameter 0.20 cm?

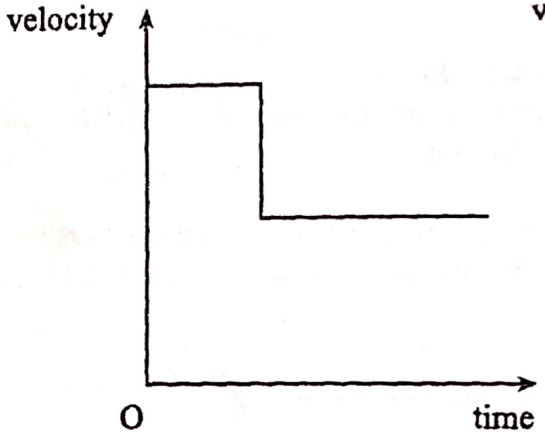
	length	diameter
A	metre rule	micrometer screw gauge
B	metre rule	vernier callipers
C	micrometer screw gauge	vernier callipers
D	vernier callipers	micrometer screw gauge

2 Which one is a vector quantity?

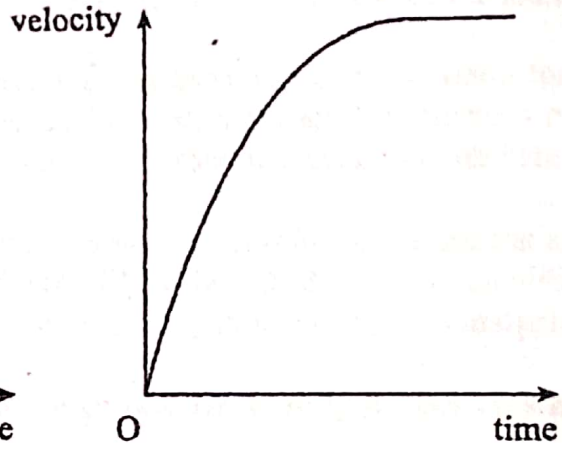
A pressure
B speed
C weight
D time

3 Which diagram shows the motion of a free falling parachutist who eventually attains a terminal velocity?

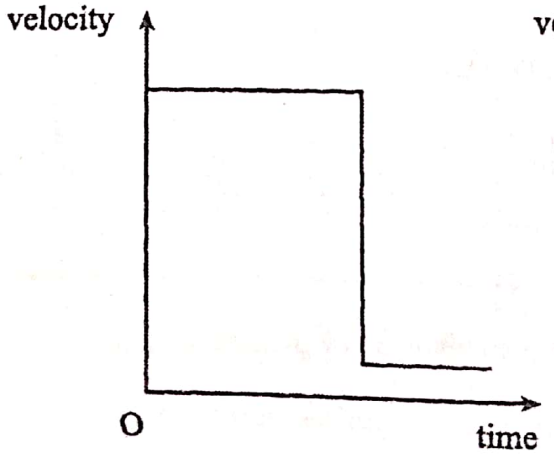
A



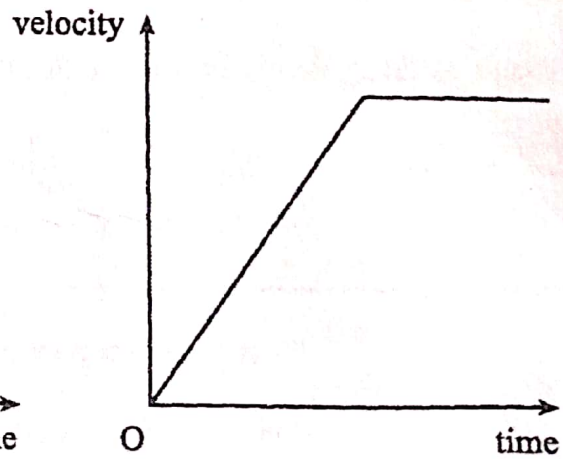
B



C



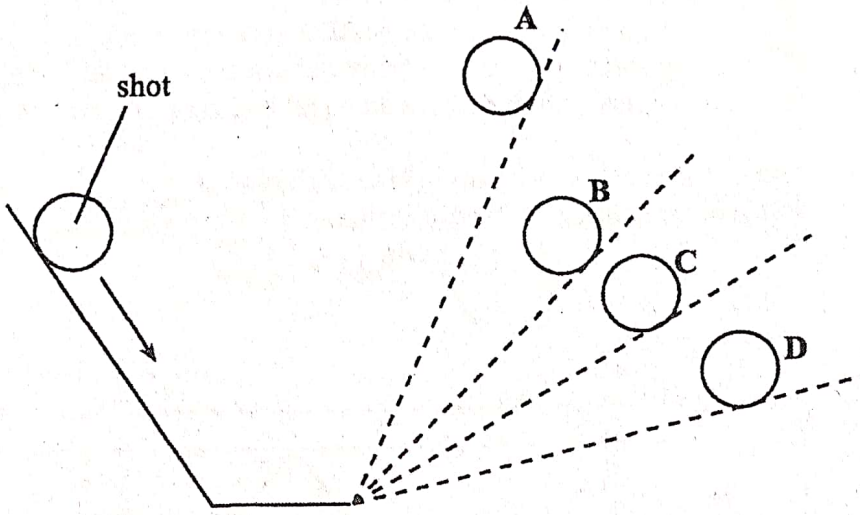
D



Scanned with CamScanner

4 The diagram shows a shot put ball on a smooth ramp. The ball is released from the position shown to roll down the ramp.

What is the greatest possible height that the ball can reach?



5 Which relationship correctly defines the acceleration due to gravity?

A mass divided by weight
B mass multiplied by weight
C weight divided by height
D weight divided by mass

6 What is implied by the term *constant velocity*?

A no change in displacement
B maximum acceleration
C no acceleration produced
D no change in speed

7 An object is projected vertically upwards with a velocity of 10 m/s.

What is the maximum height reached?

[$g = 10\ m/s^2$].

A 1 m
B 5 m
C 10 m
D 20 m

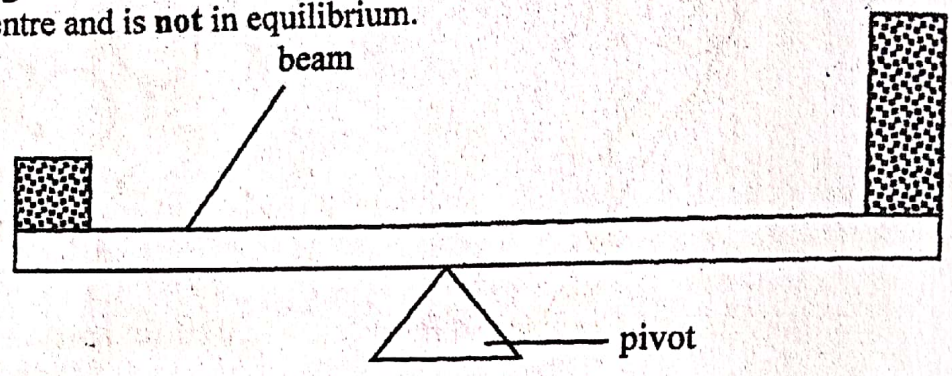
[Turn over

Scanned with CamScanner

8 Which statement is Newton's third law of motion?

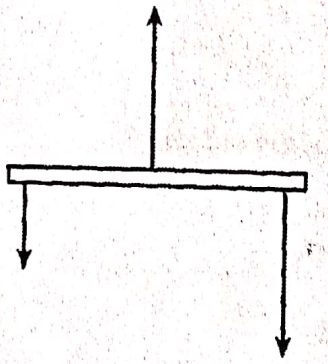
A Every force causes a reaction.
B Action and reaction are parallel and opposite.
C The forces acting on a body are always equal and opposite.
D To every action there is an equal and opposite reaction.

9 The diagram shows a beam loaded with blocks at its ends. The beam is pivoted at its centre and is **not** in equilibrium.

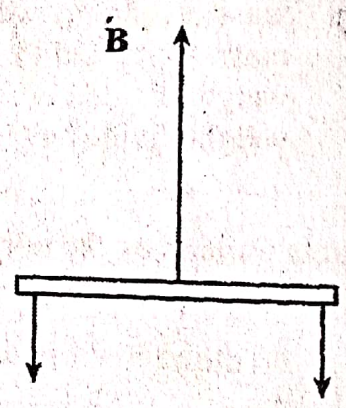


Which diagram shows the forces acting on the beam?

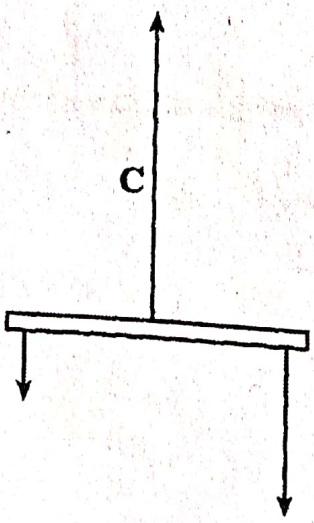
A



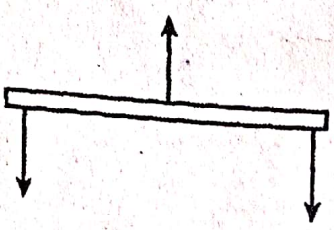
B



C

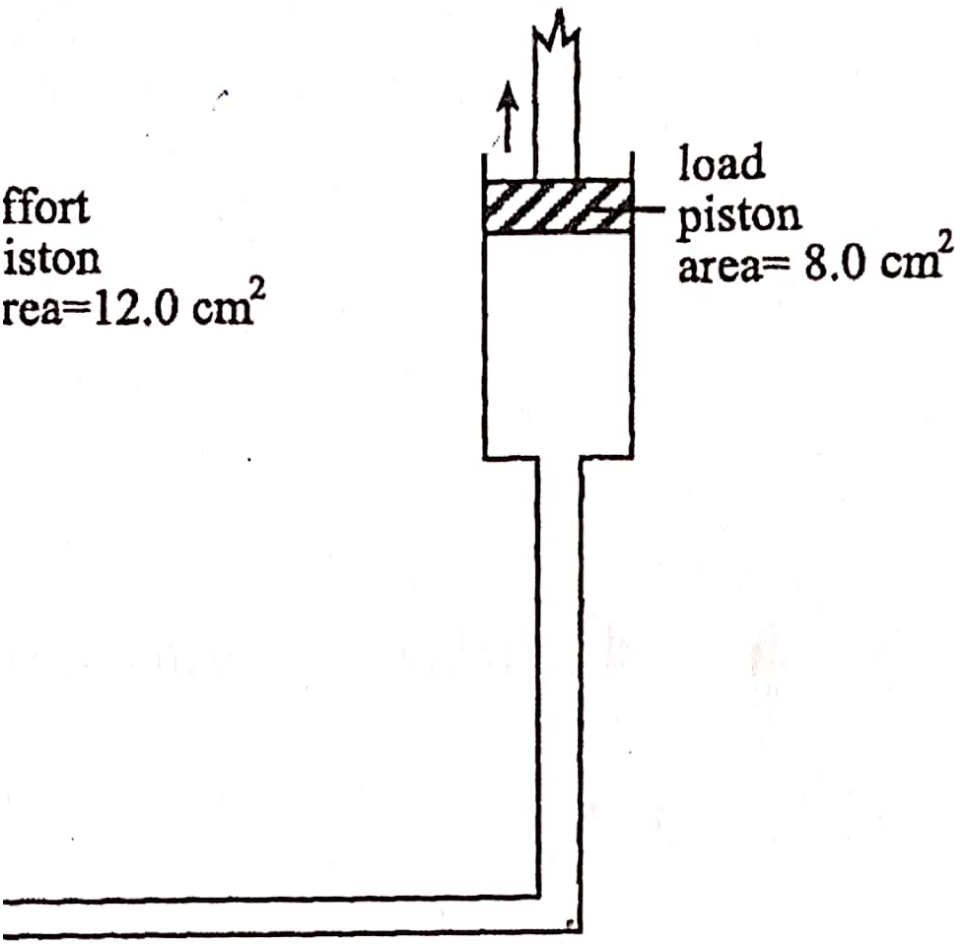


D



Scanned with CamScanner

ple hydraulic jack filled with a hydraulic fluid. An effort of 60
12.0 cm^2.

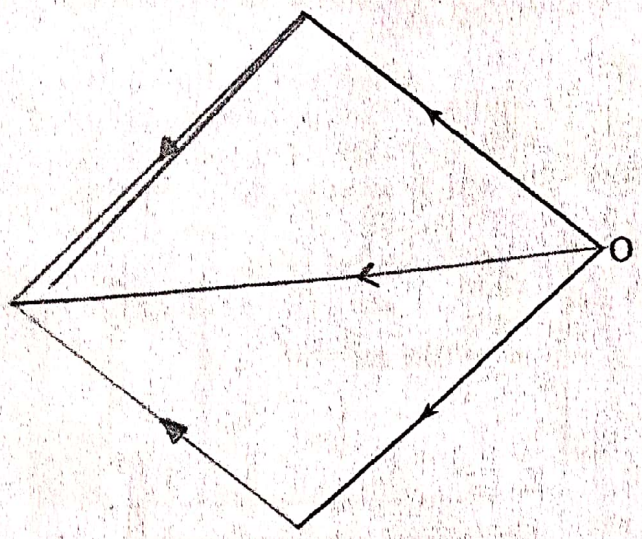


correct for the hydraulic jack?

force on load piston/ N
40
90

Scanned with CamScanner

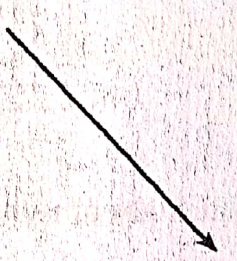
11 The diagram shows two forces acting at a point O.



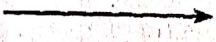
Which single force can represent their resultant?

A

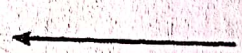
B



C

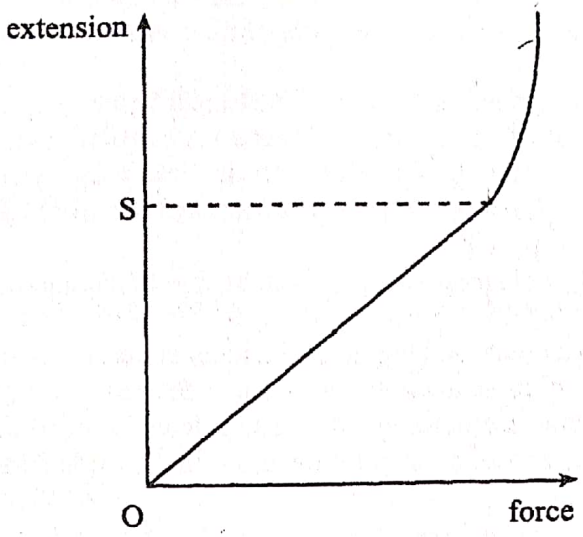


D



Scanned with CamScanner

12 The diagram shows the extension of an elastic material as force is increased.



Which statement is correct?

A The material becomes easier to extend after S.
B The material becomes harder to extend after S.
C The force and extension are always directly proportional.
D The force and extension are always inversely proportional.

13 What is the average power generated by a boy whose weight is 600 N and climbs a vertical tower 300 m high in 3 600s?

A 0.020 W
B 50 W
C 1 800 W
D 7 200 W

14 Which energy chain shows the main energy changes in a thermal power station?

A chemical → heat → kinetic → electrical
B chemical → kinetic → heat → electrical
C chemical → kinetic → electrical → heat
D chemical → heat → electrical → kinetic

Scanned with CamScanner

15 When a fixed mass of gas is compressed to a smaller volume, at constant temperature, the gas molecules strike the walls of the container

A less often than before with a higher velocity.
B more often than before with a higher velocity.
C more often than before with the same velocity
D less often than before with the same velocity.

16 Which set of changes will increase the rate of evaporation of a liquid?

A an increase in temperature and an increase in surface area
B an increase in temperature and a decrease in surface area
C a decrease in temperature and a decrease in surface area
D a decrease in temperature and an increase in surface area

17 How much energy is required to heat 2 kg of paraffin to raise its temperature by 10 °C? [specific heat capacity of paraffin = 2 000 $Jkg^{-1}K^{-1}$]

A 400 J
B 4 010 J
C 24 000 J
D 40 000 J

18 An electric immersion heater converts 100 g of water at 100 °C into steam at 100 °C in 300 seconds. The specific latent heat of steam is 2 500 J/g.

What is the average electric power used?

A $\frac{100 \times 2\ 500}{300}$ W

B $\frac{2\ 500}{300 \times 100}$ W

C $\frac{300 \times 2\ 500}{100}$ W

D 100 x 2 500 x 300 W

Scanned with CamScanner

19 The sensitivity of a simple mercury thermometer can be increased by

A increasing the volume of the mercury bulb.
B increasing the diameter of the capillary tube.
C decreasing the volume of the mercury bulb
D decreasing the diameter of the capillary tube.

20 The approximate range of audible frequencies for human beings is

A 10 Hz to 20kHz.
B 20 Hz to 20kHz.
C 10 kHz to 10 000kHz.
D 20 kHz to 20 000 kHz.

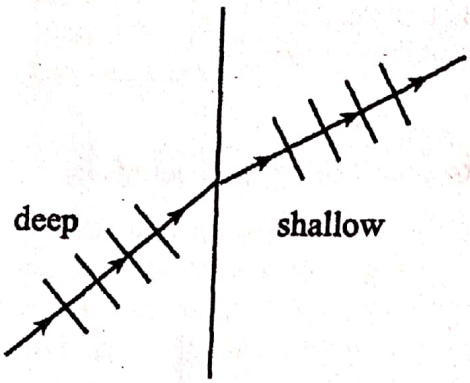
21 Which type of radiation lies between visible light and microwaves in the electromagnetic spectrum?

A infrared
B radio waves
C ultraviolet
D x-rays

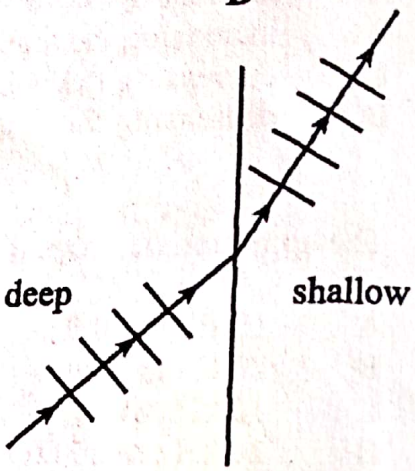
Scanned with CamScanner

22 Which diagram correctly represents water ripples travelling from deep water to shallow water?

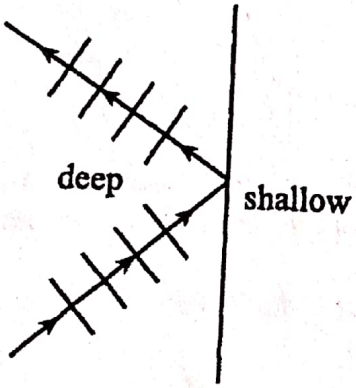
A



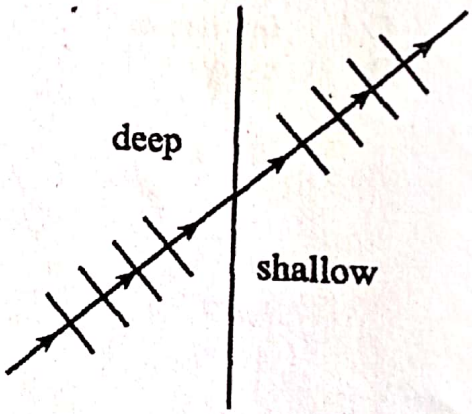
B



C

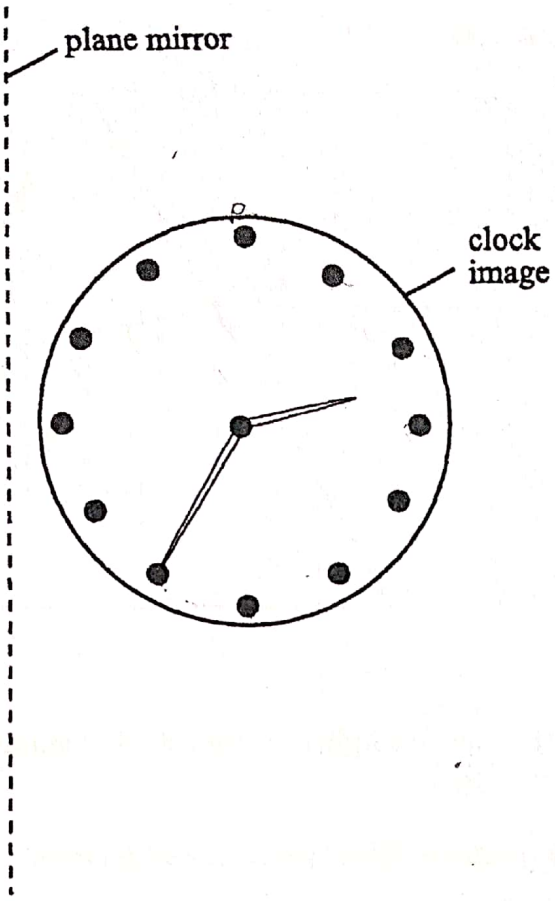


D



Scanned with CamScanner

23 The diagram shows the image of a clock formed by a plane mirror.



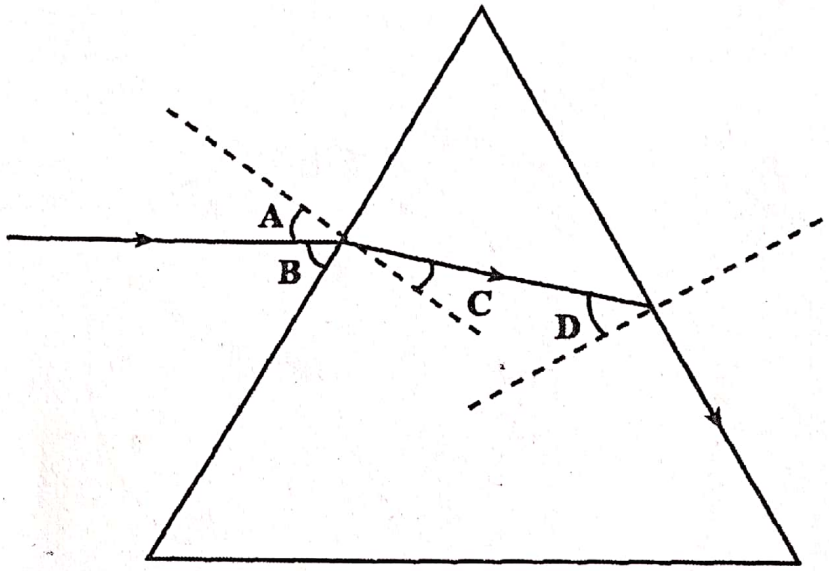
What is the time on the clock

A 2.25
B 2.35
C 8.35
D 9.25

Scanned with CamScanner

24 A ray of light is passed through a triangular glass prism as shown.

Which is the critical angle?



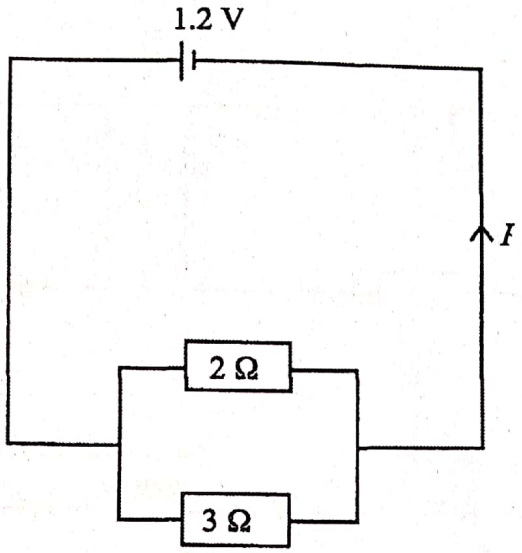
25 A set of Christmas tree lights consists of 20 identical bulbs connected in series to a 240 V mains supply.

What is the potential difference across each lamp?

A 12 V
B 24 V
C 240 V
D 4 800 V

Scanned with CamScanner

26 The diagram shows a circuit in which a 1.2 V cell is connected to two resistors in parallel.



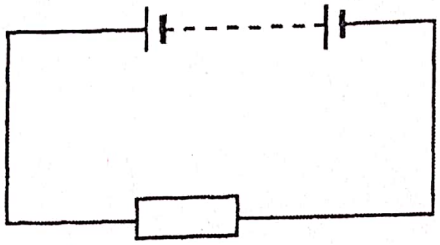
What is *I*?

A 0.24 A
B 0.40 A
C 1.00 A
D 1.44 A

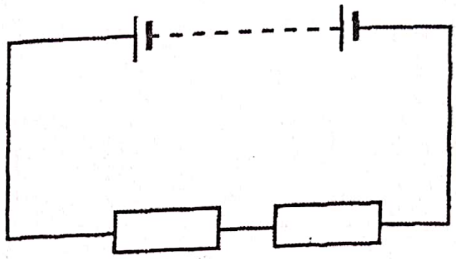
Scanned with CamScanner

27 Which circuit, if all resistors are identical, has the least effective resistance?

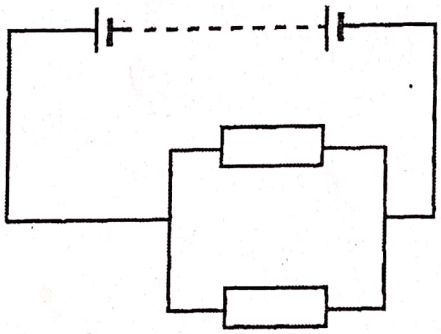
A



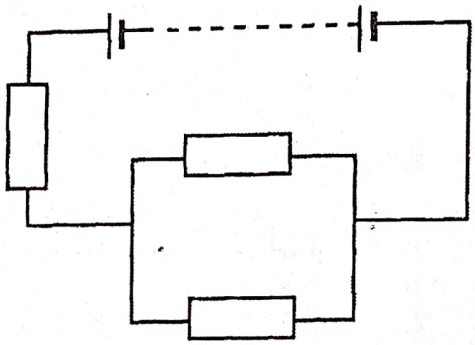
B



C



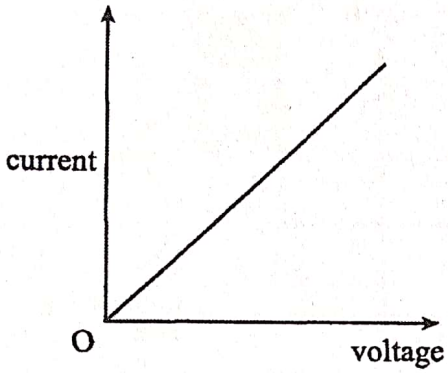
D



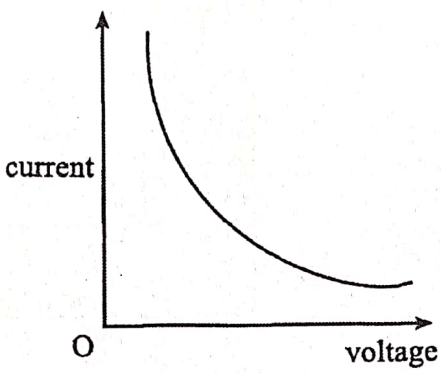
Scanned with CamScanner

28 Which graph correctly shows the variation of current with voltage across a fixed resistor?

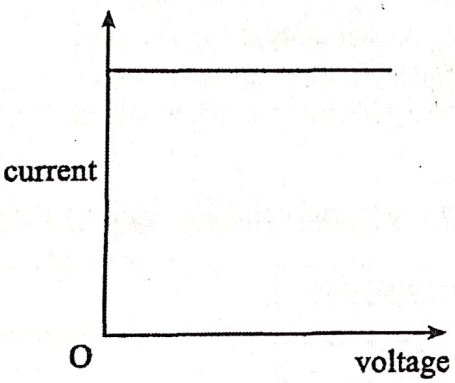
A



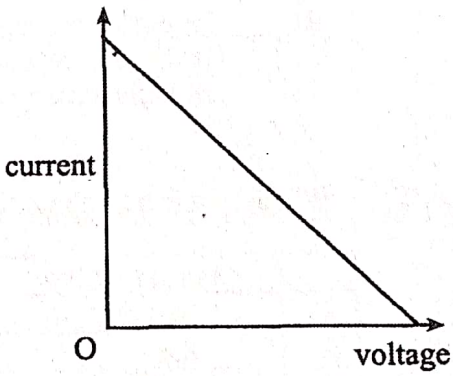
B



C



D

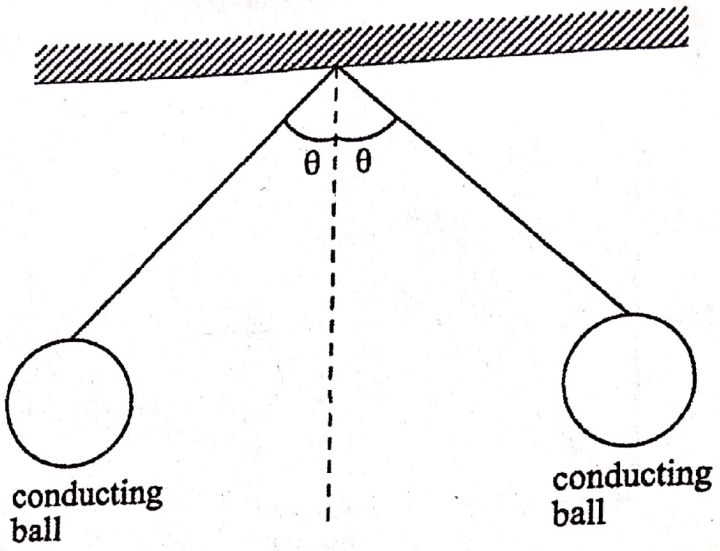


29 Which statement about a fuse is correct?

A It allows current to flow in the correct direction.
B It breaks the circuit to protect appliance.
C It returns any excess current to the earth.
D It uses up any excess current.

Scanned with CamScanner

30 Two light and identical conducting balls are freely suspended by nylon threads and behave as shown.



Which statement is **not** true about the balls?

A The balls have the same charge.
B The balls exert equal forces on each other.
C The balls have equal and unlike charges.
D The balls have equal and like charges.

31 Which row is true about the magnetisation and demagnetisation of steel?

	magnetisation	**demagnetisation**
A	difficult	easy
B	easy	difficult
C	difficult	difficult
D	easy	easy

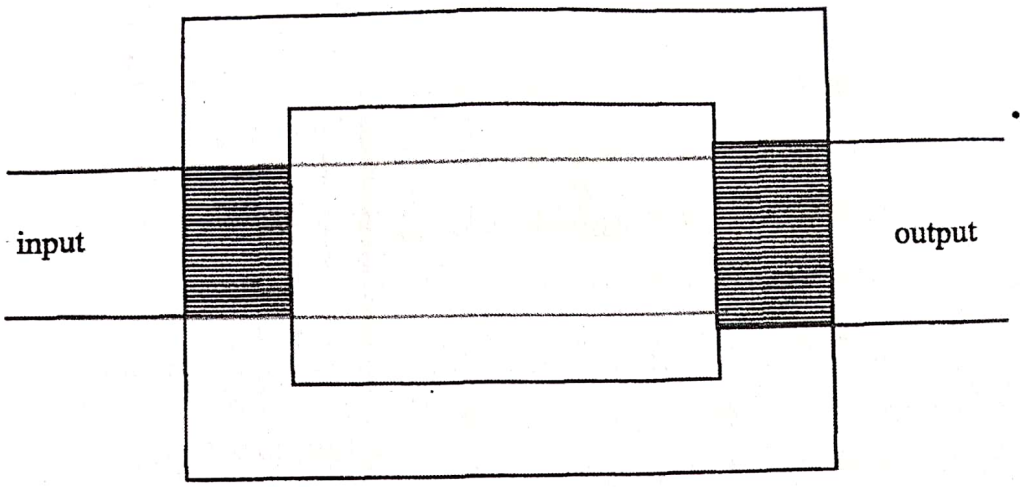
32 The end M of a metal rod attracts the north pole of a compass needle.

End M is made of

A copper and **not** permanently magnetised.
B steel and **not** permanently magnetised.
C copper with a south pole at M.
D steel with a north pole at M.

Scanned with CamScanner

33 Which statement is correct about the device shown?



The input voltage of the device is

A d.c. and the output is a.c.
B greater than the output voltage.
C the same as the output voltage.
D less than the output voltage.

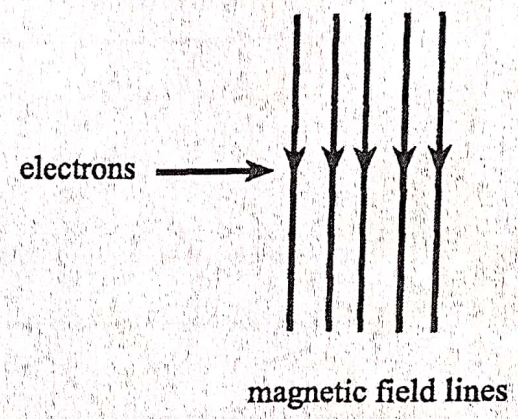
34 High voltages and low currents are used in the transmission of electrical energy over long distances.

The reason for using high voltages and low currents is to

A decrease the speed of the electrons.
B decrease heat loss from the power line.
C increase the speed of the electrons.
D increase the resistance of the power line.

Scanned with CamScanner

35 A beam of electrons enters a magnetic field as shown.



The magnetic field deflects the beam

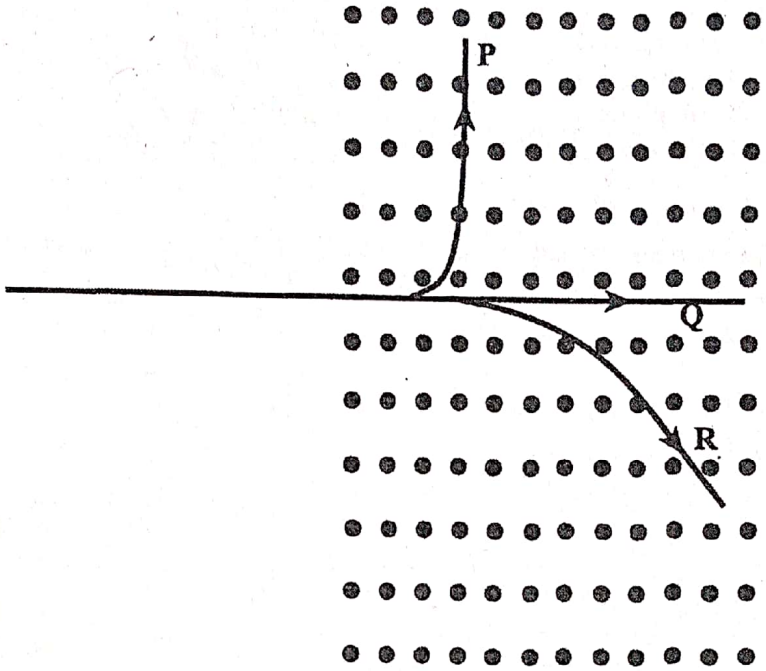
A into the plane of the paper.
B out of the plane of the paper.
C towards the bottom of the paper.
D towards the top of the paper.

36 Which particles are emitted during thermionic emission?

A electrons
B ions
C neutrons
D protons

Scanned with CamScanner

37 Emissions from a radio-active source are separated by passing them through a magnetic field. The deflections are shown in the diagram.



Which combination identifies P, Q and R correctly?

	P	Q	R
A	alpha particle	gamma rays	beta particle
B	beta particle	alpha particle	gamma rays
C	beta particle	gamma rays	alpha particles
D	gamma rays	beta particle	alpha particles

38 Which nuclide A, B, C or D is most unstable?

A $^{4}_{2}X$

B $^{33}_{16}X$

C $^{119}_{50}X$

D $^{238}_{92}X$

Scanned with CamScanner

39 A radio-active source has a count rate which falls from 400 to 50 in 3.0 minutes.

What is its half-life?

A 0.75 minutes
B 1.00 minutes
C 2.70 minutes
D 8.00 minutes

40 How many neutrons are in a nucleus of $^{14}_{6}C$?

A 2
B 6
C 8
D 14

Scanned with CamScanner

ZIMBABWE SCHOOL EXAMINATION COUNCIL

General Certificate of Ordinary Level

EXPECTED ANSWERS

PHYSICS	NOVEMBER 2015	5055/1

1	A
2	C
3	B
4	B
5	D
6	C
7	B
8	D
9	A
10	C
11	D
12	A
13	B
14	A
15	C
16	A
17	D
18	A
19	A
20	B

21	A
22	B
23	D
24	D
25	A
26	C
27	C
28	A
29	B
30	C
31	C
32	B
33	D
34	B
35	B
36	A
37	C
38	A
39	B
40	C

Scanned with CamScanner

Candidate Name | Centre Number | Candidate Number

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

5055/2

PHYSICS

PAPER 2 Theory

NOVEMBER 2015 SESSION 1 hour 45 minutes

Candidates answer on the question paper.
Additional materials: Electronic calculator and/or Mathematical table
Graph paper

Allow candidates 5 minutes to count pages before the examination

This booklet should not be punched or stapled and pages should not be removed.

TIME 1 hour 45 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page and Centre number and candidate number on top of the right corner of every page of this paper. Check if the booklet has all the pages and ask the invigilator for a replacement if there are duplicate or missing pages.

Section A

Answer **all** questions.

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

Section B

Answer any **two** questions.

Write your answers on the spaces provided on the question paper

Do not fasten the booklet

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question paper.

Candidates are reminded that **all** quantitative answers should include appropriate units.

Candidates are advised to show **all** their working in a clear and orderly manner, as more marks are awarded for sound use of Physics than for correct answers.

This question paper consists of 20 printed pages.

©ZIMSEC N2015

Copyright: Zimbabwe School Examinations Council, N2015.

[Turn over

Scanned with CamScanner

Centre Number	Candidate Number

Section A

Answer all questions from this section.

1 **(a)** Complete **Table 1.1** to describe some of the basic quantities in physics.

Table 1.1

basic quantity	base unit + symbol	measuring instrument
	metre, m	
		triple beam balance
time		

[3]

(b) **Fig.1.1** shows two vectors.

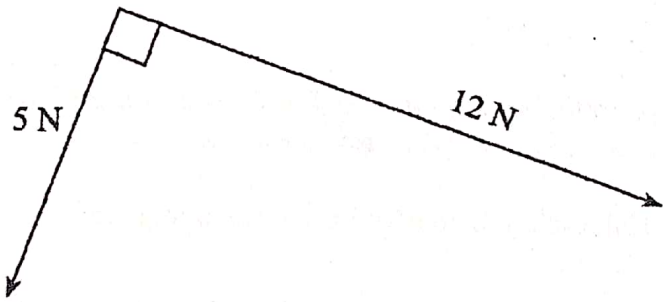


Fig.1.1

Determine the resultant vector.

resultant vector = _____ [2]

Scanned with CamScanner

2 (a) A spacecraft is orbiting the Earth at a steady speed of 8 km/s.

Find the time, t, in seconds, taken to complete a single orbit 40 000 km long.

$t =$ _____ s [3]

(b) A trolley moves at a steady speed for a time, t, and then moves an equal distance slowing down.

Sketch a length of a ticker tape that represents the motion of the trolley.

[2]

3 A bottle has a mass of 0.050 kg when empty. Its mass is 0.085 kg when filled with 25 cm^3 of a liquid.

Calculate the density of the liquid in g/cm^3.

density = _____ g/cm^3 [4]

Scanned with CamScanner

4 (i) The forces acting on an irregular object are shown in **Fig. 4.1**.

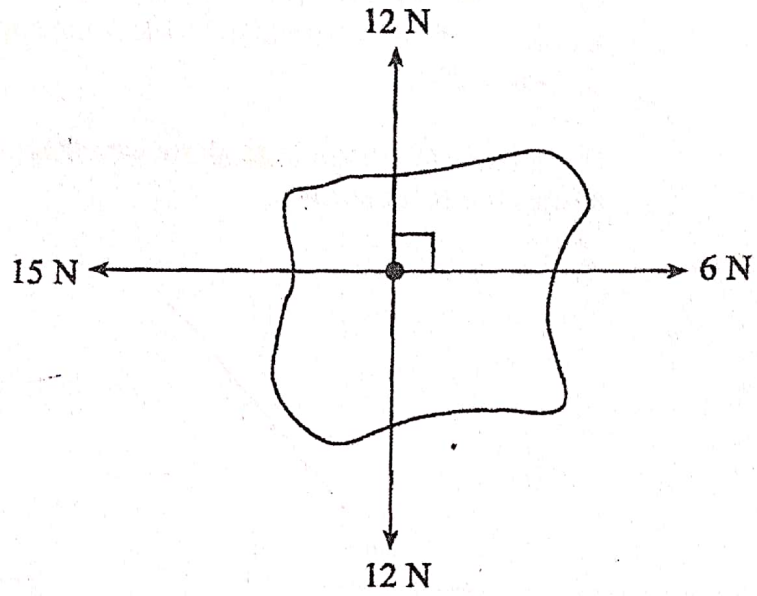


Fig. 4.1

Describe what happens to the object.

_____

_____

_____

(ii) Draw another force on **Fig. 4.1**, indicating its magnitude and direction, to balance the forces.

[4]

Scanned with CamScanner

5 (i) The diagrams in **Fig. 5.1** show two blocks of a material whose critical angle is 40°. In block A, the ray strikes the inner surface at an angle of incidence of 30° whereas in block B the angle of incidence in the inner surface is 50°.

Complete each diagram to show what happens after the ray strikes the inner surface.

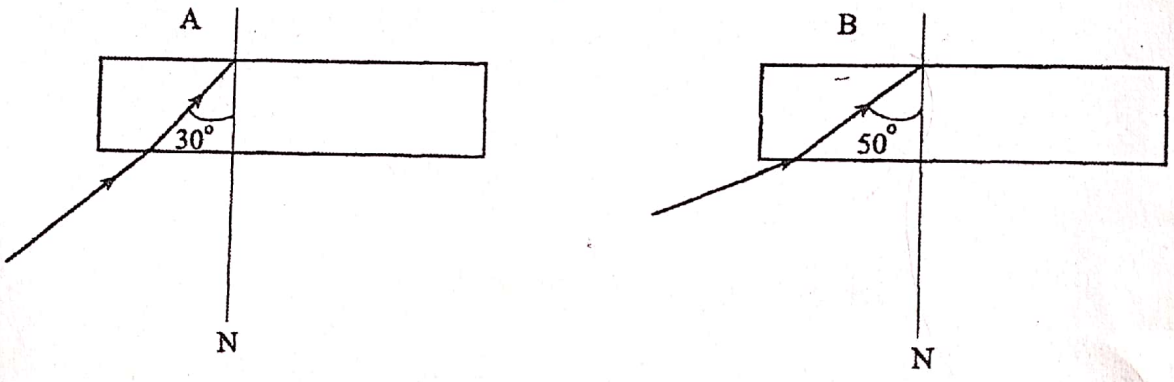


Fig. 5.1

[2]

(ii) Explain *total internal reflection* with reference to **Fig.5.1.**

[4]

[Turn over

Scanned with CamScanner

6 A boy pushes a case of mass 40 kg across a horizontal floor at a constant speed of 0.5 m/s by exerting a horizontal force of 200 N.

Find the

(i) resultant force on the case,

resultant force = _____ N [1]

(ii) frictional force,

frictional force = _____ N [1]

(iii) work done in 4 seconds.

work done = _____ J [3]

Scanned with CamScanner

7 A student set up the apparatus in **Fig. 7.1** to demonstrate the effect of passing an electric current through a copper rod in a magnetic field. The copper rod is free to roll along the iron support rods.

(i) Show, on **Fig. 7.1**, the magnetic field.

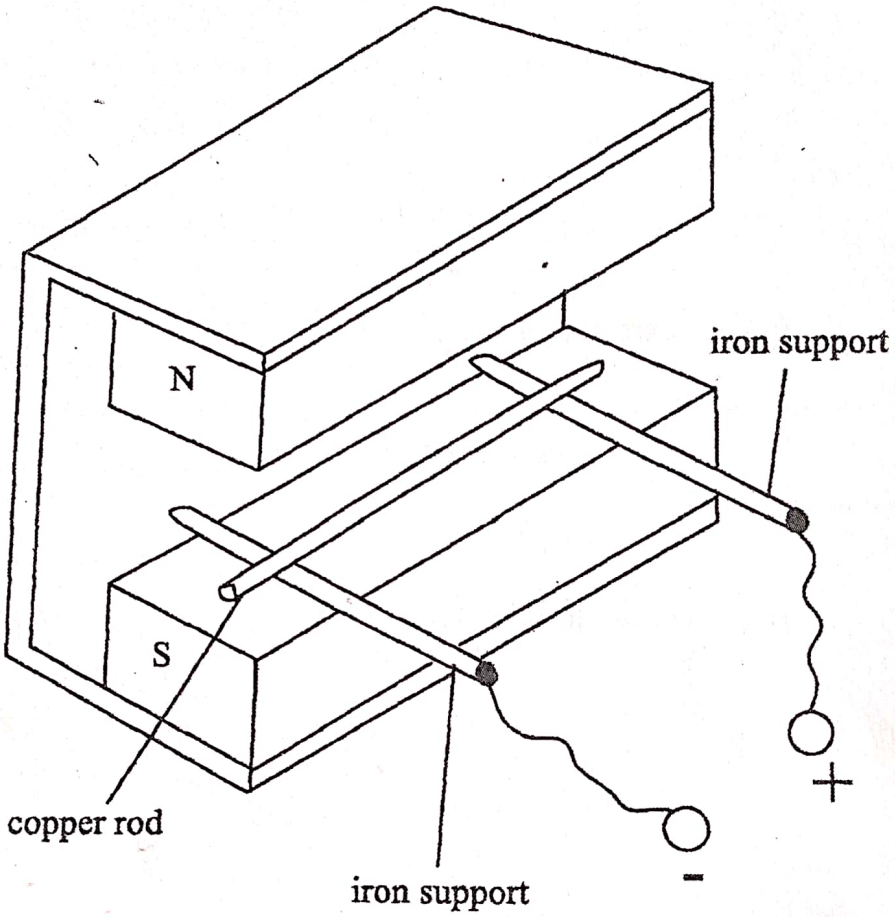


Fig. 7.1

[1]

(ii) Explain what happens to the copper rod when the electric current is switched on.

_____

_____ [1]

Scanned with CamScanner

7 (iii) Describe what happens if the connections to the power supply are reversed.

_____

_____

_____ [1]

(iv) State the rule the copper rod is obeying when the current is switched on.

_____ [1]

8 (a) **Fig. 8 .1** shows plane waves in a ripple tank approaching a flat metal plate that acts as a barrier.

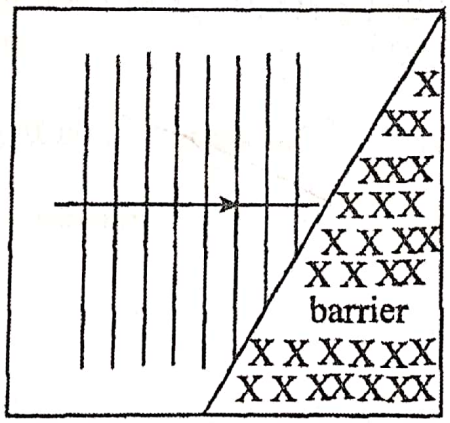


Fig. 8 .1

Complete the diagram to show the effect of the barrier on the wave motion. [3]

Scanned with CamScanner

8 (b) **Fig. 8.2** shows some wave fronts approaching a shallow region in a ripple tank.

Complete the diagram to show what happens to the wave-fronts as they enter the shallow region.

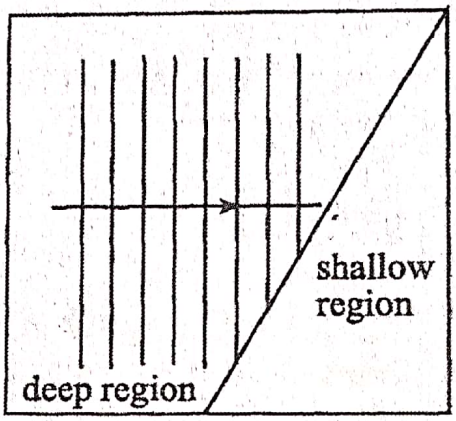


Fig. 8.2

[2]

9 Water of mass 20 kg, at 90 °C, was added to a plastic basin with 4 kg of water at 30 °C.

[Specific heat capacity of water = 4 200 J/kg/°C]

Calculate the final temperature of the mixture.

temperature = _____ °C [5]

Scanned with CamScanner

10 The diagram in **Fig. 10.1** represents a device that is used in an electric power circuit.

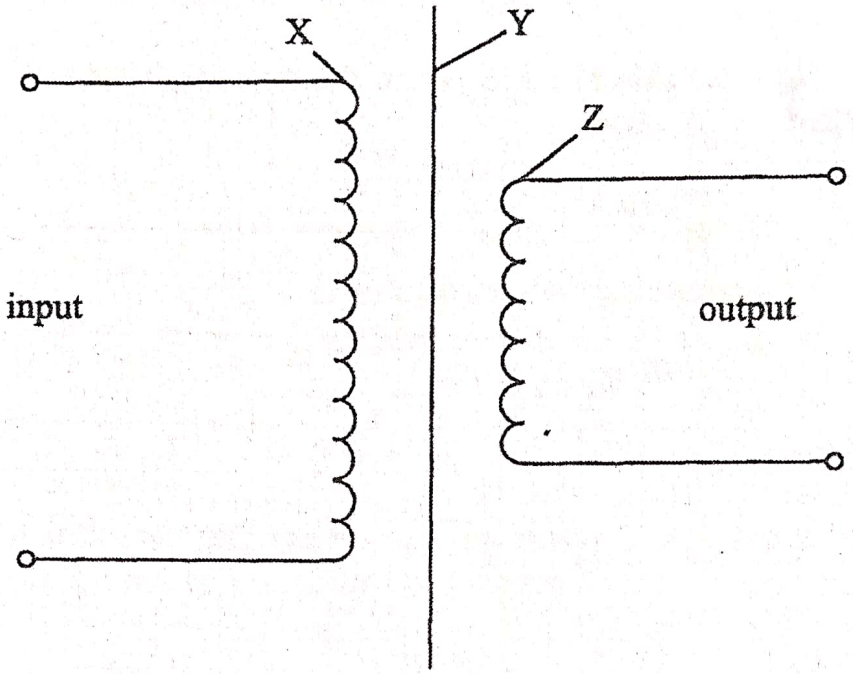


Fig. 10.1

(i) Identify the device.

_____ [1]

(ii) Name the parts labelled X, Y and Z.

X _____

Y _____

Z _____ [3]

Scanned with CamScanner

Section B

Answer any two questions from this section.

11 **(a)** **Table 11.1** shows how the stopping distance of a car depends on its speed.

Table 11.1

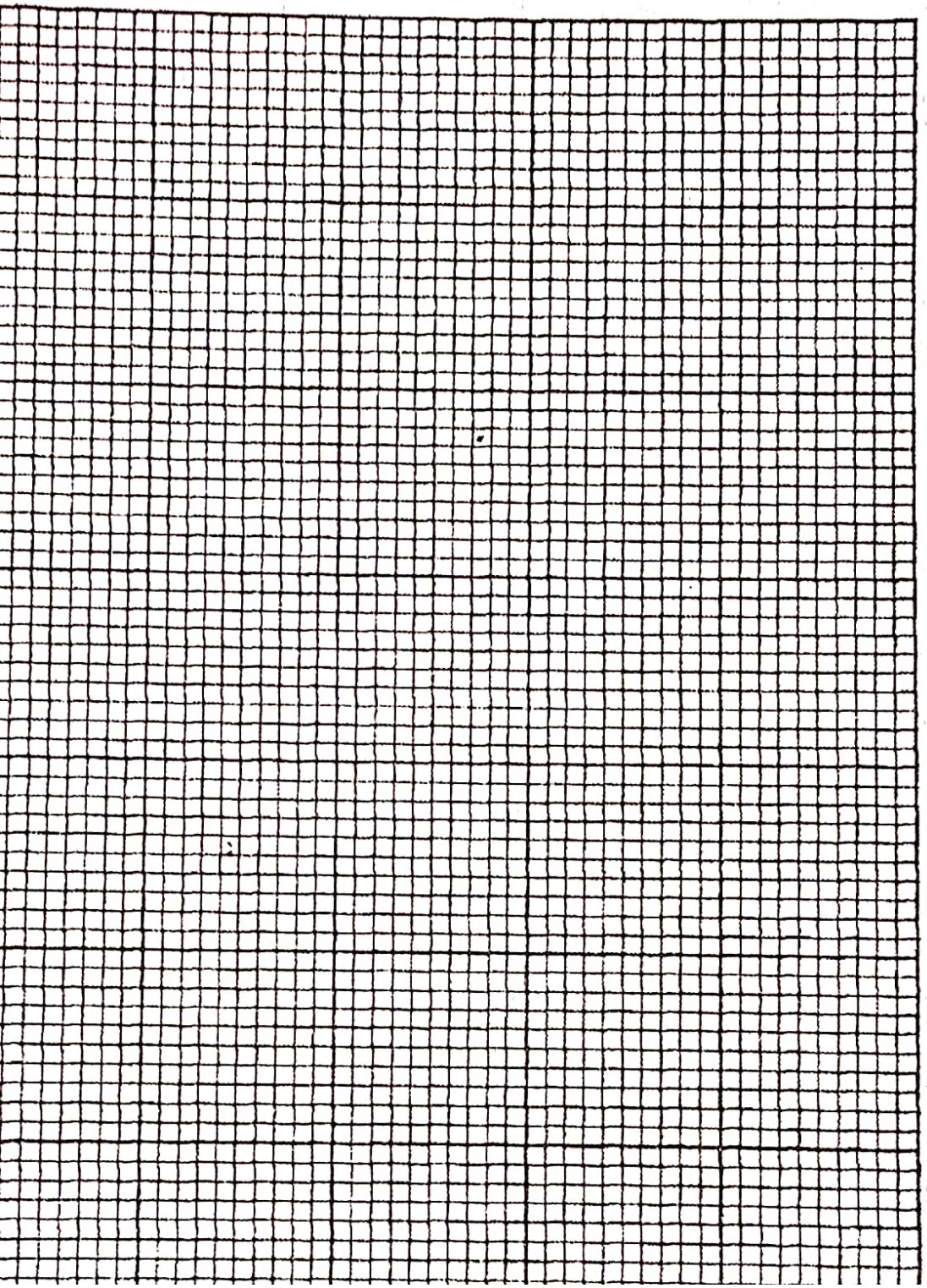
stopping distance/m	0	4	12	22	36	52	72
speed/ (m/s)	0	5	10	15	20	25	30

(i) Give **one** factor, other than the speed, that affects the stopping distance of a car.

_____ [1]

Scanned with CamScanner

on **Fig.11.1**, a graph of stopping distance (y-axis)
st speed (x-axis).



Scanned with CamScanner

11 (a) (iv) Describe how the stopping distance changes with an increase in speed.

_____

_____

_____ [1]

(b) (i) Define *temperature.*

_____

_____

_____ [1]

(ii) When calibrating a thermometer, two fixed points are essential.

State the numerical values of the **two** points.

1. _____

2. _____ [2]

(iii) State the temperature range for a clinical thermometer.

_____ [1]

Scanned with CamScanner

11 (b) (iv) In an electrical method to measure the specific heat capacity of brine, the measurements made were:

mass of aluminium calorimeter	=	0.1 kg
mass of brine	=	0.05 kg
temperature change	=	7.5°C
voltage across heating coil	=	5.0 V
current through the coil	=	1.0A
time current flowed	=	450 s
specific heat capacity of aluminium	=	900 J/kg/K

Calculate the specific heat capacity of brine.

heat capacity = _____ [4]

12 (a) (i) Describe how the focal length of a converging lens is determined by experiment.

_____

_____

_____

_____

_____

_____ [4]

Scanned with CamScanner

12 (a) (ii) A small object is placed on the axis of a converging lens of focal length 2 cm so that it is 5 cm from the lens.

Show, by a ray diagram inside the box, the nature and position of the image formed.

[4]

Scanned with CamScanner

12 (b) (i) Describe how the field lines for a bar magnet are plotted using a plotting compass.

[4]

(ii) Draw the magnetic field pattern for a pair of bar magnets with the North poles facing each other.

[3]

Scanned with CamScanner

13 (a) **Fig.13.1** shows two coils of insulated copper wire, one inside the other. The inner coil is connected to a sensitive galvanometer, while the outer coil is connected to a direct current source via a switch, H.

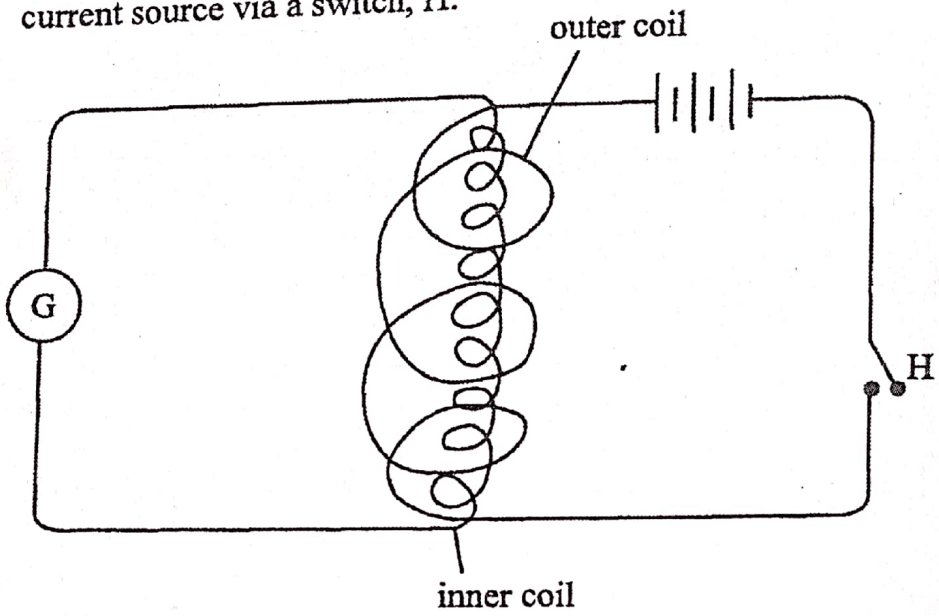


Fig.13.1

(i) Describe what happens when the switch is closed.

_____

_____ [1]

(ii) Explain the answer in (i).

_____

_____

_____

_____

_____

_____ [4]

Scanned with CamScanner

13 (a) (iii) State the effect of

1. increasing the number of turns of the inner coil,

_____

_____ [1]

2. decreasing the number of turns of the outer coil.

_____

_____ [1]

Scanned with CamScanner

13 (b) **Fig.13.2** shows a device whose operation depends on thermionic emission.

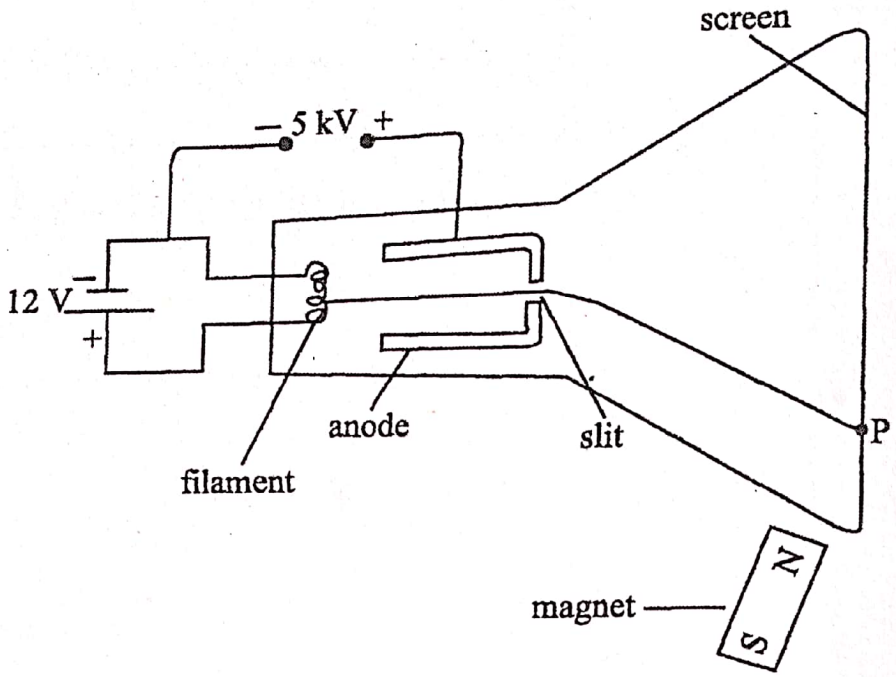


Fig.13.2

(i) Describe how the electron beam is produced and ends up at P.

[6]

Scanned with CamScanner

13 (b) (ii) State the **two** effects of increasing the slit width.

_____

_____

_____

_____ [2]

Scanned with CamScanner

ZIMBABWE SCHOOL EXAMINATION COUNCIL

General Certificate of Education Ordinary Level

EXPECTED ANSWERS

NOVEMBER 2015

PHYSICS **4023/2**

Scanned with CamScanner

1. **(a)**

Basic Quantity	Base Unit+Symbol	Measuring instrument
Length	Metre, m	Ruler
mass	Kilogram, kg	Tripple beam balance
Time	Second, s	Stopwatch/clock

(b) $R^2 = 12^2 + 13^2$

$R = 13N$

---

2. **(a)** $time = \frac{distance}{speed} = \frac{40\ 000}{8}$

$= 5000s$

(b) -first dots are equally spaced for time ***t*** and are further apart as compared to the second part
-dots are close together

---

3. $density = \frac{mass}{volume} = \frac{0.035 \times 1\ 000}{25}$

$= 1.4g/cm^3$

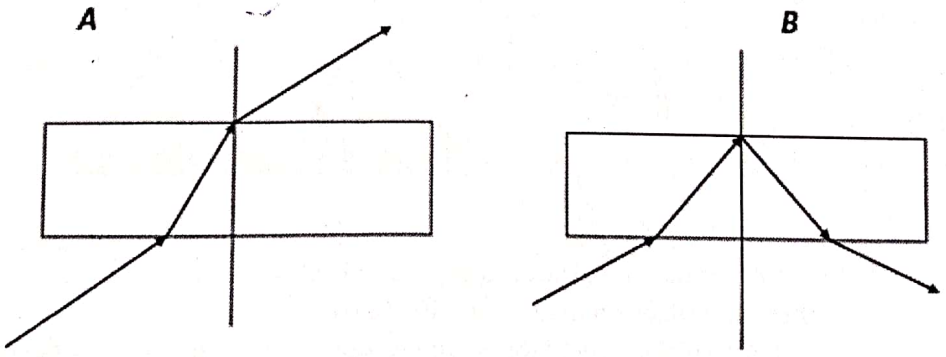
---

4. **(i)** -the object will move to the left with a resultant force of 9N

(ii) - a force of 9N drawn at an angle of 63°C above the force 6N

---

5. **(i)**



Scanned with CamScanner

(ii) -is when a ray of light from an optically denser medium strike the medium boundary at an angle greater than the incident angle and is reflected back into the more dense medium e.g. in ***fig b*** above.

6. (i) $Resultant\ Force = 0N$, constant velocity

(ii) $Frictional\ Force = 200N$

$Work\ done = force \times distance$

$Work\ done = 400J$

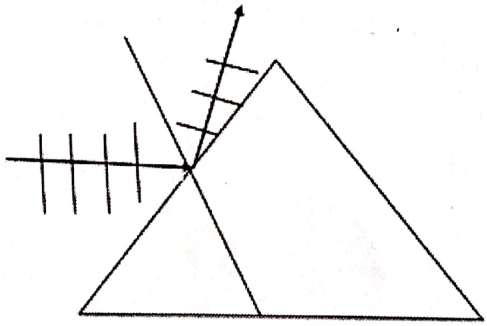
7. (i) -magnetic field from North to South Pole. Arrow pointing downwards.

(ii) -it will roll out of the horse shoe magnet

(iii) -it will roll inwards

(iv) -Fleming's left hand rule

8. (a)



-the ray must be parallel to the wave fronts
-there is reflection away from the barrier
-spacing of the wave fronts are the same before and after reflection.

(b) -wave fronts move closer to the normal
-wavelength reduces i.e. wave fronts become closer to each other
-wave fronts must be at right angle to the ray

Scanned with CamScanner

9. (a) *heat supplied by water at* $90°C$ = *heat supplied by water at* $30°C$

$Q = mc\Delta\theta$

$20 \times 4200 \times (90 - \theta) = 4 \times 4200 \times (\theta - 30)$

$\theta = 80°C$

10. (i) transformer

(ii) X – primary coil

Y – Iron core

Z – Secondary coil

11. (i) -reaction time; slippery of the road

(ii) -axes labelled
-scale 1cm to represent 5 units on the x axis, and 1cm to 10 units on the y axis
-correct plotting of points
-smooth curve correctly drawn, with an increasing gradient

(iii) 7.5m

(iv) -increases

(b) (i) -the degree of coldness or hotness of a body

(ii) **1.** 1.0°C

2. 100°C

(iii) 35°C – 42°C

Scanned with CamScanner

(iv) $Q = mc\Delta\theta$

$VIt = heat\ gained\ by\ aluminium + heat\ gained\ by\ brine$

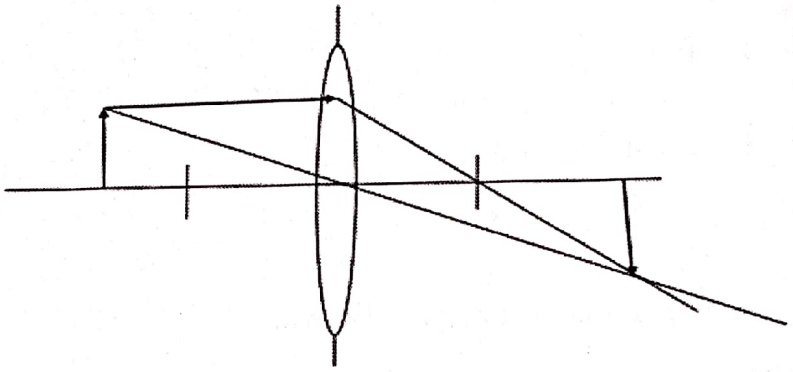
$5.00 \times 1.0 \times 450 = 0.1 \times 900 \times 7.5 \times c \times 7.5$

$\boldsymbol{heat\ capacity\ of\ brine = 4\,200 J/kg/k}$

---

12. **(a)** **(i)** -pass a ray of light on a converging lens.
-the rays appear to meet at a point
-measure the distance from the centre of converging lens to that point using a ruler.
-that's the focal length.

(ii)



(b) -place a bar magnet on a clean piece of paper
-take one plotting compass and place it at one end of the pole.
-make a mark at the tail of the compass arrow and at the tip of the compass arrow.
-move the plotting compass so that the tail of the arrow is on the point where the tip h
been previously marked.
-repeat this procedure until a curve is drawn.

NB. A compass follows the magnetic field lines, with its north pointing to the magnet
south.

---

13. **(a)** **(i)** -deflection of the galvanometer

(ii) -when the switch is closed, there is a change of magnetic flux cutting.

Scanned with CamScanner

-Current/voltage is induced in the inner coil.

(iii) **1.** –increase current or voltage

2. –decrease current or voltage

(b) **(i)** -when a filament is heated by a high potential difference supply, electrons are emitted
-they are accelerated by the anode and they pass through the slit.
-using Fleming's left hand rule, they move towards P due to the effect of the field produced by the magnet.

(ii) -more electrons will pass through the slit
-some electrons will go straight to the screen

Scanned with CamScanner

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

PHYSICS 5055/1

PAPER 1 Multiple Choice

NOVEMBER 2016 SESSION 1 hour

Additional materials:
- Multiple Choice answer sheet
- Soft clean eraser
- Soft pencil (type B or HB is recommended)
- Electronic calculator and/or Mathematical tables

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Do not open this booklet until you are told to do so.
Write your name, Centre number and candidate number on the answer sheet in the spaces provided unless this has already been done for you.

There are **forty** questions in this paper. Answer **all** questions. For each question, there are four possible answers, **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice in **soft pencil** on the separate answer sheet.

Read very carefully the instructions on the answer sheet.

INFORMATION FOR CANDIDATES

Each correct answer will score **one** mark. A mark will **not** be deducted for a wrong answer.

Any rough working should be done in this booklet.

This question paper consists of 16 printed pages.

Copyright: Zimbabwe School Examinations council, N2016.

©ZIMSEC N2016

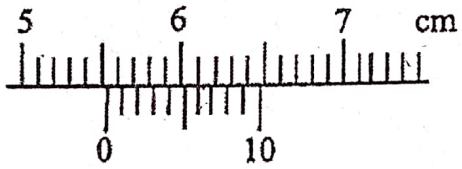
[Turn over

Scanned with CamScanner

1 What instrument is used to measure velocity at an instant?

A speedometer
B odometer
C clock
D c.r.o

2 The diagram shows a measurement on a vernier callipers.



The reading shown is

A 5.55 cm.
B 5.56 cm.
C 5.60 cm.
D 6.00 cm.

3 A uniform metal rod is heated evenly along its length.

Which statement is correct?

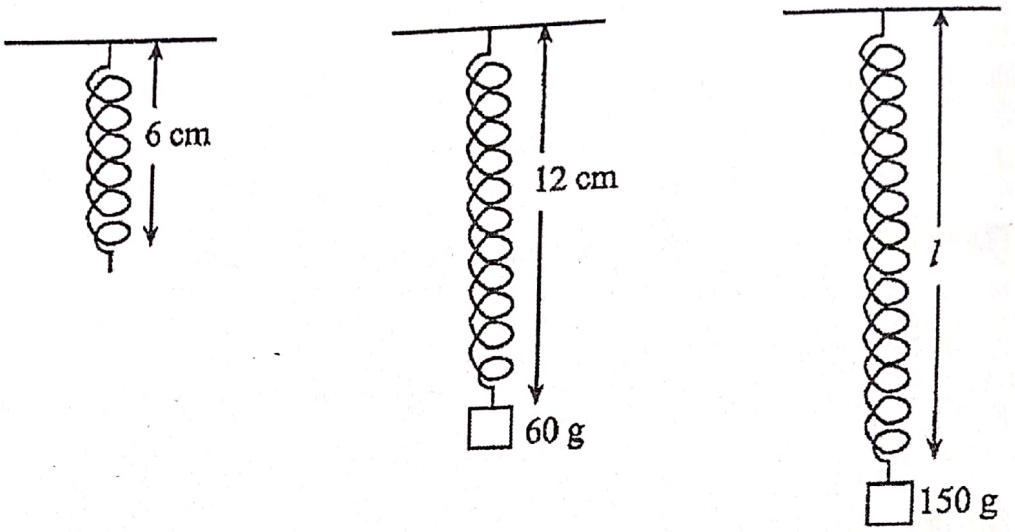
A Its mass decreases.
B Its mass increases.
C Its density decreases.
D Its density increases.

4 The acceleration of an object falling with terminal velocity is

A zero.
B constant.
C decreasing.
D increasing.

Scanned with CamScanner

5 Objects of different masses were hung on a spring as shown.



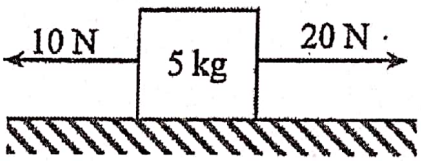
What is the length, *l*, if the spring obeys Hooke's law?

A 15 cm
B 21 cm
C 30 cm
D 36 cm

6 Which statement about the effect of a force on an object is **incorrect**?

A It changes the mass of the object.
B It changes the length of the object.
C It changes the shape of the object.
D It changes the direction of the motion of the object.

7 The diagram shows two forces acting on an object.

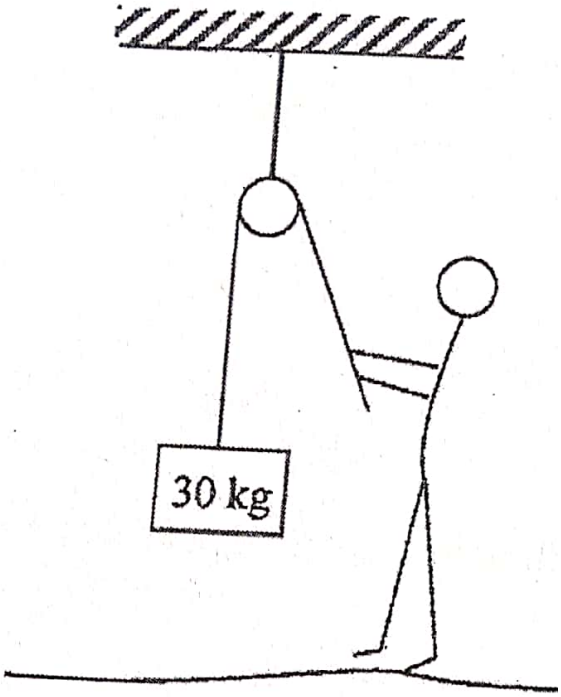


What is true about the motion of the object?

A speed is 2 ms^{-1}
B speed is 4 ms^{-1}
C acceleration is 2 ms^{-2}
D acceleration is 4 ms^{-2}

Scanned with CamScanner

supports a mass of 30 kg.

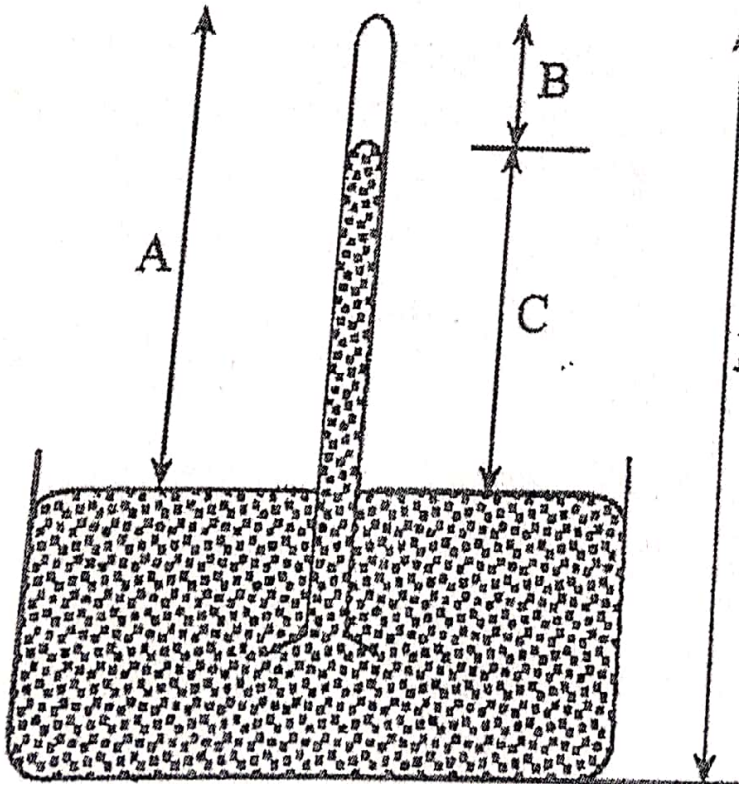


What is the resultant force acting on the mass?

A	0 N
B	10 N
C	30 N
D	300 N

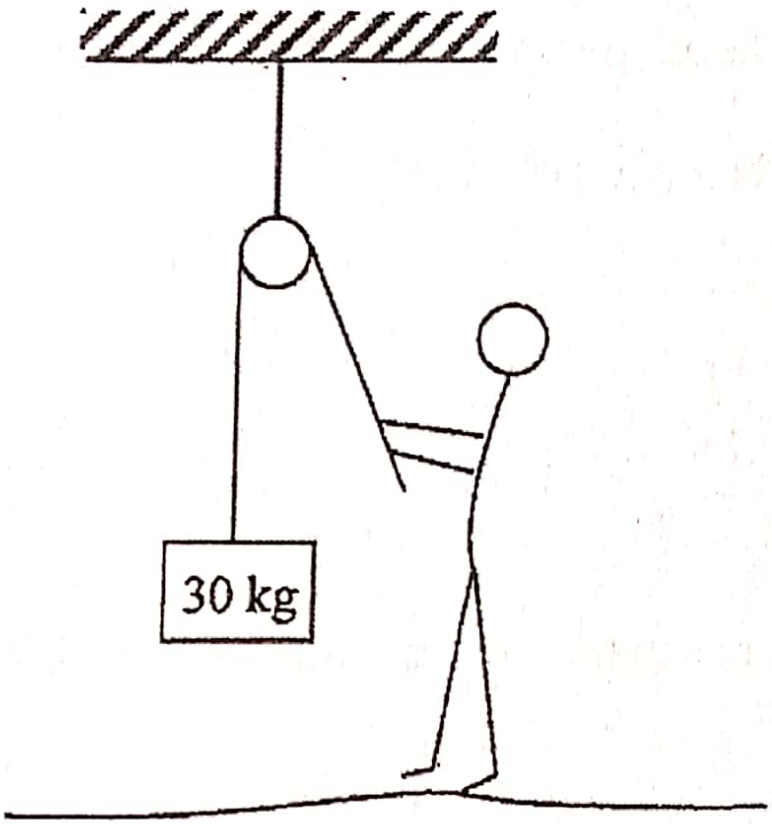
The diagram shows a mercury barometer.

Which length, **A**, **B**, **C** or **D** corresponds to the atmos



Scanned with CamScanner

ɔorts a mass of 30 kg.



nt force acting on the mass?

; a mercury barometer.

Scanned with CamScanner

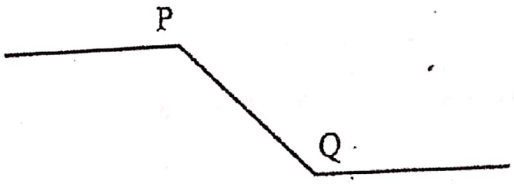
10 In a nuclear power station, 0.25 kg of uranium was all changed into nuclear energy.

What was the amount of energy produced?

[the speed of light is 3.0×10^8 m/s]

A 2.25×10^{18} J
B 2.25×10^{16} J
C 7.50×10^{10} J
D 7.50×10^{7} J

11 A boy slides down a rough plane from a point of rest P to stop at point Q.

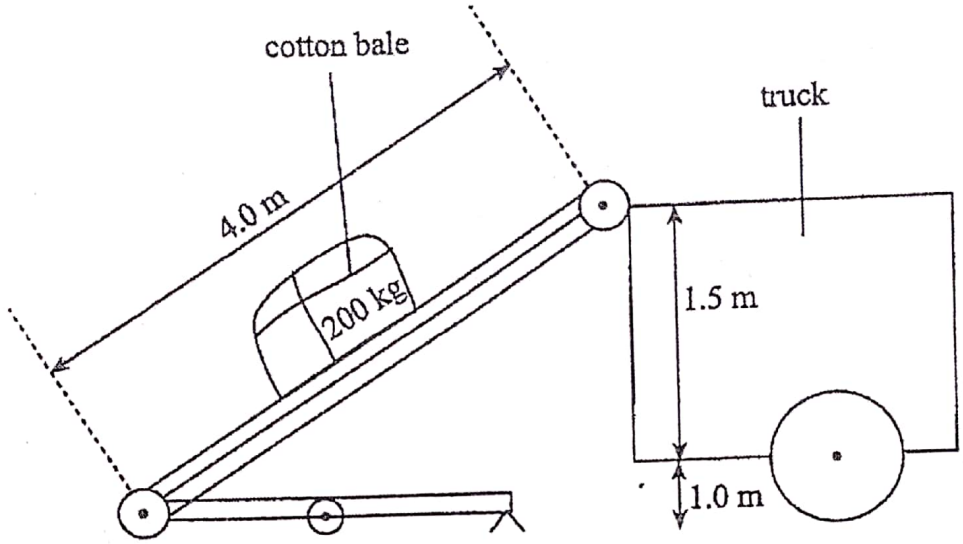


The energy changes for the boy between P and Q are

A potential → heat → kinetic.
B potential → kinetic → heat.
C kinetic → potential → heat.
D kinetic → heat → potential.

Scanned with CamScanner

12 The diagram shows an electrically powered elevator used to lift bales of cotton into a truck. The elevator takes 30 s to lift one bale of mass 200 kg into the truck ($g = 10\ ms^{-2}$).



What is the power developed by the elevator?

A 267 W
B 167 W
C 100 W
D 67 W

13 Which force must be overcomed when ice changes from solid to liquid?

A The force between electrons and nucleus.
B The force between the atoms in a molecule.
C The force between molecules.
D The force of gravity.

14 Which statement about evaporation is true?

A Evaporation takes place only within the liquid.
B Evaporation takes place only at a fixed temperature.
C Evaporation takes place only at the surface.
D Evaporation takes place only at a fixed pressure.

15 Which design features should a clinical thermometer have?

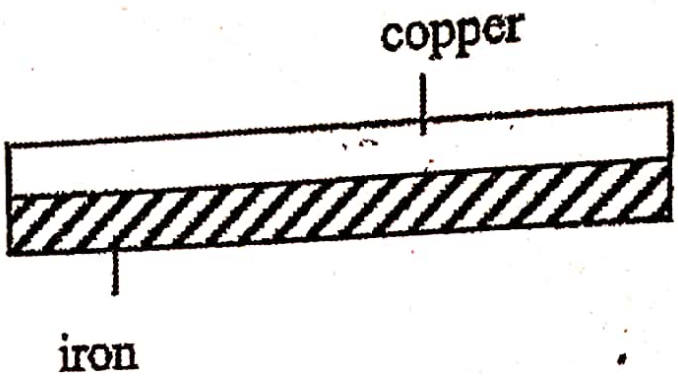
A thick glass bulb and a narrow bore
B thick glass bulb and a wide bore
C thin glass bulb and a narrow bore
D thin glass bulb and a wide bore

Scanned with CamScanner

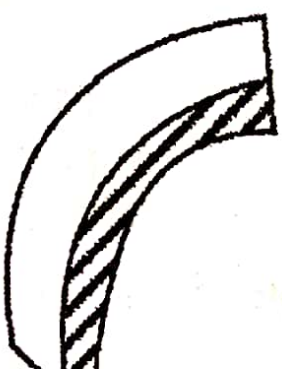
7

is needed to raise the temperature of 5 kg of a substance by 20 °C?
apacity of substance is 300 J/kg/°C]

ows a bimetallic strip made of copper and iron at 25 °C.



correctly shows the bimetallic strip when placed at a
about – 4 °C, given that copper has a higher rate of thermal expansion than



B

Scanned with CamScanner

18 The speed of a water wave is best described by the distance

A between successive troughs.
B between crest and trough.
C a particle moves up and down in one second.
D a wave front moves in one second.

19 Which row is correct about wave speed and frequency when a wave moves from a deep end to a shallow end?

	wave frequency	wave speed
A	changes	changes
B	changes	unchanged
C	unchanged	changes
D	unchanged	unchanged

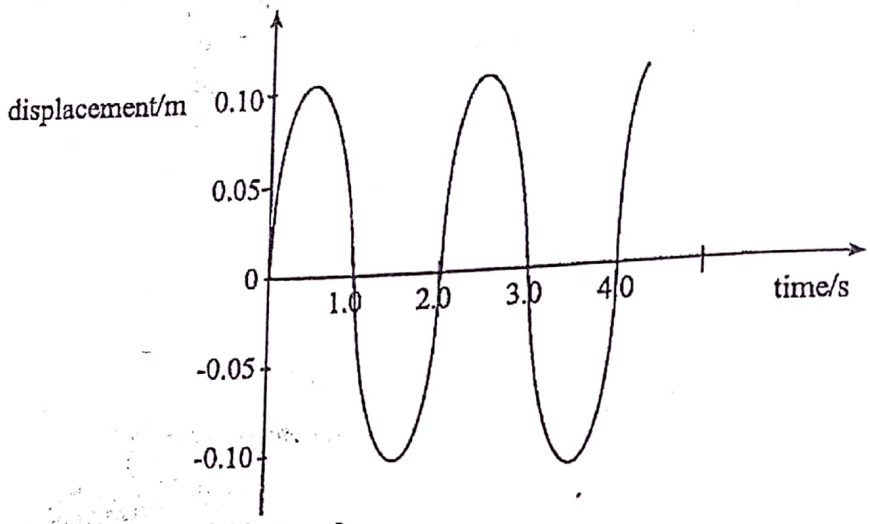
20 A ship transmits ultrasonic waves into the sea of depth 2 500 m and receives an echo 5 seconds later.

What is the speed of ultrasonic sound in water?

A $250\ ms^{-1}$
B $330\ ms^{-1}$
C $500\ ms^{-1}$
D $1000\ ms^{-1}$

Scanned with CamScanner

21 The diagram shows how displacement varies with time as the wave passes a fixed point.

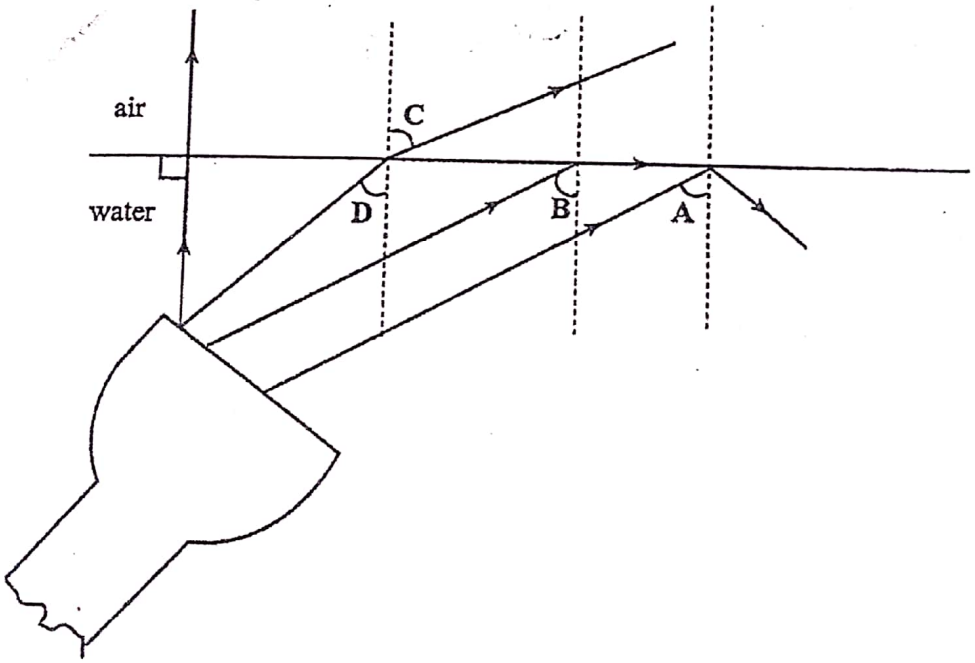


What is the frequency of this wave?

A 0.25 Hz
B 0.50 Hz
C 1.0 Hz
D 2.0 Hz

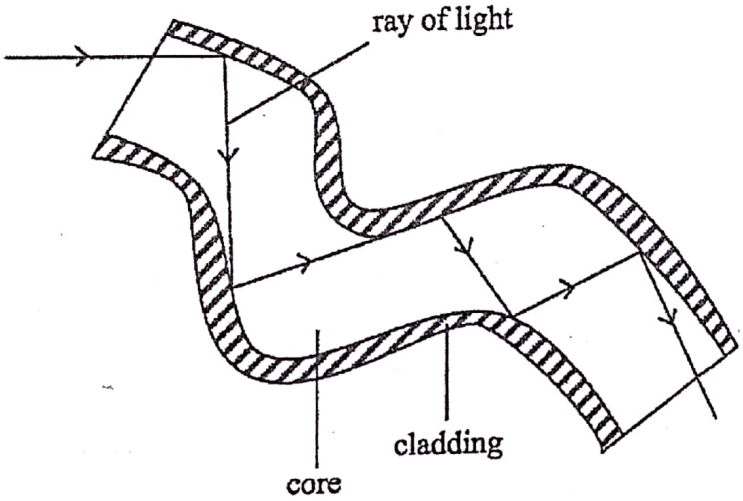
22 The diagram shows four rays of light from a torch below the surface of water.

Which angle, **A**, **B**, **C** or **D**, is the critical angle?



Scanned with CamScanner

23 The diagram shows an optical fibre.



Which statement best explains why the ray is trapped in the fibre?

A The refractive index of the core is zero.
B The refractive index of the core equals that of the cladding.
C The refractive index of the core is less than that of the cladding.
D The refractive index of the core is greater than that of the cladding.

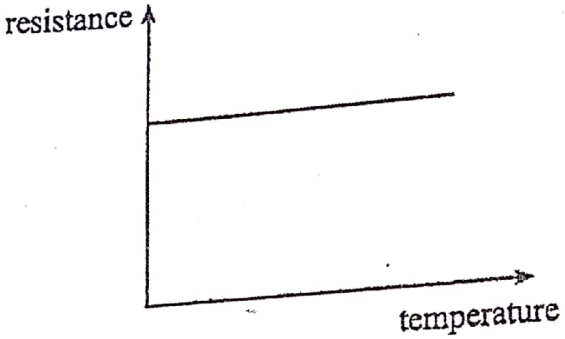
24 An electrical quantity defined as "the energy converted by a source in driving a unit charge round a complete circuit" is the

A current.
B electromotive force.
C potential difference.
D power.

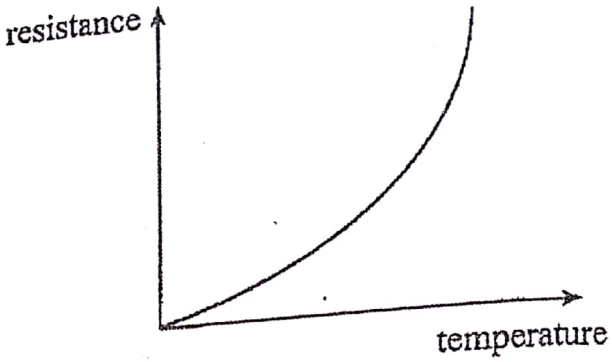
Scanned with CamScanner

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

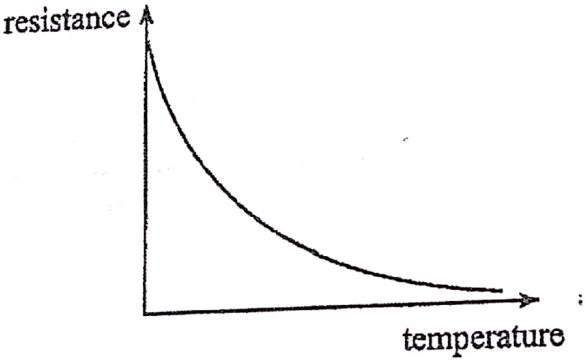
A



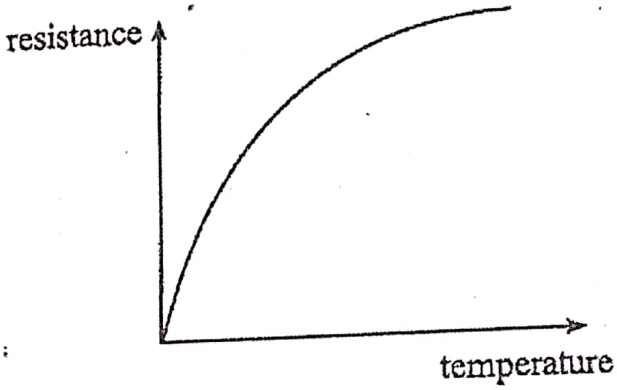
B



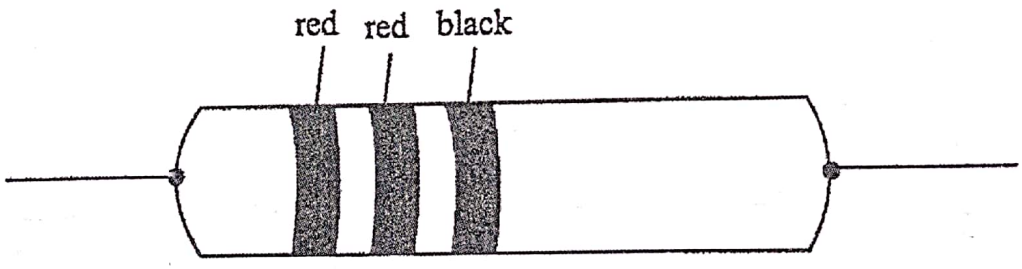
C



D



26 The diagram shows a carbon resistor.



What is the resistance of the resistor?

A 22 Ω
B 220 Ω
C 2 200 Ω
D 22 000 Ω

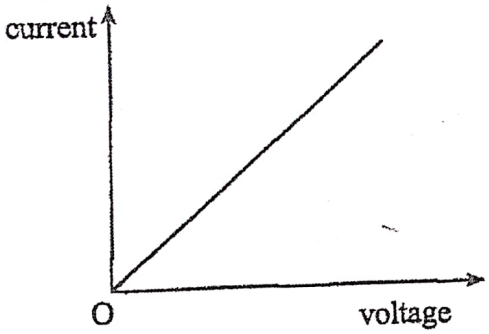
Scanned with CamScanner

27 How much charge flows through a 100 W heater when 10 A is allowed to flow for 5 minutes?

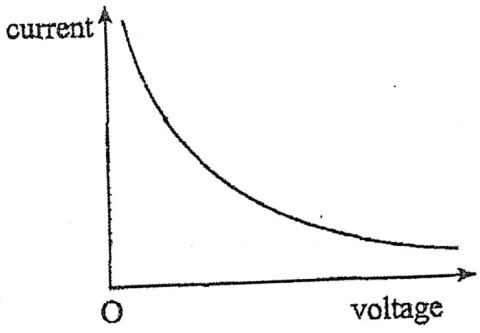
A 0.5 C
B 2 C
C 50 C
D 3 000 C

28 Which graph shows how the current changes when the voltage across an ohmic conductor is varied?

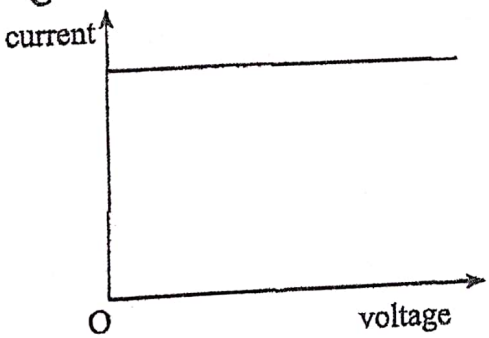
A



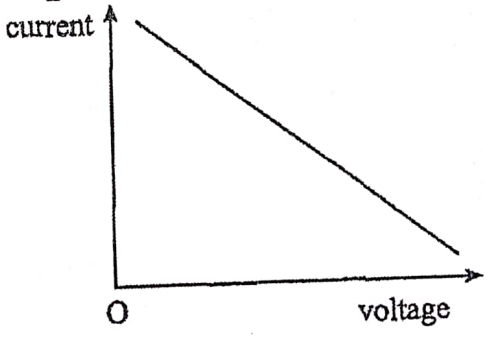
B



C

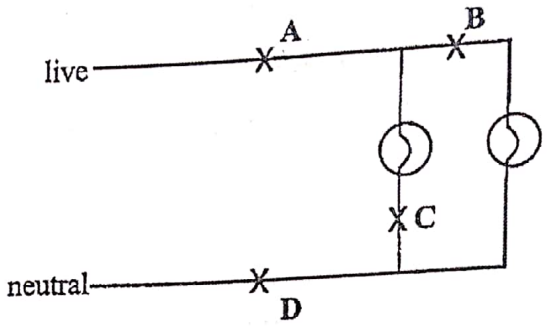


D



Scanned with CamScanner

29 Which is the best switch position in order to turn off both lamps?



30 Which statement about an electrical appliance with double insulation is correct?

A It has no earth wire connected.
B It has an earth wire connected.
C It has a metal casing.
D It has high risk of shock.

31 Overheating in electrical cables can be minimised by using

A thinner cables.
B thicker cables.
C thinner insulation.
D thicker insulation.

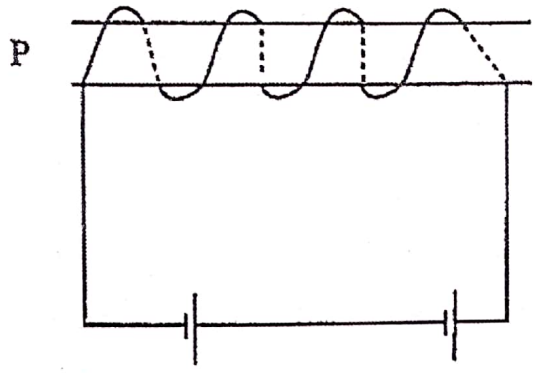
32 An electric heater is rated 3 kW. Electrical energy costs 0.1 c per kWh.

What is the cost of using the heater for 5 hours?

A 0.5 c
B 1.5 c
C 15 c
D 150 c

Scanned with CamScanner

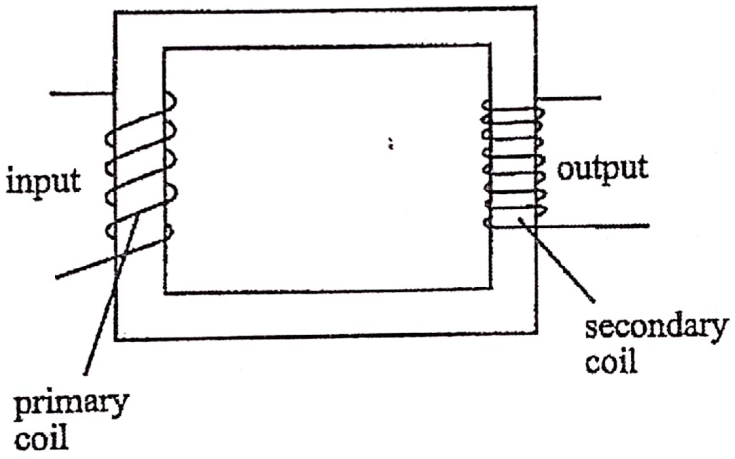
33 The diagram shows a solenoid connected to a constant d.c supply.



Which statement about end P is correct?

A It is positive.
B It is negative.
C End P is the north pole.
D End P is the south pole.

34 The diagram shows a transformer.



Which statement, about the transformer, is correct?

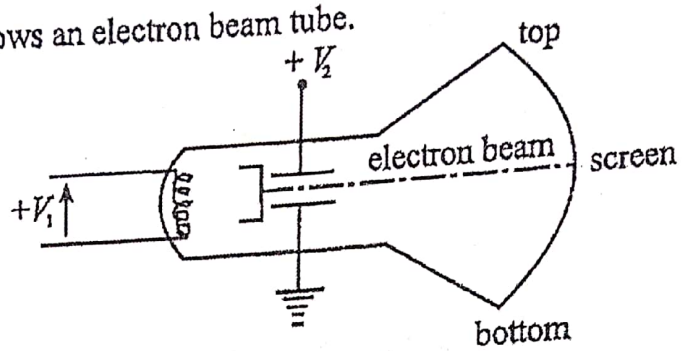
A The input is direct current.
B The input current is greater than the output current.
C The input current is less than the output current.
D The input current is the same as the output current.

35 Which particle does **not** experience a force in an electric field?

A neutron
B proton
C electron
D alpha particle

Scanned with CamScanner

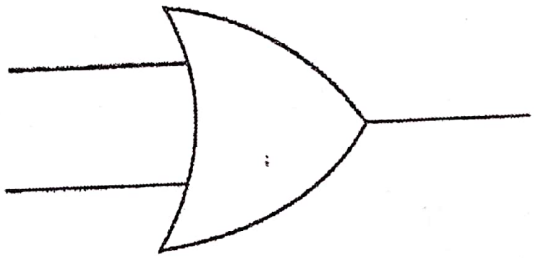
36 The diagram shows an electron beam tube.



Which change in voltage results in the position of the spot on the screen moving towards the top?

A decreasing V_1
B decreasing V_2
C increasing V_1
D increasing V_2

37 The diagram shows a logic gate.



The logic gate is

A OR.
B NOR.
C NAND.
D AND.

38 The radioactive nucleus, $^{226}_{88}Ra$, decays with the emission of a β particle.

How many protons and neutrons are left in the nucleus?

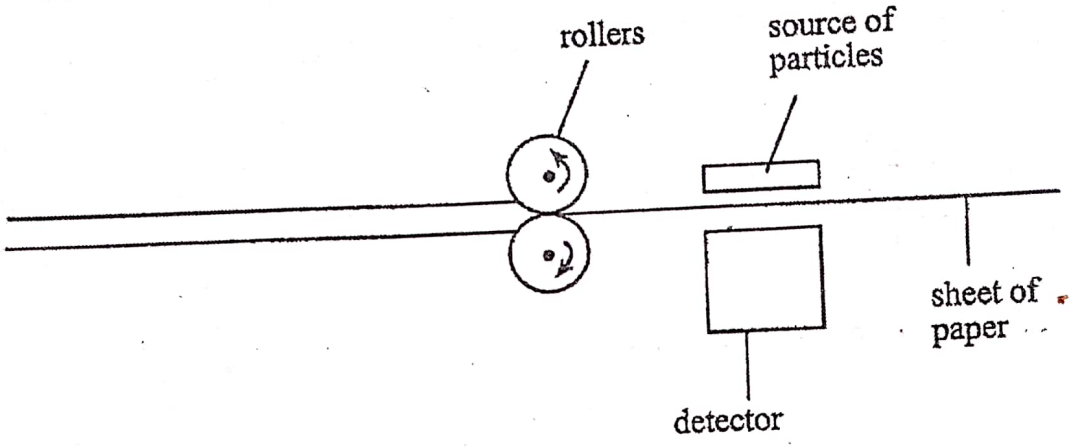
	protons	neutrons
A	88	137
B	88	138
C	89	137
D	89	226

Scanned with CamScanner

39 The count-rate from a radioactive source of half-life 1.0 minutes falls from 400 to 50 in

A $\frac{1}{3}$ minutes.
B 1 minute.
C 3 minutes.
D 8 minutes.

40 The diagram shows apparatus to determine the thickness of paper.



A source of alpha-particles is **not** suitable because alpha particles

A are all stopped by the paper.
B are too dangerous to those working nearby.
C have a short half-life.
D make the paper radioactive.

Scanned with CamScanner

ZIMBABWE SCHOOL EXAMINATION COUNCIL

General Certificate of Ordinary Level

EXPECTED ANSWERS

PHYSICS	NOVEMBER 2016	5055/1

1	A
2	B
3	C
4	A
5	B
6	A
7	C
8	A
9	C
10	B
11	B
12	B
13	C
14	C
15	C
16	D
17	C
18	D
19	C
20	D

21	B
22	B
23	D
24	B
25	C
26	B
27	D
28	A
29	A
30	A
31	B
32	B
33	D
34	C
35	A
36	D
37	A
38	C
39	C
40	A

Scanned with CamScanner

Surname	Forename(s)	Centre Number	Candidate Number

For Performance Measurement

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

PHYSICS

5055/2

PAPER 2 Theory

NOVEMBER 2016 SESSION

1 hour 45 minutes

Candidates answer on the question paper.
Additional materials: Electronic calculator and/or Mathematical tables

Allow candidates 5 minutes to count pages before the examination

This booklet should not be punched or stapled and pages should not be removed.

TIME 1 hour 45 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page and Centre number and candidate number on top of the right corner of every page of this paper. Check if the booklet has all the pages and ask the invigilator for a replacement if there are duplicate or missing pages.

Section A

Answer **all** questions.
Write your answers in the spaces provided on the question paper.

Section B

Answer any **two** questions.
Write your answers on the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

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

This question paper consists of 18 printed pages.

Copyright: Zimbabwe School Examinations Council, N2016.

[Turn over

©ZIMSEC N2016

Scanned with CamScanner

Section A

Answer all questions in this section.

1 **Fig. 1.1** represents the motion of cyclists, **P** and **Q**, travelling along a straight path in the same direction.

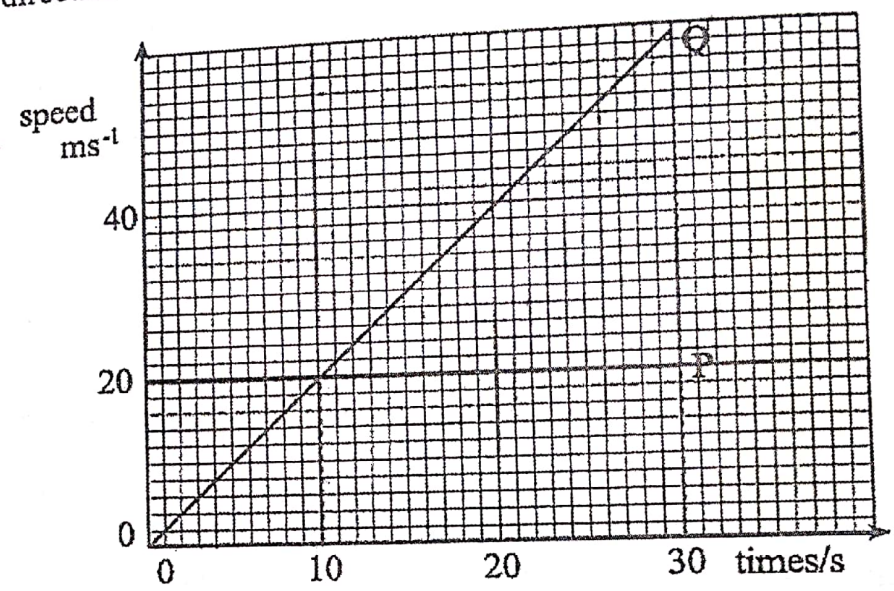


Fig. 1.1

(a) Calculate

(i) the distance travelled by **P** in the first 10 s,

distance = _____ [1]

(ii) the acceleration of **Q**,

acceleration = _____ [1]

Scanned with CamScanner

1 (a) (iii) the distance covered by Q in the first 10 s.

distance = _____ [1]

(b) Q catches up with P when the cyclists would have travelled the same distance from $t = 0$.

Calculate the

(i) speed of Q at the time of overtaking P,

speed = _____ [2]

(ii) time at which Q overtakes P,

time = _____ [1]

(iii) distance covered by each cyclist at this time.

distance = _____ [1]

Scanned with CamScanner

2 The sun produces energy from a nuclear fusion reaction.

(a) Explain what is meant by *nuclear fusion*.

[2]

(b) State Einstein's mass-energy equivalence formula and define each symbol in it.

[2]

(c) Determine the decrease in the mass of the sun when it releases 1.8×10^6 J.

mass decrease = _____ [2]

3 Explain the following observations:

(i) the pressure inside a ball increases as air is pumped into it

[2]

Scanned with CamScanner

3 (ii) the pressure in a ball decreases when the ball is left outside overnight

_____

_____

_____ [2]

4 Refraction of light occurs when it passes from one medium to another.

(a) (i) Explain the term *refraction*.

_____

_____

_____ [1]

(ii) State the condition in which light would pass through a boundary unrefracted?

_____

_____ [1]

Scanned with CamScanner

4 (b) Fig. 4.1 shows wave fronts of light incident on a water-glass boundary.

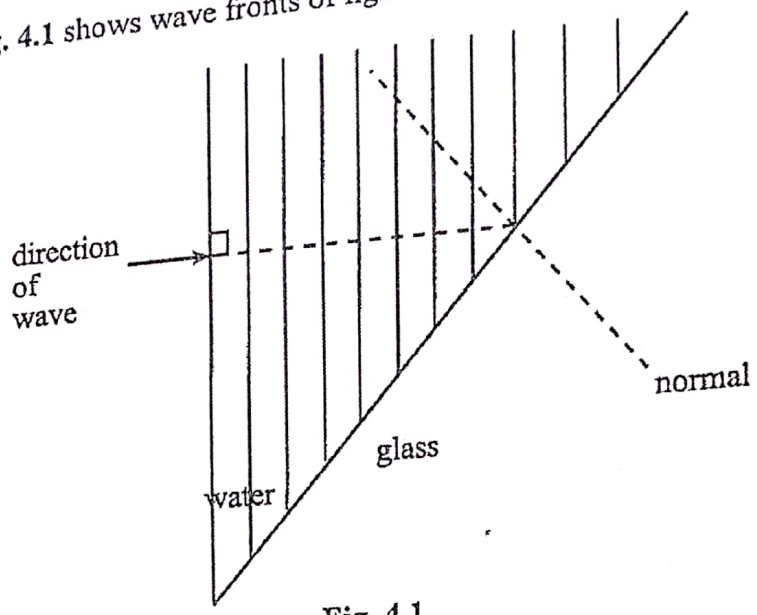


Fig. 4.1

Complete the diagram to show the wave fronts and the direction of travel in the glass block. [3]

5 (a) A light bulb is labelled 240 V; 60 W.

Calculate the

(i) current that flows through the bulb when it is on,

current = _____ [1]

(ii) charge that flows through the bulb in one minute,

charge = _____ [2]

Scanned with CamScanner

5 (a) (iii) resistance of the bulb.

resistance = _____ [1]

(b) Three bulbs similar to those in (a) are then connected as shown in **Fig. 5.1.**

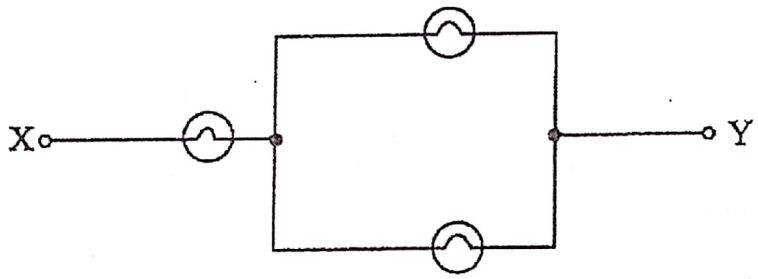


Fig. 5.1

Calculate the resistance between points X and Y.

resistance = _____ [2]

Scanned with CamScanner

6 (a) State

(i) any **three** effects of electricity,

1. _____

2. _____

3. _____ [3]

(ii) the commercial unit of electrical energy.

_____ [1]

(b) A 2 000 W electric kettle was used three times daily to boil a fixed mass of water. It takes an average of 5 minutes to boil the water.

(i) Determine the amount of electrical energy used in a 30 day month.

amount = _____ [2]

(ii) Calculate the cost of using the kettle per month if the cost per unit is 10 c.

cost = _____ [1]

Scanned with CamScanner

Centre Number	Candidate Number

7 Fig. 7.1 shows a current-voltage graph for an electronic device.

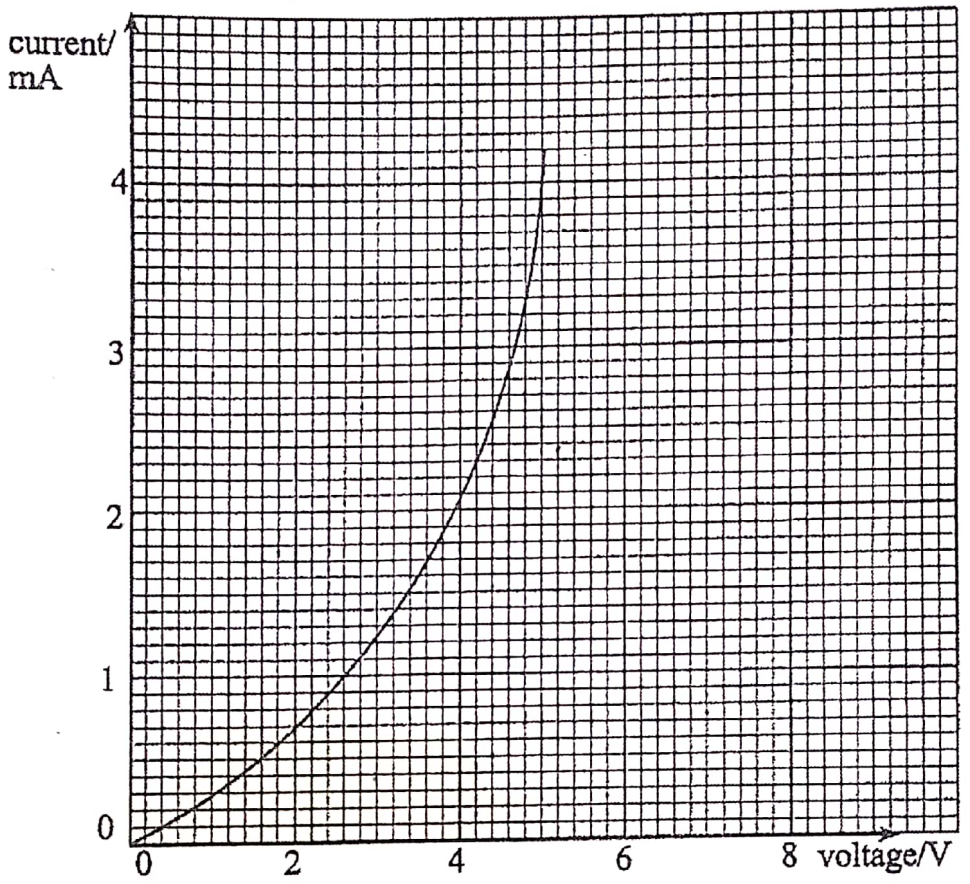


Fig. 7.1

(a) Comment on the resistance of the device.

_____

_____ [1]

Scanned with CamScanner

7 (b) Calculate the resistance of the device when the voltage is 4.8 V.

resistance _____ [2]

(c) Suggest a suitable identity of this device.

_____ [1]

8 **Fig. 8.1** and **Fig. 8.2** show a burglar alarm operated by a reed switch.

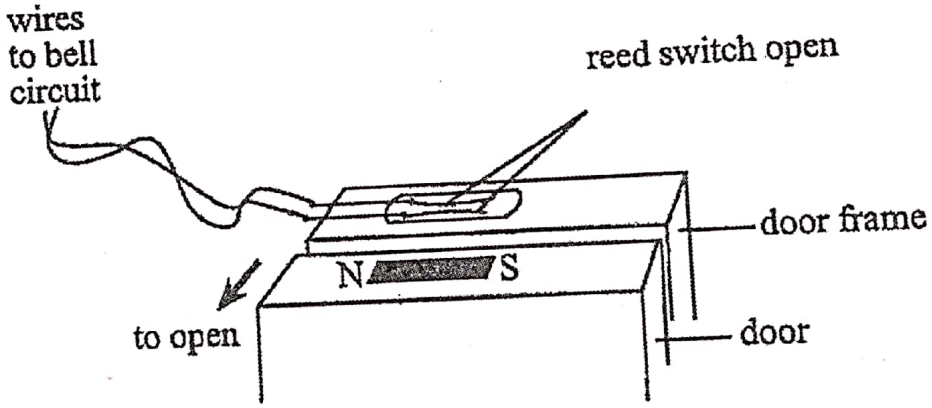


Fig. 8.1

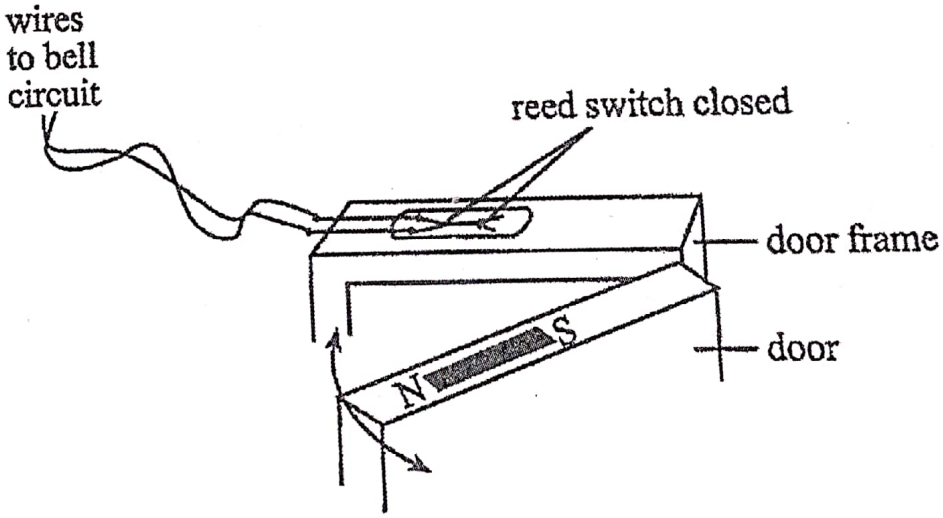


Fig. 8.2

(a) Name the material used to make reeds.

_____ [1]

Scanned with CamScanner

8 (b) Explain

(i) why the reed switch contacts are open in **Fig. 8.1.**

_____

_____ [2]

(ii) how, by opening the door, the burglar alarm is activated.

_____

_____

_____ [3]

Scanned with CamScanner

Section B

Answer any two questions from this section.

9 (a) (i) Draw a ray diagram to illustrate the formation of a virtual image of an object by a thin converging lens. Mark optical centre, C, and the principal focus, F, of the lens.

[3]

(ii) Name, with a reason, an instrument that makes use of such an arrangement.

_____

_____ [2]

Scanned with CamScanner

9 (b) Describe an experiment to determine the speed of sound in air.

[5]

(c) A fishing boat using sonar to detect a shoal of fish emits a short pulse of sound and detects the echo from the shoal 0.1 s later. The sound travels through sea water at 1 500 ms^{-1}.

(i) Calculate the depth of the shoal of fish.

depth = [2]

(ii) Suggest a reason why several echoes are detected.

[1]

(iii) State **two** changes that would be observed when the sonar emits sound of lower amplitude and higher frequency.

[2]

Scanned with CamScanner

10 (a) State the charge and nature of each of the **three** types of emission from radioactive sources.

[6]

(b) A radioactive radium isotope of half-life 15 days, decays to an isotope of actinium as follows:

$$^{225}_{88}\mathrm{Ra} \rightarrow {}^{225}_{89}\mathrm{Ac} + \mathbf{X}$$

(i) Name the particle **X** and state the proton and nucleon numbers of the actinium isotope.

[3]

Scanned with CamScanner

10 (b) (ii) Sketch a decay curve for a sample of the radium isotope, with N atoms, over a period of 60 days.

[3]

(iii) State the fraction of N left at the end of the 60 days.

fraction = _____ [1]

(c) State **two** reasons why iodine-131, a beta-emitter with a half life of 2 hours, is used for medical purposes.

_____

_____ [2]

Scanned with CamScanner

Centre Number	Candidate Number

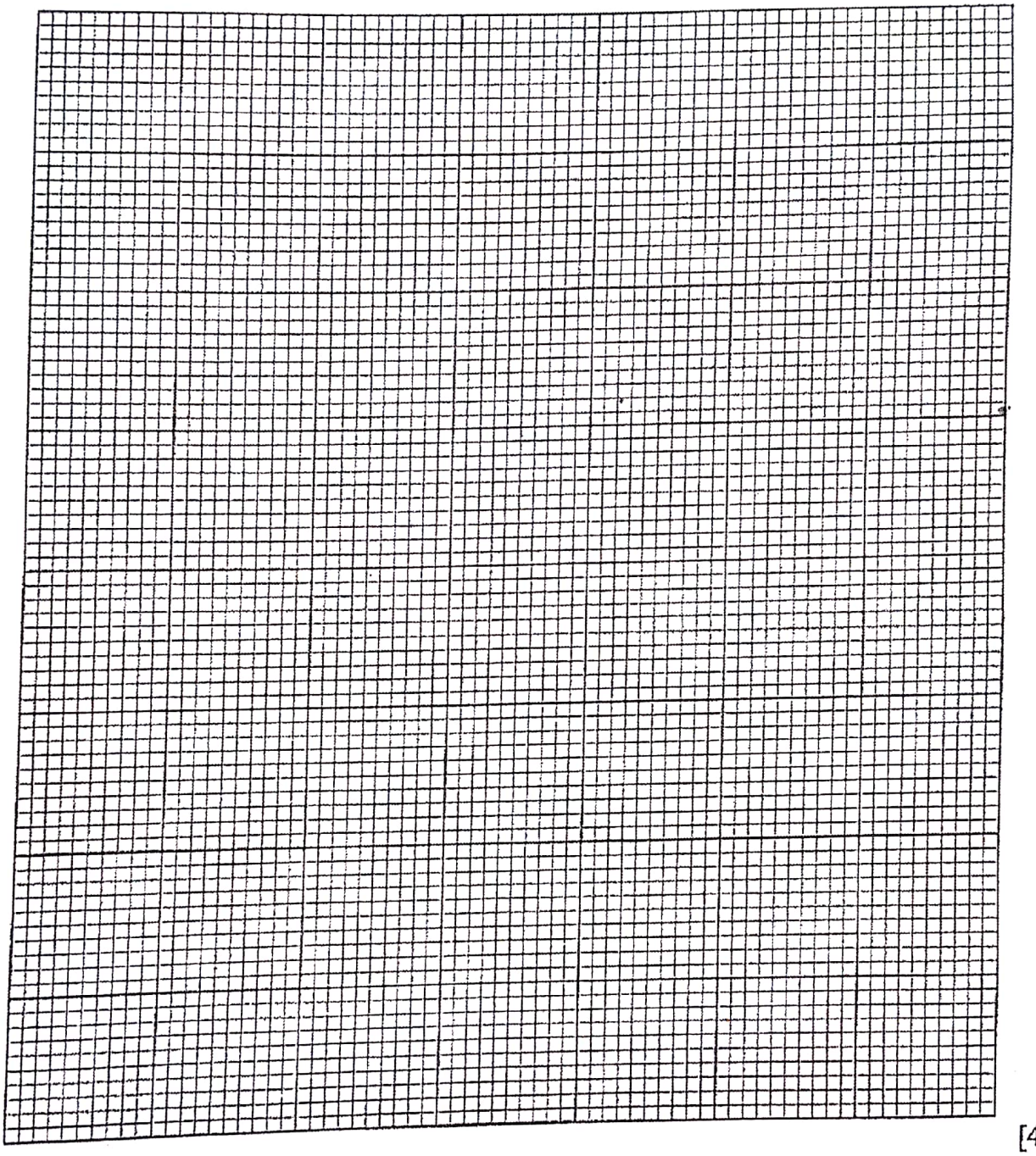
11 (a) (i) In an experiment to investigate the behaviour of a spring under a force, the following measurements were obtained.

mass hung from spring (g)	0	100	200	300	400	500	600	700	800
stretching force (N)									
length of spring (mm)	60	72	84	96	108	120	132	150	180
extension (mm)									

Complete the table. [4]

Scanned with CamScanner

11 (a) (ii) Plot a graph of stretching force against extension.



[4]

(iii) Indicate, with a letter E on the graph, the limit of proportionality. [1]

Scanned with CamScanner

11 (a) (iv) Deduce the relation between stretching force and extension of the string.

_____

_____ [2]

(v) Suggest a value for the length of the spring after all the masses have been removed.

_____

_____ [1]

(b) State the property on which each thermometer depends.

(i) a liquid-in-glass thermometer _____

(ii) a thermocouple thermometer _____ [2]

(c) Give **one** advantage of a thermocouple thermometer over a liquid-in-glass thermometer.

_____

_____ [1]

Scanned with CamScanner

ZIMBABWE SCHOOL EXAMINATION COUNCIL

General Certificate of Education Ordinary Level

EXPECTED ANSWERS

NOVEMBER 2016

PHYSICS **4023/2**

Scanned with CamScanner

1. (a) (i) $Distance = 10 \times 20 = 200m$

(ii) $a = \frac{v-u}{t} = \frac{20}{10}$

$= 2ms^{-2}$

(iii) $= \frac{1}{2} \times 20 \times 10 = 100m$

(b) (i) $Distance\ travelled\ by\ P = 20 \times t = 20t$

$Distance\ travelled\ by\ Q = \frac{1}{2} \times bh$

$= \frac{1}{2} t \times v$

$but\ \frac{1}{2} t \times v = 20t$

$\boldsymbol{v = 20m/s}$

(iii) $20 \times 20 = 400m$

---

2. (a) -the joining of two unstable nuclei to form a stable nucleus.

(b) $\boldsymbol{E = mc^2}$ where $\boldsymbol{E}$ is the energy, $\boldsymbol{m}$ is the mass and $\boldsymbol{c}$ is the speed of light in a vacuum.

(c) $m = \frac{1.8 \times 10^6}{(3 \times 10^8)^2}$

$\boldsymbol{= 2 \times 10^{-11} kg}$

---

3. (i) -the force exerted by air molecules per unit area increases.
-number of air molecules increases
-number of collisions per unit area increases

(ii) -temperature decreases, therefore the rate of collision of particles inside the ball increases.

Scanned with CamScanner

1. (a) (i) $Distance = 10 \times 20 = 200m$

(ii) $a = \frac{v-u}{t} = \frac{20}{10}$

$= 2ms^{-2}$

(iii) $= \frac{1}{2} \times 20 \times 10 = 100m$

(b) (i) $Distance\ travelled\ by\ P = 20 \times t = 20t$

$Distance\ travelled\ by\ Q = \frac{1}{2} \times bh$

$= \frac{1}{2} t \times v$

$but\ \frac{1}{2} t \times v = 20t$

$\boldsymbol{v = 20m/s}$

(iii) $20 \times 20 = 400m$

---

2. (a) -the joining of two unstable nuclei to form a stable nucleus.

(b) $\boldsymbol{E = mc^2}$ where $\boldsymbol{E}$ is the energy, $\boldsymbol{m}$ is the mass and $\boldsymbol{c}$ is the speed of light in a vacuum.

(c) $m = \frac{1.8 \times 10^6}{(3 \times 10^8)^2}$

$\boldsymbol{= 2 \times 10^{-11} kg}$

---

3. (i) -the force exerted by air molecules per unit area increases.
-number of air molecules increases
-number of collisions per unit area increases

(ii) -temperature decreases, therefore the rate of collision of particles inside the ball increases.

Scanned with CamScanner

4. **(a) (i)** -the bending of light as it passes through different medium of different optical density.

(ii) -when the boundary has the same refractive index, or passes through the normal

(b) -Ray drawn at right angle to the wave fronts
-Ray moves towards the normal
-wave fronts must be close together

---

5. **(a) (i)** $P = IV$

$$I = \frac{60}{240}$$

$$= \mathbf{0.25A}$$

(ii) $Q = It$

$$= 0.25 \times 60$$

$$= \mathbf{15C}$$

(iii) $P = \frac{V^2}{R}$

$$= \frac{240^2}{60}$$

$$= \mathbf{960\Omega}$$

(b) $Effective\ resistance = 960 + \frac{960 \times 960}{960+9}$

$$= \mathbf{1\,440\Omega}$$

---

6. **(a) (i) 1.** Heating
2. Lighting
3. Magnetic

Scanned with CamScanner

(ii) Kilowatt hour

(b) (i) $E = Pt$

$= 2\,000 \times \frac{5\times3\times30}{60}$

$= \mathbf{15\ KWhr}$

(ii) $15\ KWhr \times 10\ cents$

=$1.50

---

7. (a) (i) -Resistance is not constant, it increases with an increase in voltage

(ii) -Draw a tangent at $V = 4.8v$

$R = \frac{4.8-3.4}{3.2mA-\ .4mA}$

$= \mathbf{500\Omega}$

---

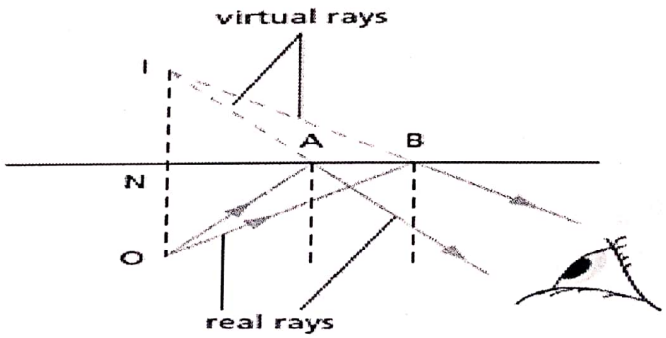
8. (a) -metal reeds/soft iron

(b) (ii) -the metal reeds repel each other because of the presence of the magnetic field

(iii) -when the door is opened, the reeds attract each other thereby completing the circuit.

---

9. (a) (i)



Scanned with CamScanner

(ii) -Magnifying glass, to form an enlarged object

(b) -two pupils to stand at the same distance from a very big wall e.g 100m from the wall.
-the pupils must stand at opposite sides.
-One of them claps hands and immediately upon hearing the sound the other student starts the stop watch.
-the stopwatch is stopped after hearing the sound of an echo from the wall.

$$speed = \frac{2 \times distance}{time}$$

(c) (i)

$$s = \frac{2 \times d}{t}$$

$$d = \frac{1\,500 \times 0.1}{2}$$

$$= \mathbf{75}\boldsymbol{m}$$

---

10. (a) -Alpha – helium nucleus, positively charged
-Beta – an electron, negatively charged
-Gamma – electromagnetic radiation, neutral

(b) (i) - X is a Beta particle

$$- \; Proton\ number = 89, Nucleon\ Number = 225$$

(ii) - correct shape of a decay curve

-X axes clearly labelled and time marked from 0, 15, 30, 45 and 60

-Y axes labelled and number of atoms N marked: N, $\frac{N}{2}, \frac{N}{4}, \frac{N}{8}, \frac{N}{16}$ corresponding to 0, 15, 30, 45 and 60

(iii) $fraction = \frac{1}{16}$

(c) -heals the patient fast, it is quickly removed from the body.

Scanned with CamScanner

(a) **(i)**

Mass/g	0	100	200	300	400	500	600	700	800
Force/N	0	1	2	3	4	5	6	7	8
Length/mm	60	72	84	96	108	120	132	150	180
Extension/mm	0	12	24	36	48	60	72	90	120

(ii) -Labelled axis
-good scale Y axis 1cm to represent 1N, x-axis 1cm to represent 20mm
-correct plotting
-correct shape of the graph, straight from 0 to 72mm and curve from 72mm to 120mm

(iii) -E marked at 72mm

(iv) -Force is directly proportional to extension from 0mm to 72mm. And after 72mm it is not directly proportional to the extension.
-a small increase in force gives a greater increase in extension.

(b) **(i)** -length of liquid column

(ii) -potential difference between the two junctions

(c) -is more sensitive
-can measure rapidly changing temperature
-can measure a wider ranger

Scanned with CamScanner

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

5055/1

PHYSICS

PAPER 1 Multiple Choice

1 hour

NOVEMBER 2017 SESSION

Additional materials:
- Multiple Choice answer sheet
- Soft clean eraser
- Soft pencil (type B or HB is recommended)
- Electronic calculator and/or Mathematical tables

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Do not open this booklet until you are told to do so.
Write your name, Centre number and candidate number on the answer sheet in the spaces provided unless this has already been done for you.

There are **forty** questions in this paper. Answer **all** questions. For each question there are four possible answers, **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice in **soft pencil** on the separate answer sheet.

Read very carefully the instructions on the answer sheet.

INFORMATION FOR CANDIDATES

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

This question paper consists of 20 printed pages.

Copyright: Zimbabwe School Examinations council, N2017.

[Turn over

©ZIMSEC N2017

Scanned with CamScanner

1 Which physical quantity is a scalar quantity?

A force
B acceleration
C weight
D pressure

2 Which instrument is most suitable for measuring a length of 2.100 cm?

A micrometer screw gauge
B vernier calliper
C tape measure
D ruler

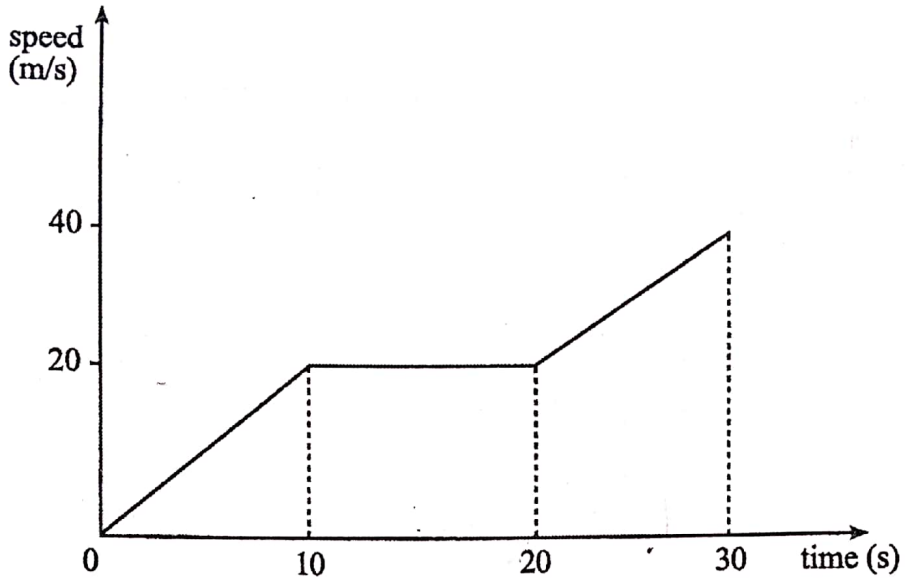
3 A red powder of volume 25 cm^3 and density 0.200 g/cm^3 and a green powder of volume 40 cm^3 and density 0.125 g/cm^3 were mixed to form a yellow powder.

What is the average density of the yellow powder?

A 0.005 g/cm^3
B 0.154 g/cm^3
C 0.163 g/cm^3
D 0.325 g/cm^3

Scanned with CamScanner

4 The graph represents the motion of a body.



The distance travelled in the last 10 seconds is

A 200 m.
B 300 m.
C 400 m.
D 600 m.

5 One hundred identical steel balls each of mass 270 g were immersed in a measuring cylinder containing 200 cm^3 of water. The reading of the water level rose to 500 cm^3.

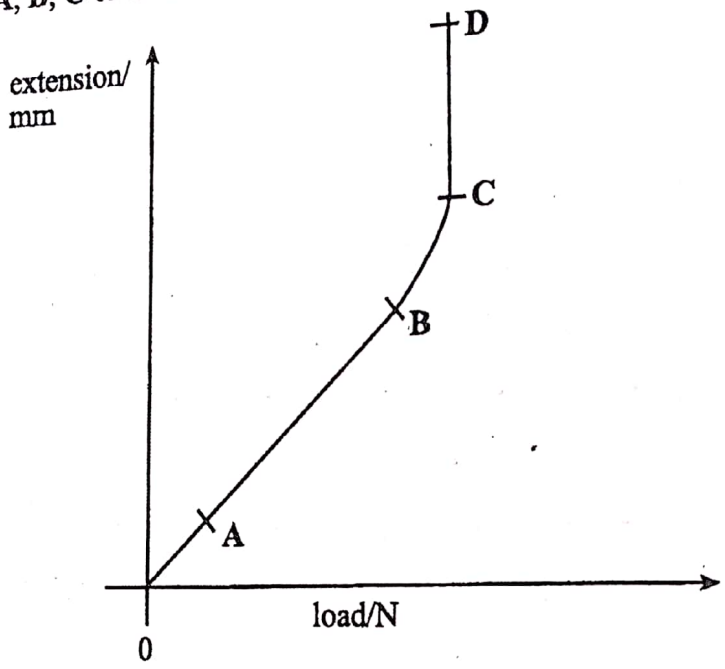
What is the density of one of the steel balls?

A 0.11 g/cm^3
B 0.90 g/cm^3
C 90 g/cm^3
D 130 g/cm^3

Scanned with CamScanner

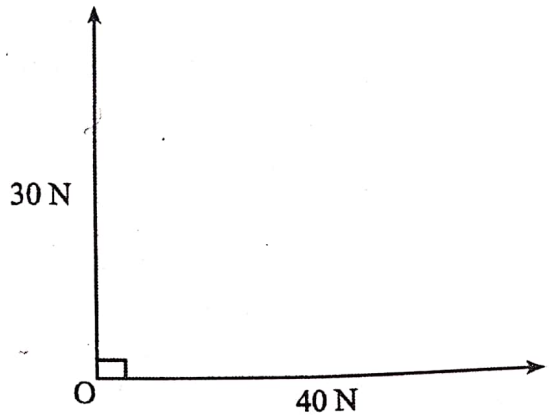
6 The extension-load graph shows the result of increasing the load on a spring.

Which point **A**, **B**, **C** or **D** is the limit of proportionality for the spring?



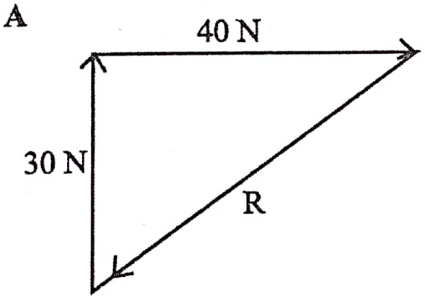
Scanned with CamScanner

7 Forces are acting at a point, O, as shown.

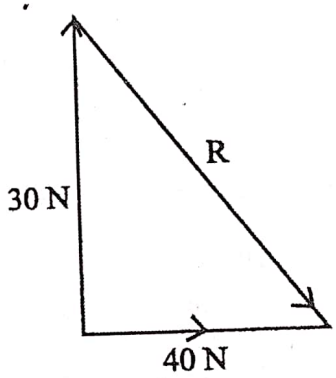


Which diagram can be used to find the resultant R of these two forces?

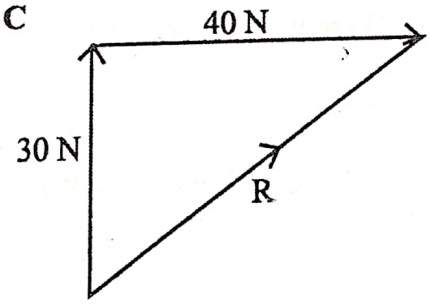
A



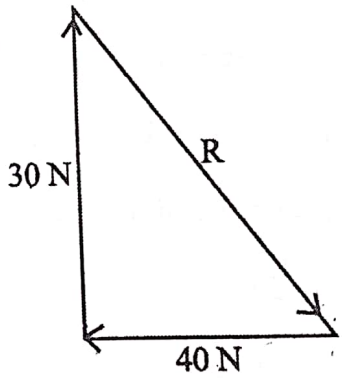
B



C



D



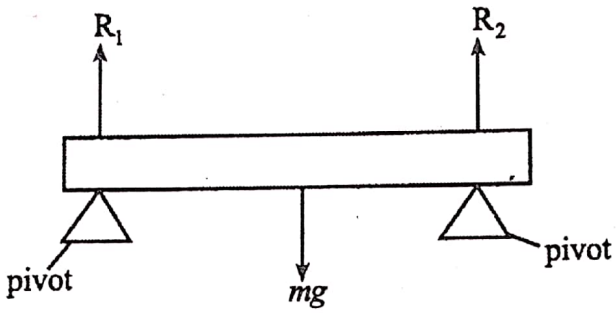
Scanned with CamScanner

8 A body moves in a circular path with a constant speed and a constant acceleration.

Which statement is **not** true?

A No force is acting on the body.
B The velocity of the body is changing.
C The force acting on the body is perpendicular to the velocity.
D The acceleration and the force are in the same direction.

9 The diagram shows a beam resting in equilibrium and supported by two pivots.



Which statement is correct?

A All forces are equal in magnitude.
B The total upward force is twice the downward force.
C The resultant force is zero and the resultant turning effect is zero.
D The forces are in one direction and the turning effects are in opposite direction.

10 The atmospheric pressure at the top of a mountain is 73 cm using a mercury barometer.

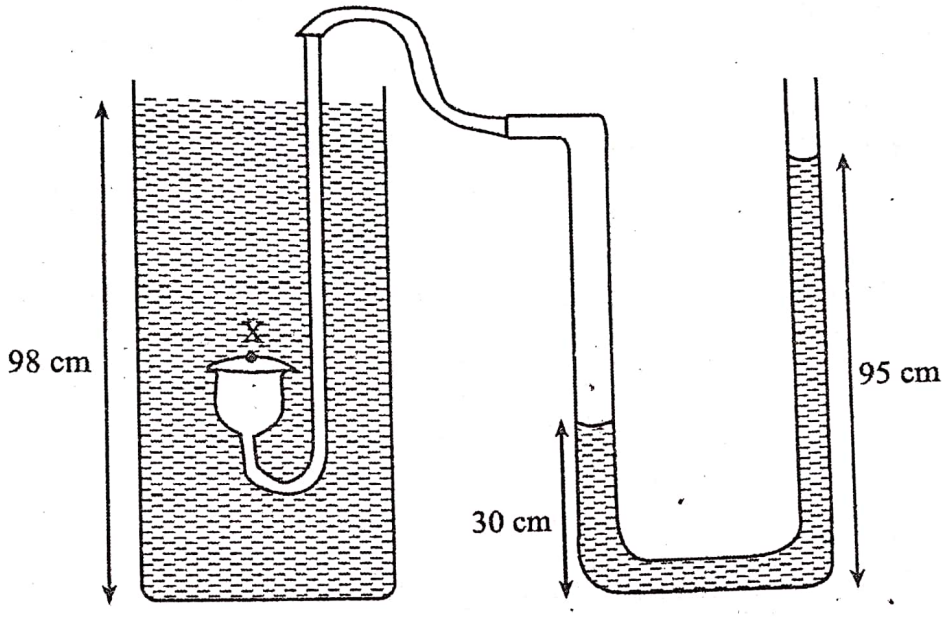
What would be the same pressure reading on a water barometer?

(The densities of mercury and water are 13.6 g/cm^3 and 1.0 g/cm^3 respectively)

A 5.4 cm
B 73 cm
C 730 cm
D 993 cm

Scanned with CamScanner

11 The diagram shows a manometer used to measure pressure of a liquid.



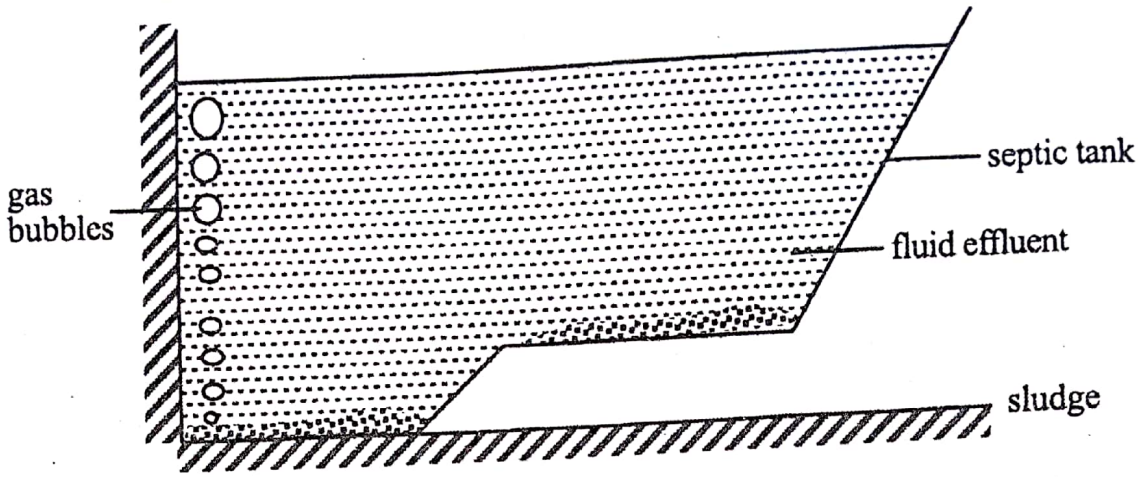
What is the pressure at point X?

(The density of the liquid in the manometer is 1 000 kgm^{-3} and g = 10 ms^{-2}).

A 9 800 Pa
B 9 500 Pa
C 6 500 Pa
D 3 000 Pa

Scanned with CamScanner

12 Bubbles of a gas are escaping from the bottom of a septic tank as shown in the diagram.



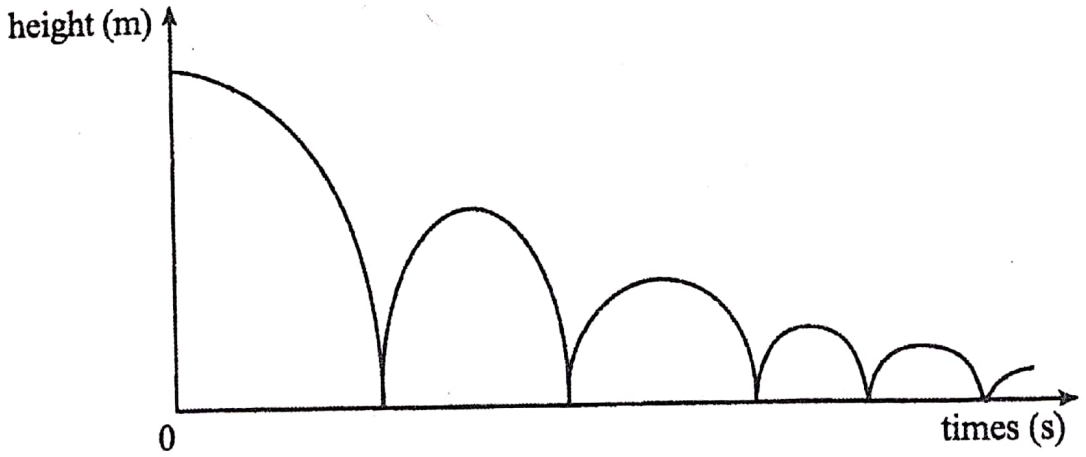
The gas bubbles get larger as they rise because

A atmospheric pressure on the bubbles decreases.
B atmospheric pressure on the bubbles increases.
C fluid effluent pressure on the bubbles decreases.
D fluid effluent pressure on the bubbles increases.

13 Which form of energy is received directly from the sun?

A chemical
B kinetic
C nuclear
D light

14 The diagram shows how the height of a bouncing tennis ball varies with time.



The height of each bounce decreases with time due to

A kinetic energy being converted into potential energy.
B kinetic energy being converted into heat energy.
C the ball gaining kinetic energy on impact with the floor.
D the ball losing chemical energy and wearing out.

Scanned with CamScanner

15 A boy of weight 500 N runs up a flight of stairs 6.5 m high in 7 seconds.

How much power does he develop?

A 0.93 W
B 464.3 W
C 538.4 W
D 3 250 W

16 How do particles move in Brownian motion?

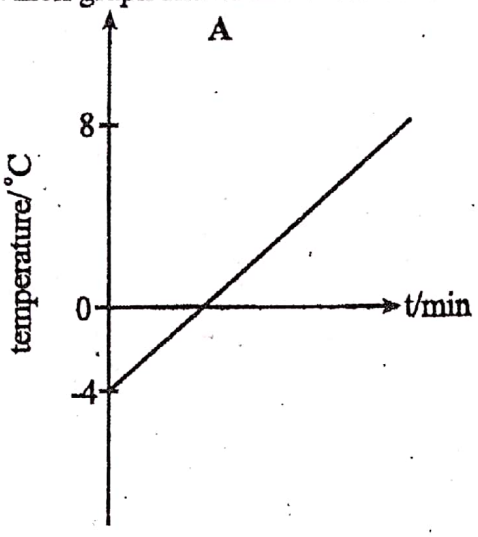
A at random
B in circles
C in the same direction
D vibrate about fixed positions

Scanned with CamScanner

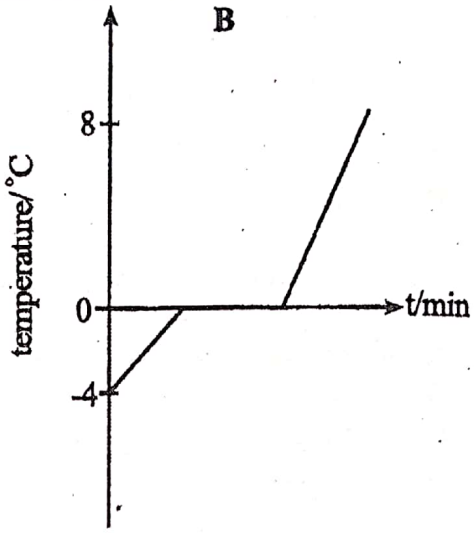
17 Ice blocks at –4°C are heated at constant rate until they become liquid at 8°C.

Which graph shows the variation of temperature with time?

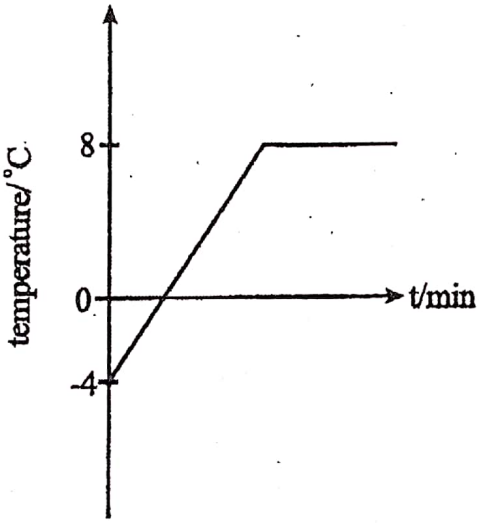
A



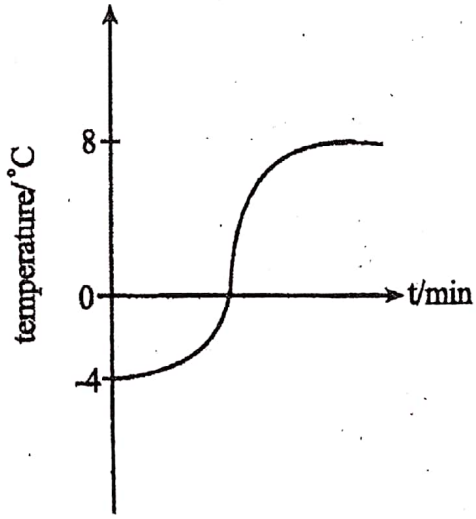
B



C



D



Scanned with CamScanner

18 Which one is a fixed point in the calibration of a thermometer?

A the bottom end of the thermometer
B the top end of the thermometer
C the temperature of pure melting ice
D the temperature of pure distilled water

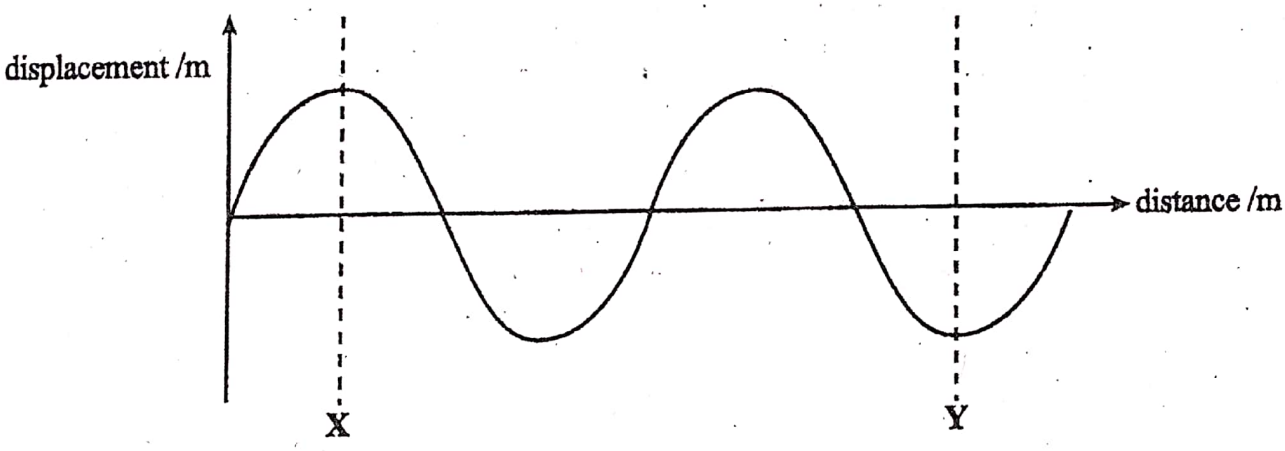
19 Which feature gives an advantage of a thermocouple thermometer over a liquid in glass thermometer?

A a thermocouple thermometer has a hot and a cold junction
B a thermocouple thermometer consists of different metals joined together
C a thermocouple thermometer can measure rapidly changing temperatures
D a thermocouple thermometer uses a millivoltmeter to measure temperature

20 Which is an example of a longitudinal wave?

A water ripples
B sound
C radio
D light

21 The diagram shows a wave.



How many wavelengths are shown between X and Y?

A $\frac{1}{3}$

B 1

C $1\frac{1}{2}$

D 3

Scanned with CamScanner

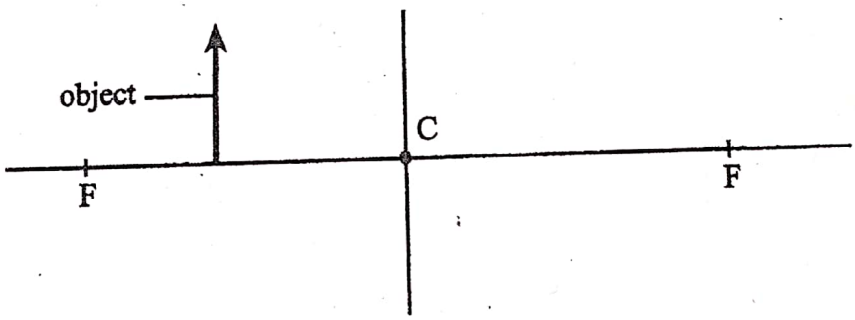
22 The object is 6 m from a mirror. The distance between the object and its image is

A 2 m.
B 6 m.
C 10 m.
D 12 m.

23 Which characteristics describe the image formed by a plane mirror?

A real and inverted
B virtual and upright
C real and magnified
D virtual and diminished

24 The diagram shows an object placed between the optical centre, C and the principal focus, F.



Which description is correct for the image formed?

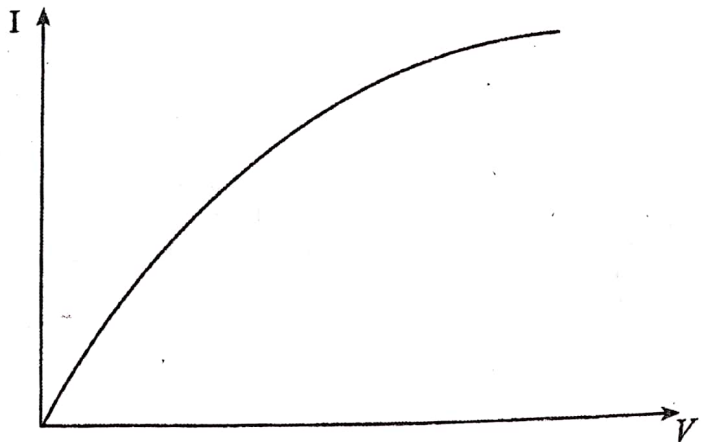
A same, upright and virtual
B same, inverted and real
C magnified, upright and virtual
D magnified, inverted and real

25 When polythene is rubbed with a cloth it becomes negatively charged because it

A gains electrons.
B loses electrons.
C gains protons.
D loses protons.

Scanned with CamScanner

26 The diagram shows the I-V characteristics of a filament lamp.



Which statement is true?

A current is inversely proportional to voltage
B current is directly proportional to voltage
C the resistance increases as current increases
D the resistance decreases as current increases

27 A current of 5A flows through a flood lamp.

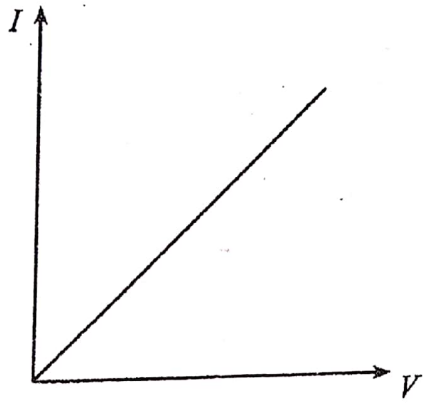
What charge passes through the lamp in 5 minutes?

A 25 C
B 60 C
C 300 C
D 1 500 C

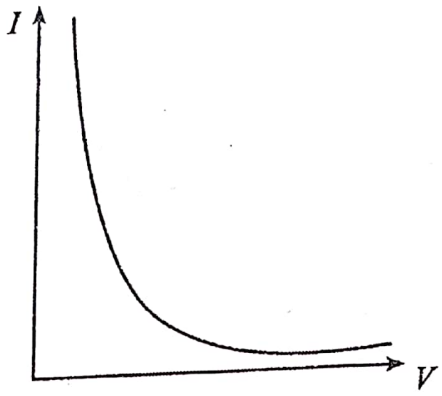
Scanned with CamScanner

28 Which graph correctly shows the variation of current, I and voltage, V, of an ohmic conductor?

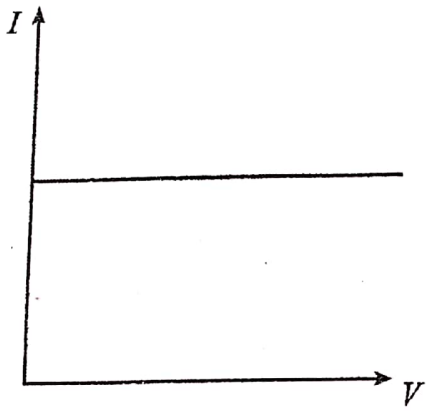
A



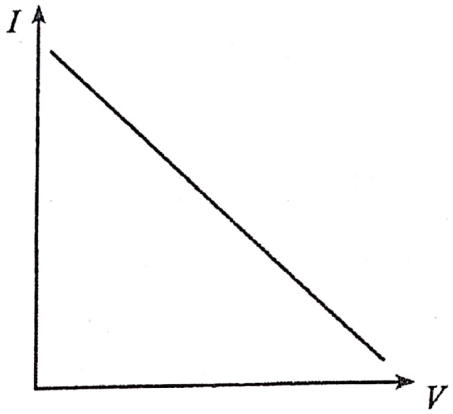
B



C

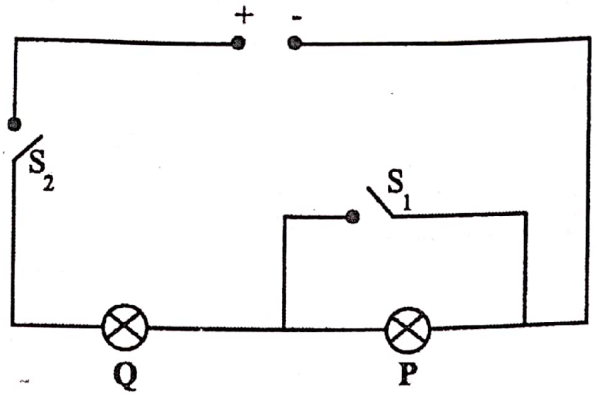


D



Scanned with CamScanner

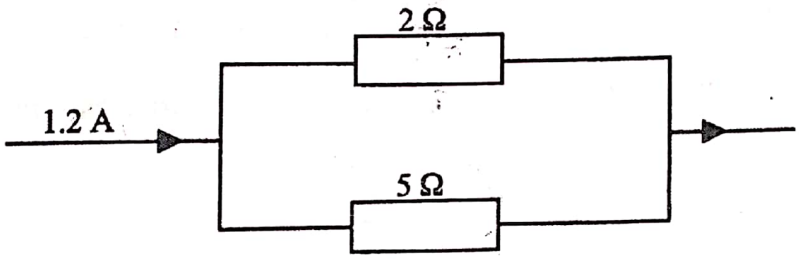
29 The diagram shows two lamps **P** and **Q** connected to a power supply and two switches, S_1 and S_2.



Which statement is correct?

A When S_1 and S_2 are closed **P** and **Q** are lit.
B When S_1 open and S_2 closed **P** and **Q** are lit.
C When S_1 open and S_2 closed only **P** is lit.
D When S_1 open and S_2 closed only **Q** is lit.

30 The diagram shows part of an electrical circuit.



What is the current in the 2 Ω resistor?

A 0.24 A
B 0.34 A
C 0.60 A
D 0.86 A

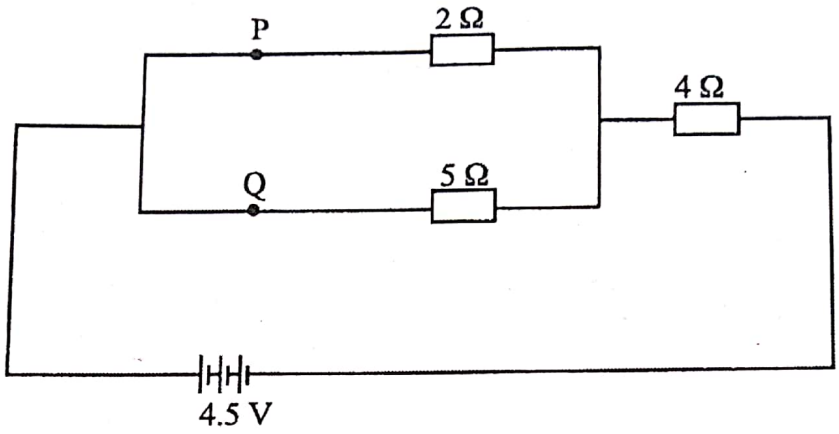
31 An electric hot plate is rated 240 V, 10 A.

What is the cost of using the hot plate for 2 hours when 1 kWh costs 20c?

A $96 000
B $960
C $96
D $0.96

Scanned with CamScanner

32 The diagram shows an electric circuit.

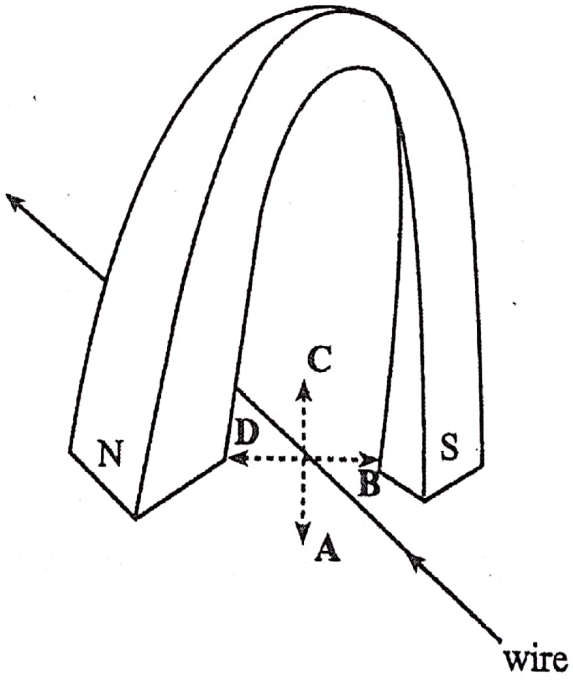


What is the current passing through **P**?

A 0.44 A
B 0.59 A
C 0.90 A
D 1.8 A

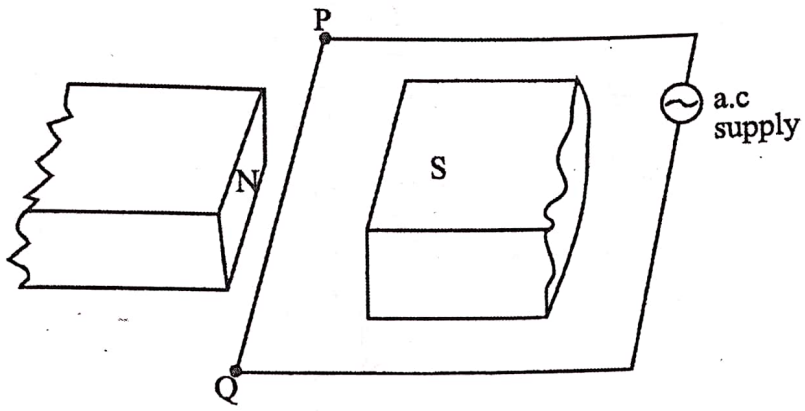
33 The diagram shows a current carrying wire passing through a magnet.

In which direction **A**, **B**, **C** or **D** is the force acting on the current carrying wire?



Scanned with CamScanner

34 An a.c. supply is connected to a wire PQ stretched between the poles of a magnet.

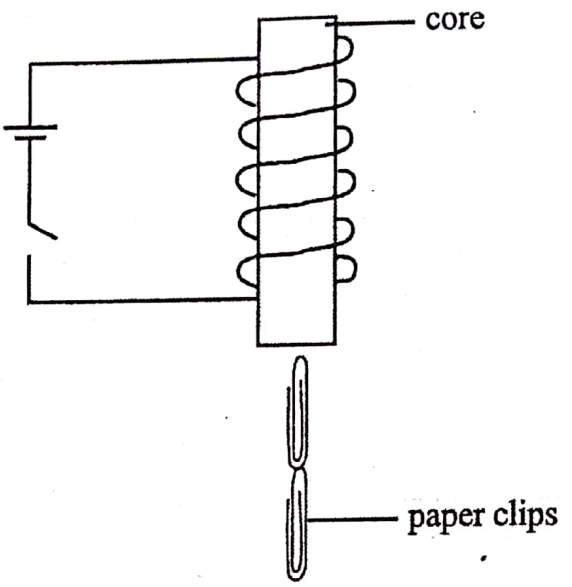


Which way will the wire move?

A left and right
B right only
C up and down
D up only

Scanned with CamScanner

35 The diagram shows how four substances were tested for use as a core of an electromagnet. The current was switched on and off.

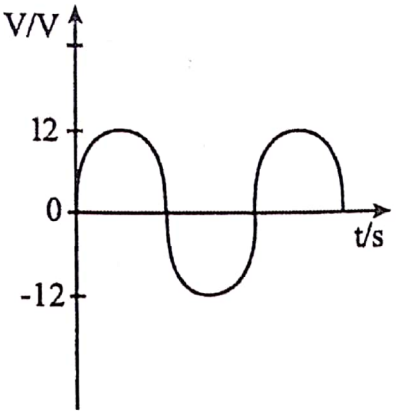


Which substance **A**, **B**, **C** or **D**, is the best for making the core of a transformer?

	number of paper clips held when there is a current in the electromagnet	number of paper clips held when current is switched off
A	8	4
B	6	0
C	5	1
D	4	0

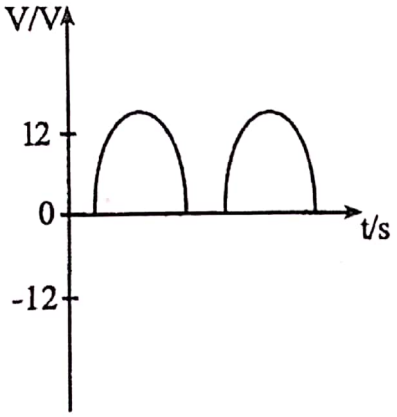
Scanned with CamScanner

36 The diagram shows the voltage output from a step down transformer.

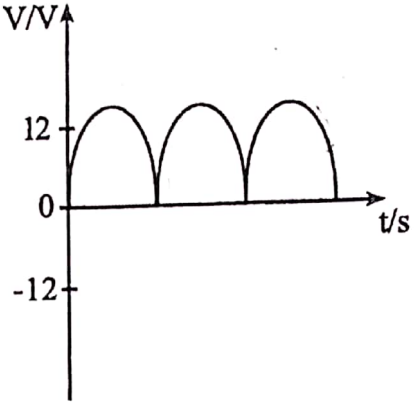


Which diagram shows the input voltage?

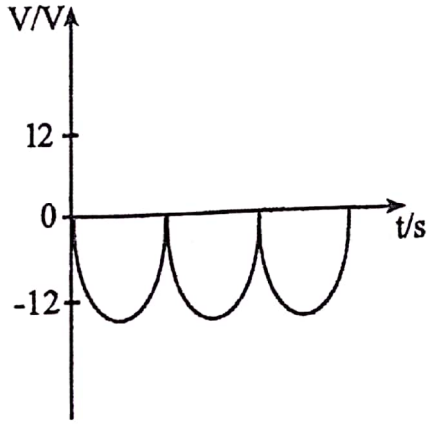
A



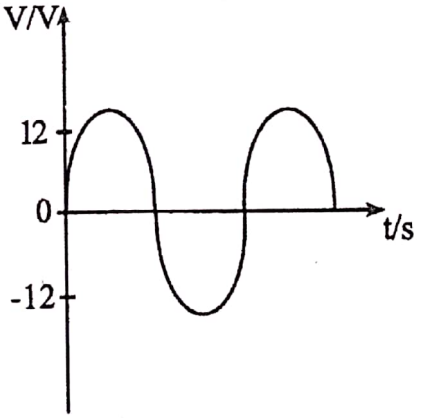
B



C



D



Scanned with CamScanner

37 Why is electrical energy transmitted at high voltage?

A Little energy is wasted in the transmission cables.
B Current in the transmission cables is large.
C Resistance of the transmission cables is small.
D Transmission system does not require transformers.

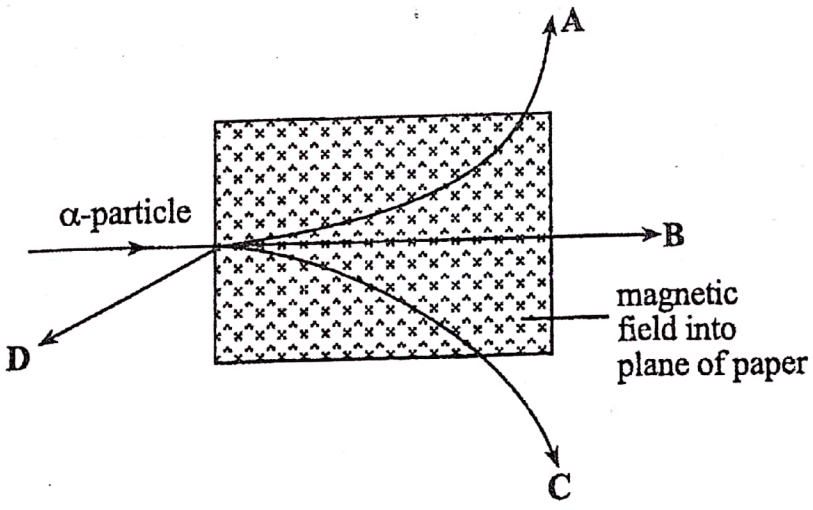
38 In a cathode ray tube, the particles emitted by a heated cathode are

A electrons.
B protons.
C neutrons.
D atoms.

39 For a neutral atom, the number of

A neutrons equal the number of protons.
B neutrons equal the number of electrons.
C neucleons equal the number of neutrons.
D protons equal the number of electrons.

40 The diagram shows α-particles entering a uniform magnetic field at a right angle.



Which path **A**, **B**, **C** or **D**, would be followed by an alpha particle?

Scanned with CamScanner

ZIMBABWE SCHOOL EXAMINATION COUNCIL

General Certificate of Ordinary Level

EXPECTED ANSWERS

PHYSICS	NOVEMBER 2017	5055/1

1	D
2	A
3	B
4	B
5	C
6	B
7	C
8	A
9	C
10	D
11	C
12	C
13	D
14	B
15	B
16	A
17	C
18	C
19	C
20	B

21	C
22	D
23	B
24	C
25	A
26	D
27	D
28	A
29	B
30	D
31	D
32	B
33	A
34	C
35	B
36	D
37	A
38	A
39	D
40	A

Scanned with CamScanner

Surname	Forename(s)	Centre Number	Candidate Number

For Performance Measurement

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

PHYSICS 5055/2

PAPER 2 Theory

NOVEMBER 2017 SESSION 1 hour 45 minutes

Candidates answer on the question paper.
Additional materials: Electronic calculator and/or Mathematical table
Graph paper

Allow candidates 5 minutes to count pages before the examination.

This booklet should not be punched or stapled and pages should not be removed.

TIME 1 hour 45 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page and Centre number and candidate number on top of the right corner of every page of this paper.
Check if the booklet has all the pages and ask the invigilator for a replacement if there are duplicate or missing pages.

Section A

Answer **all** questions.
Write your answers in the spaces provided on the question paper.

Section B

Answer any **two** questions.
Write your answers on the spaces provided on the question paper.
Do not fasten the booklet

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.
Candidates are reminded that **all** quantitative answers should include appropriate units.
Candidates are advised to show **all** their working in a clear and orderly manner, as more marks are awarded for sound use of Physics than for correct answers.

This question paper consists of 20 printed pages.

Copyright: Zimbabwe School Examinations Council, N2017.

Scanned with CamScanner

Section A

*Answer **all** questions from this section.*

1 (a) **Fig. 1.1** shows one of the basic laboratory instrument.

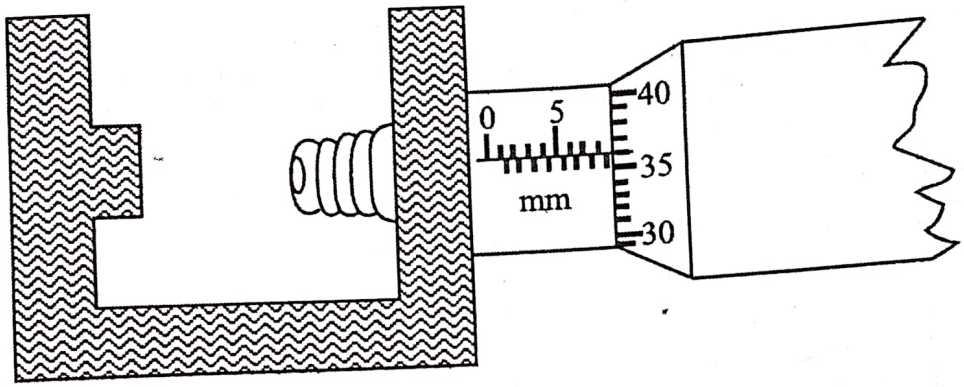


Fig. 1.1

(i) Name the instrument, and state its use.

Name: _____

Use: _____

_____ [2]

(ii) State the reading shown in **Fig. 1.1**.

_____ [1]

(iii) Give any **one** precaution that should be taken when using this instrument.

_____

_____ [1]

[Total: 4]

Scanned with CamScanner

2 **Fig. 2.1** shows a velocity-time graph for a ball which was rolled up a uniform slope.

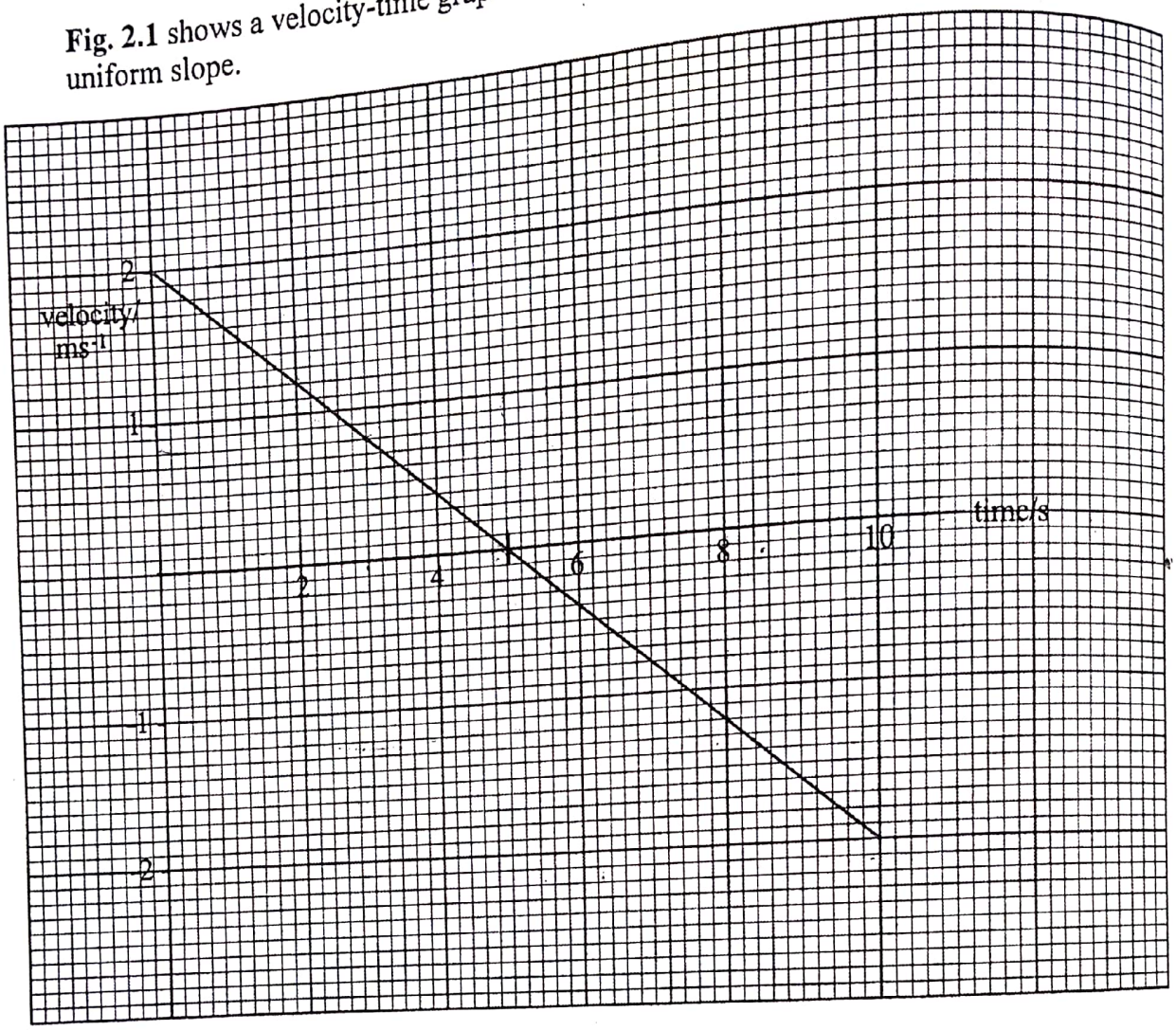


Fig. 2.1

(i) Determine the distance moved by the ball in 5 seconds.

distance = _____ [2]

(ii) State the velocity of the ball after 8 seconds.

_____ [1]

Scanned with CamScanner

2 (iii) Determine the displacement of the ball after 10 seconds.

_____ [1]

(iv) Calculate the acceleration of the ball.

acceleration = _____ [2]

[Total: 6]

3 (a) **Table 3.1** shows base quantities and their SI units.

Table 3.1

base quantity	**S1 unit**
length	metre
temperature	
	ampere

[2]

Complete **Table 3.1**.

(b) State the S1 unit of

1. volume, _____

2. density. _____ [2]

[Total: 4]

Scanned with CamScanner

4 A girl lifts a bucket full of water from a well at a steady speed, using a pulley as shown in **Fig. 4.1.**

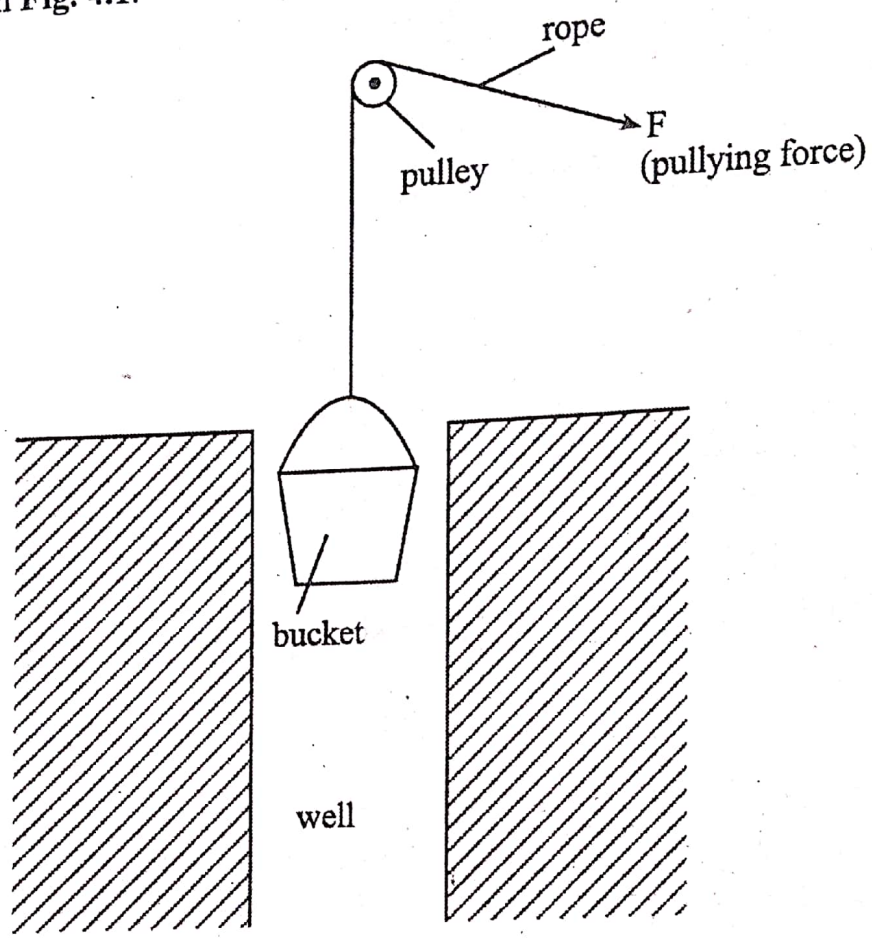


Fig. 4.1

The mass of the bucket and the water is 15 kg. The force, F, applied by the girl is 160 N.

(a) Determine the weight of the bucket and water given that $g = 10$ N/kg.

weight = _____ N [2]

(b) The bucket is raised through a height of 6 m.

(i) State the type of energy gained by the bucket.

_____ [1]

Scanned with CamScanner

Centre Number	Candidate Number

4 **(b)** **(ii)** Calculate the work done by the girl.

work done = _____ J [2]

[Total: 5]

5 **(a)** State Newton's third Law of Motion.

_____

_____ [1]

(b) **Fig. 5.1** shows a uniform bar of length 10 m in equilibrium.

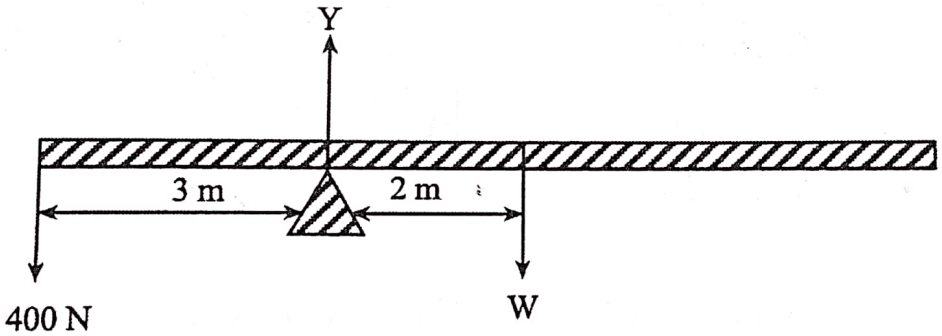


Fig. 5.1

Calculate the

(i) weight, W, of the bar

W = _____ [2]

(ii) force, Y, which the pivot exerts on the bar.

Y = _____ [1]

[Total: 4]

Scanned with CamScanner

6 **(a)** Define the term *pressure*.

_____

_____ [1]

(b) **Fig. 6.1** shows a water manometer used to measure the pressure of a gas.

(The density of water is 1 000 kg/m^3 and $g = 10$ ms^{-2}).

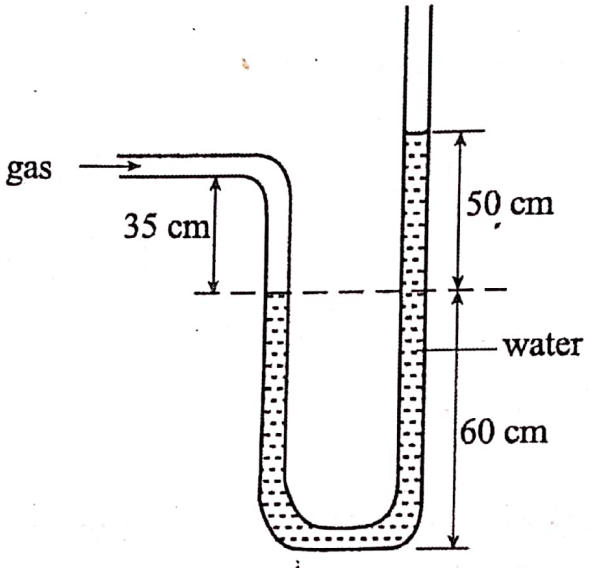


Fig. 6.1

Calculate the pressure of the gas if atmospheric pressure is 1.01×10^5 Pa.

[3]

[Total: 4]

Scanned with CamScanner

7 A balloon was rubbed against a wall and it became negatively charged as shown in **Fig. 7.1**.

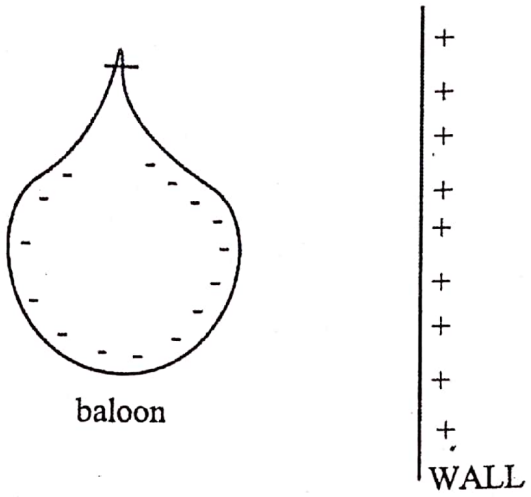


Fig. 7.1

(a) Draw on **Fig. 7.1** the electric field line pattern between the balloon and the wall. [2]

(b) **(i)** Explain, in terms of movement of electrons, how the wall and the balloon become charged.

_____

_____ [1]

(ii) Give a reason why the balloon would stick to the wall.

_____

_____ [1]

(iii) Explain why the balloon would drop after a short time.

_____

_____ [1]

[Total: 5]

Scanned with CamScanner

8 **Fig. 8.1** shows cross-sections of two conductors A and B. Conductor A carries current into the plane of the paper and conductor B carries current out.

Fig. 8.1

(a) **(i)** Draw **two** arrows to show the directions of the forces of interaction between the **two** currents. [1]

(ii) Name the type of field of force around the conductors A and B.

_____ [1]

(b) State **two** ways of increasing the sizes of the forces in **(a)(i)**.

1. _____

2. _____

[2]

[Total: 4]

Scanned with CamScanner

9 (a) Explain the term *thermionic emission*.

[1]

(b) **Fig. 9.1** shows an electron beam entering into a magnetic field.

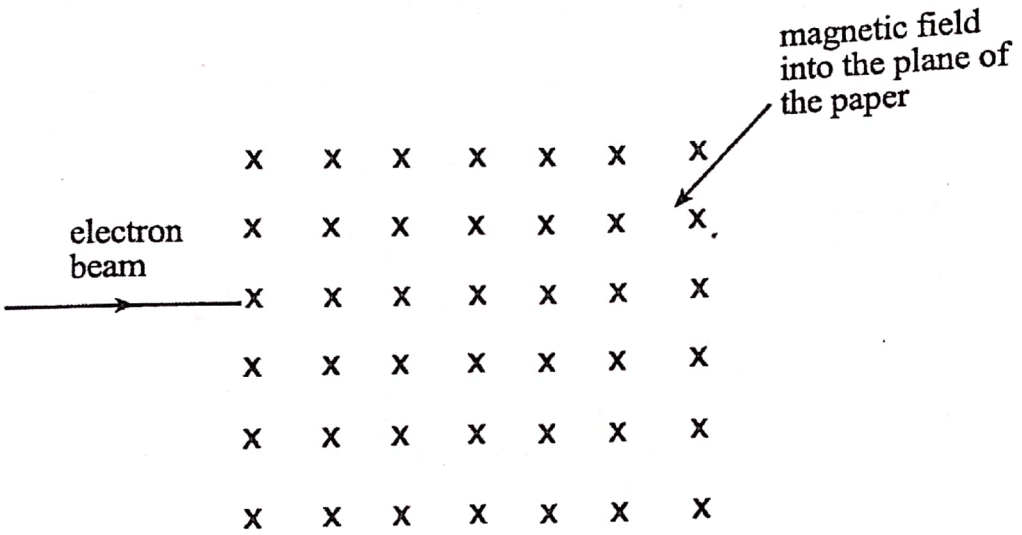


Fig. 9.1

(i) Complete the diagram to show the path of the electron beam. [1]

Scanned with CamScanner

Section B

Answer any two questions from this section.

11 (a) **Fig. 11.1** shows a car travelling at 20 m/s on a level road. It has to overcome a total resistive force of 400 N.

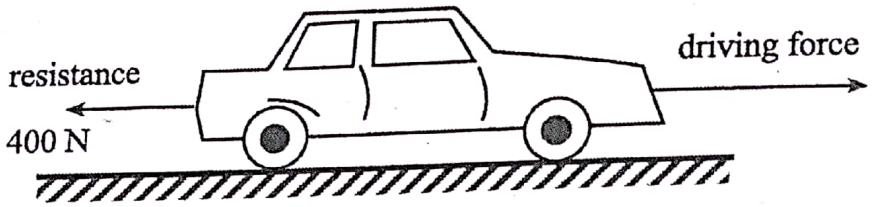


Fig. 11.1

(i) State the value of the driving force produced by the engine in order to maintain a steady speed of 20 m/s.

_____ [1]

(ii) Suggest **two** examples of resistive forces acting on the car.

1. _____

2. _____

[2]

Scanned with CamScanner

11 **(b)** While travelling on the level road at 20 m/s, the car then decelerates uniformly to rest in 50 s. The mass of the car is 1 000 kg.

(i) Calculate the deceleration of the car.

deceleration = _____ [2]

(ii) Determine the retarding force on the car.

retarding force = _____ [1]

(iii) Explain why the car speeds up as it moves down hill, even though the engine thrust remains unchanged.

_____

_____ [1]

(c) A mass of water was heated in a vessel with an immersion heater of 40 W. The heat produced was used to boil the water for 120 s and the mass decreased by 0.002 kg.

(i) State one assumption necessary in order to calculate the specific latent heat of vaporisation of water.

_____ [1]

(ii) Write a formula which relates energy to power.

_____ [1]

Scanned with CamScanner

11 (c) (iii) Calculate the energy supplied by the heater during a time of 120 s.

energy supplied = _____ [2]

(iv) Hence, calculate the specific latent heat of vaporisation of water.

latent heat of vaporisation = _____ [2]

(v) Give a reason why the value calculated in part **(iv)** is greater than the actual one.

_____ [1]

(vi) Give a reason why water is used as a coolant in car radiators.

_____ [1]

[Total: 15]

Scanned with CamScanner

12 (a) (i) Gamma rays, ultra-violet rays and X-rays are components of the electromagnetic spectrum.

1. List the components in their order of increasing wavelength.

_____

2. State **one** use of each component.

X-ray:

_____

Ultra-violet rays:

_____

_____

Gamma rays:

_____

3. Give **one** danger associated with over exposure to X-rays.

_____

[5]

(ii) Distinguish between real and virtual images.

_____

_____

_____ [2]

Scanned with CamScanner

12 (b) (i) Sketch the magnetic field line pattern between two like poles of a bar magnet.

[3]

(ii) **Fig. 12.1** shows an electrical circuit.

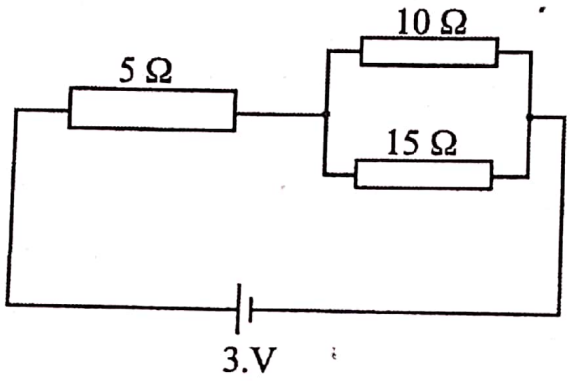


Fig. 12.1

1. Determine the effective resistance in the circuit.

effective resistance = _____

Scanned with CamScanner

12 (b) (ii) 2. Calculate the potential difference across the 15 Ω resistor.

potential difference = _____

[5]

[Total: 15]

13 **Fig. 13.1** shows a simple transformer.

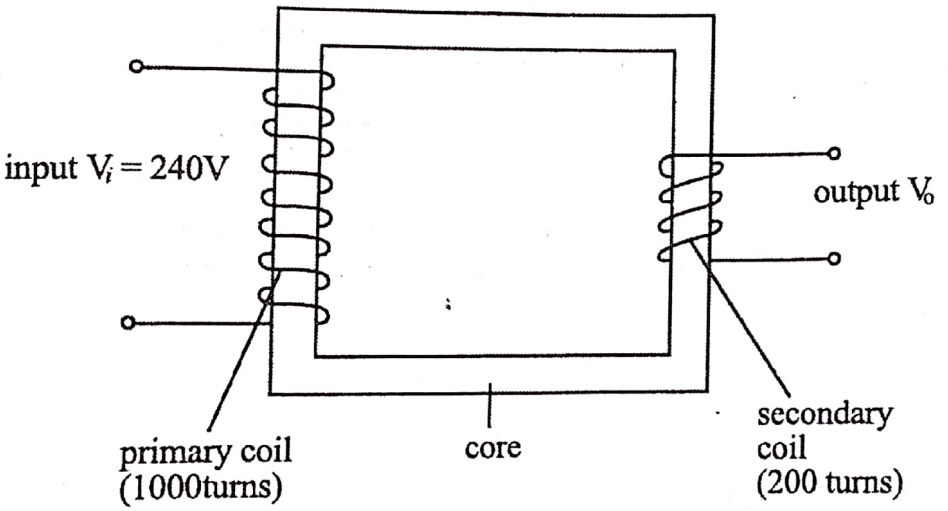


Fig. 13.1

(a) (i) Identify, with a reason, the type of transformer shown.

_____

_____ [2]

Scanned with CamScanner

13 (a) (ii) State a suitable material for making the core of the transformer.

_____ [1]

(iii) Calculate the output voltage of the transformer if it is 100% efficient.

voltage = _____ [2]

(iv) State any **two** causes of energy losses in a real transformer.

1. _____

2. _____ [2]

(v) State any **two** ways of reducing the energy losses.

1. _____

2. _____ [2]

(b) **Fig. 13.2** represents an alarm system.

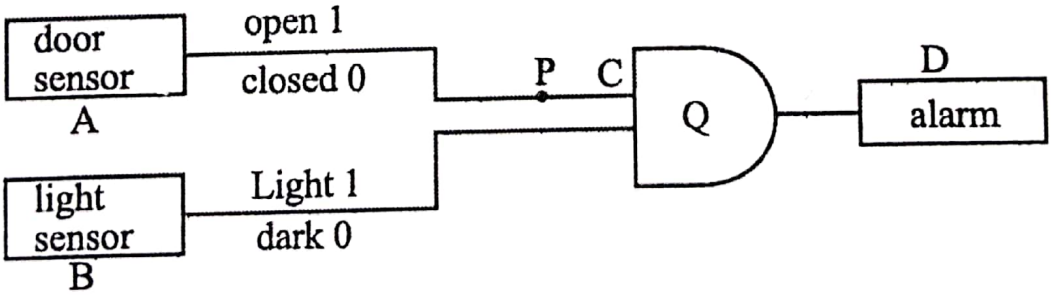


Fig. 13.2

(i) Identify the component Q.

_____ [1]

Scanned with CamScanner

13 (a) (ii) State a suitable material for making the core of the transformer.

_____ [1]

(iii) Calculate the output voltage of the transformer if it is 100% efficient.

voltage = _____ [2]

(iv) State any **two** causes of energy losses in a real transformer.

1. _____

2. _____

[2]

(v) State any **two** ways of reducing the energy losses.

1. _____

2. _____

[2]

(b) **Fig. 13.2** represents an alarm system.

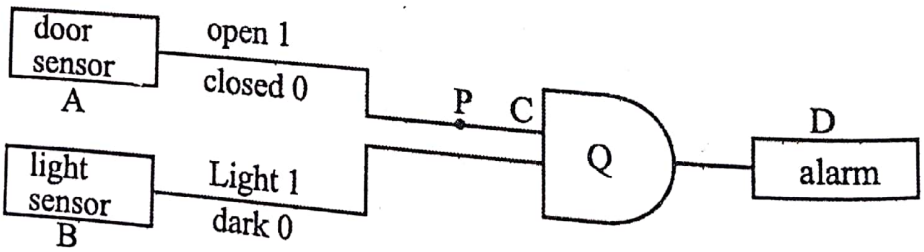


Fig. 13.2

(i) Identify the component Q.

_____ [1]

Scanned with CamScanner

Centre Number	Candidate Number

13 (b) (ii) State **two** conditions necessary for the alarm to sound.

1. _____

2. _____ [2]

(iii) Complete the truth table for the alarm system in **Fig. 13.2** with a NOT gate at P.

A	B	C	D
0	0		
0	1		
1	0		
1	1		

[2]

(iv) Deduce the effect of putting the NOT gate at P.

_____

_____ [1]

[Total: 15]

Scanned with CamScanner

ZIMBABWE SCHOOL EXAMINATION COUNCIL

General Certificate of Education Ordinary Level

EXPECTED ANSWERS

NOVEMBER 2017

PHYSICS

4023/2

Scanned with CamScanner

1. (a) (i) -micrometer screw gauge – to measure small lengths

(ii) $8.5 + 0.35mm = 8.86mm$

(iii) -wipe the ends of the spindle and anvil.
-not the zero error
-use the ratchet to avoid over tightening

---

2. (i) $distance = area\ under\ graph = 5m$

(ii) $V = -1.20ms^{-1}$

(iii) $displacement = 0m$

(iv) $\boldsymbol{a} = gradient = \frac{-2-2}{10} = -0.04ms^{-2}$

---

3. (a)

Base Quantity	**SI Unit**
Temperature	Kelvin
Current	Ampere

(b) 1 Volume → $\boldsymbol{m^3}$

2 Density → $\boldsymbol{kgm^{-3}}$

---

4. (a) $\boldsymbol{W} = 15 \times 10 = 150N$

(b) (i) Gravitational Potential Energy

(ii) $\boldsymbol{W} = 160 \times 6 = 960J$

---

5. (a) Newton's third law – Action and Reaction are always opposite and equal.

(b) (i) $W \times 2 = 400 \times 3$

$W = 200 \times 3 = \boldsymbol{600N}$

(ii) $Y = 400 + 600 = \boldsymbol{1000N}$

Scanned with CamScanner

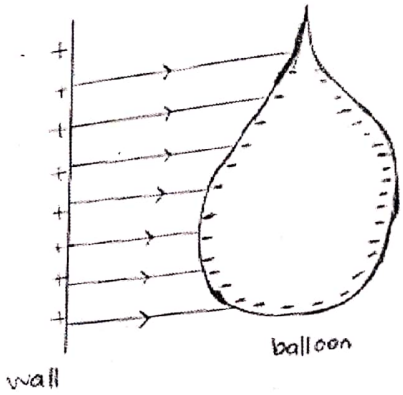
6. (a) Force per unit area

(b) gas pressure $= \rho gh + P_{atm}$

$= 1\,000 \times 10 \times 0.5 + 1.01 \times 10^5 pa$

$= \mathbf{106\,000}\boldsymbol{pa}$

7. (a)



(b) (i) -electrons are transfered from the wall to the balloon.

(ii) -unlike charges attract

(iii) -charges neutralise

8. (a) (i)

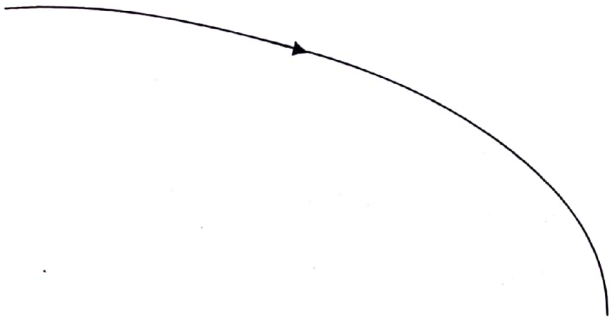
(ii) magnetic field

(b) -increase size of current,
-reduce the distance between the current carrying conductors

9. (a) emission of electrons from a hot metal/ filament

(b) (i)

Scanned with CamScanner



(ii) 2 600 Ohm

10. (a) (i) NOR GATE

(ii)

A	B	Q
0	0	1
1	0	0
0	1	0
1	1	0

(b) (i)

A	B	Q
0	0	0
0	1	0
1	0	0
1	1	1

(ii) AND GATE

11. (a) (i) 400N

(ii) Friction, air resistance, drag force

(b) (i) $deceleration = 0.4ms^{-2}$ or acceleration $= -0.4ms^{-2}$

(ii) $f = ma = (1\,000 \times 0.4) = 400N$

(iii) Gravitational force increases the resultant force.

(c) (i) Heat supplied (by heater) = Heat absorbed (by water)

(ii) $Q = Pt$

Scanned with CamScanner

(iii) $Q = 40 \times 120 = 4\,800J$

(iv) $L = 2\,400\,000J/Kg$

(v) Energy supplied is greater than energy absorbed/ there are no energy loses

(vi) Water has a high specific heat capacity.

---

12. **(a)** **(i)** **1.** Gamma rays, X-rays, Ultra-violet rays

2.

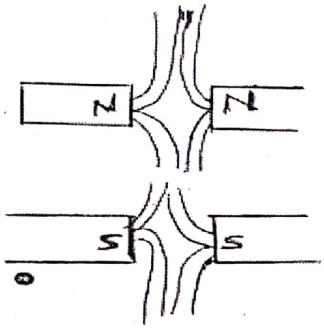
Gamma Rays	-monitor thickness -medical Purposes -Radiotherapy/Destroying Cancer cells -Sterilisation -Imaging
X Rays	-Radiography/detect fractures -medical Purposes -Sterilisation -Imaging
UV	-vitamin D manufacture -fluorescent plants -Sterilisation -checking fake notes

3. X ray exposure leads to
-sterility/infertility
-cancer
-damage cells
-burns
-causes eye cataracts

(ii) -real can be formed on the screen, virtual cannot
-light passes through a real image, but cannot pass through a virtual image.

Scanned with CamScanner

(b) (i)



(ii) 1. $effective\ resistance = 11\Omega$

2. $potential\ difference = 1.64V$

---

13. (a) (i) step down
-less turns in secondary coil/more turns on primary

(ii) (Soft) iron

(iii) $V_0 = 48V$

(iv) -eddy currents
-loss of field lines
-magnetic field leakage/flux leakage

(v) -use thicker wires
-use better conductor
-use laminated core
-wind coils close to each other/-wind coils one on top of the other

(b) (i) AND gate

(ii) (Door) open; light (on)

(iii)

C	D
1	0
1	1
0	0
0	0

(iv) Door closed (light on), alarm sounds

Scanned with CamScanner

Surname	Forename(s)	Centre Number	Candidate Number

For Performance Measurement

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

4023/2

PHYSICS

PAPER 2 Theory

NOVEMBER 2018 SESSION

2 hour 15 minutes

Candidates answer on the question paper.
Additional materials: Electronic calculator

Allow candidates 5 minutes to count pages before the examination

This booklet should not be punched or stapled and pages should not be removed.

TIME 2 hour 15 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page and Centre number and candidate number on top of the right corner of every page of this paper.
Check if the booklet has all the pages and ask the invigilator for a replacement if there are duplicate or missing pages.

Section A

Answer **all** questions.
Write your answers in the spaces provided on the question paper.

Section B

Answer any **three** questions.
Write your answers on the spaces provided on the question paper
Do not fasten the booklet

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question paper.
Candidates are reminded that **all** quantitative answers should include appropriate units.
Candidates are advised to show **all** their working in a clear and orderly manner, as more marks are awarded for sound use of Physics than for correct answers.

This question paper consists of 21 printed pages and 3 blank pages.

©ZIMSEC N2018

Copyright: Zimbabwe School Examinations Council, N2018.

Scanned with CamScanner

Section A

Answer all questions from this section.

1 (a) (i) Define *density*.

_____

_____ [1]

(b) **Fig. 1.1** shows apparatus used to measure the densities of an irregular stone and cork.

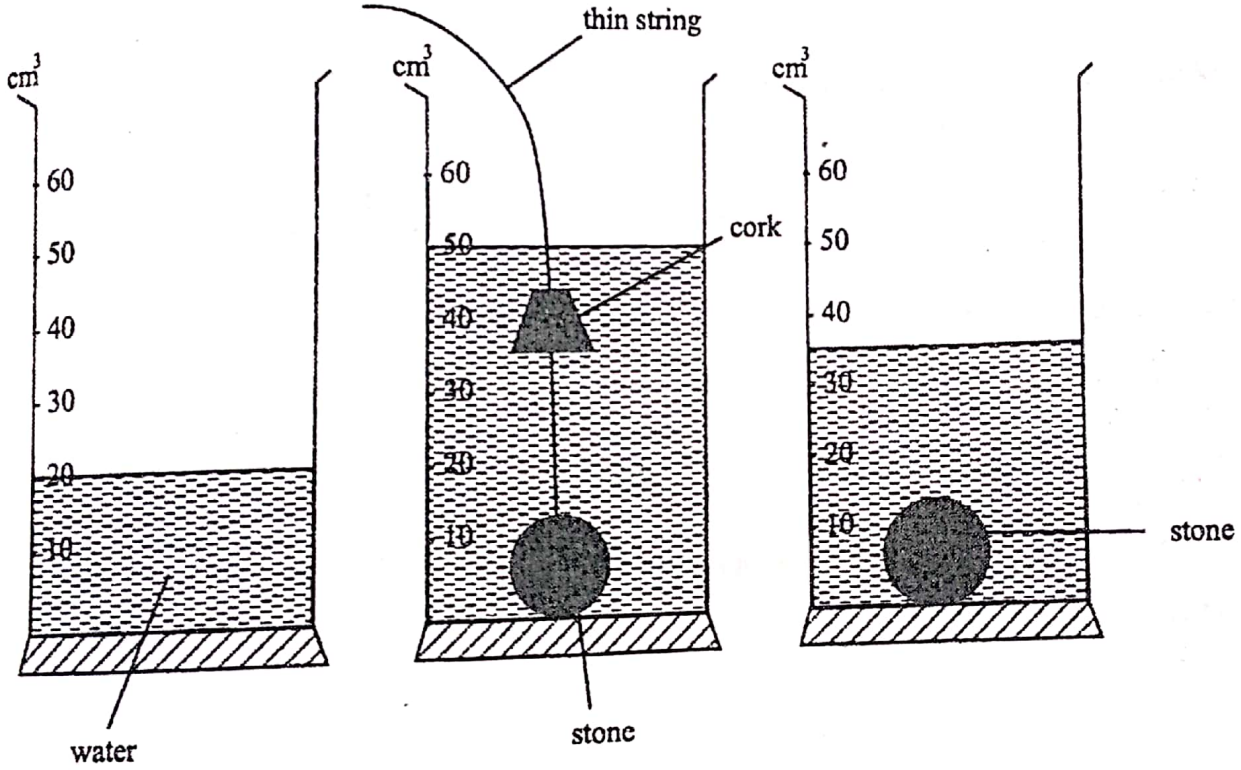


Fig. 1.1

The mass of the stone is 20 g and the mass of the cork is 5 g.

Determine the density of the

(i) stone,

[2]

Scanned with CamScanner

1 (b) (ii) cork. 2

[2]

2 (a) State the equation relating efficiency to mechanical advantage and velocity ratio. 3

[1]

(b) A block and tackle system of 5 pulleys is used to raise a load of 500 N steadily through a height of 20 m. The work done against friction is 200 J.

Calculate the

(i) work done in raising the load,

[1]

(ii) work done by the effort,

[1]

Scanned with CamScanner

2 (b) (iii) efficiency of the system.

[2]

3 (a) (i) Use the kinetic theory of matter to describe the movement of particles in a

1. solid,

2. liquid,

3. gas.

[3]

(ii) Explain why the pressure inside a bicycle tyre increases after cycling for some distance.

[2]

4 (a) State *Boyle's Law*.

[2]

Scanned with CamScanner

4 (b) A sea-diver is working under water at a place where the pressure is 2.0 atmospheres. He is breathing out air bubbles which are each 0.5 cm^3 in volume. At the surface the pressure is 1.0 atmosphere.

Determine the volume of the bubble when it reaches the surface of the water.

[2]

(c) Explain why the air bubbles move upwards from the bottom of water.

_____

_____ [1]

5 (a) Arrange the following electromagnetic waves in order of increasing frequency: radio waves, x-rays, visible light, ultra-violet.

_____

_____ [2]

(b) State any **three** properties of electromagnetic waves.

1._____

2._____

3._____ [3]

Scanned with CamScanner

Centre Number	Candidate Number

6

6 **Fig.6.1** shows wavefronts, A-K, for a wave moving in air.

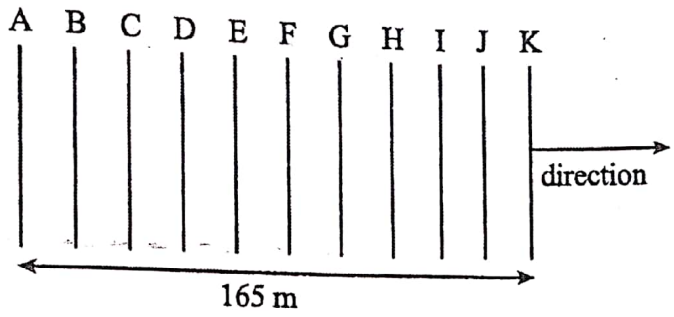


Fig.6.1

(a) Calculate the wavelength of the wave.

[2]

(b) Calculate, the speed of the wave, given that 0.5 seconds ago wavefront K was at the position occupied by A.

[2]

(c) Deduce a name for the wave.

[1]

Scanned with CamScanner

7 **Fig.7.1** shows a current carrying conductor.

Fig.7.1

(a) On **Fig.7.1** draw the magnetic field pattern. [1]

(b) **Fig.7.2** shows a solenoid wound on a soft iron core.

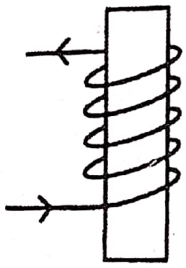


Fig.7.2

Indicate on **Fig.7.2** the N-pole and the S-pole when the current flows in the direction shown. [1]

Scanned with CamScanner

(c) **Fig.7.3** shows how the weight lifted by an electromagnet depends on the current in the coil.

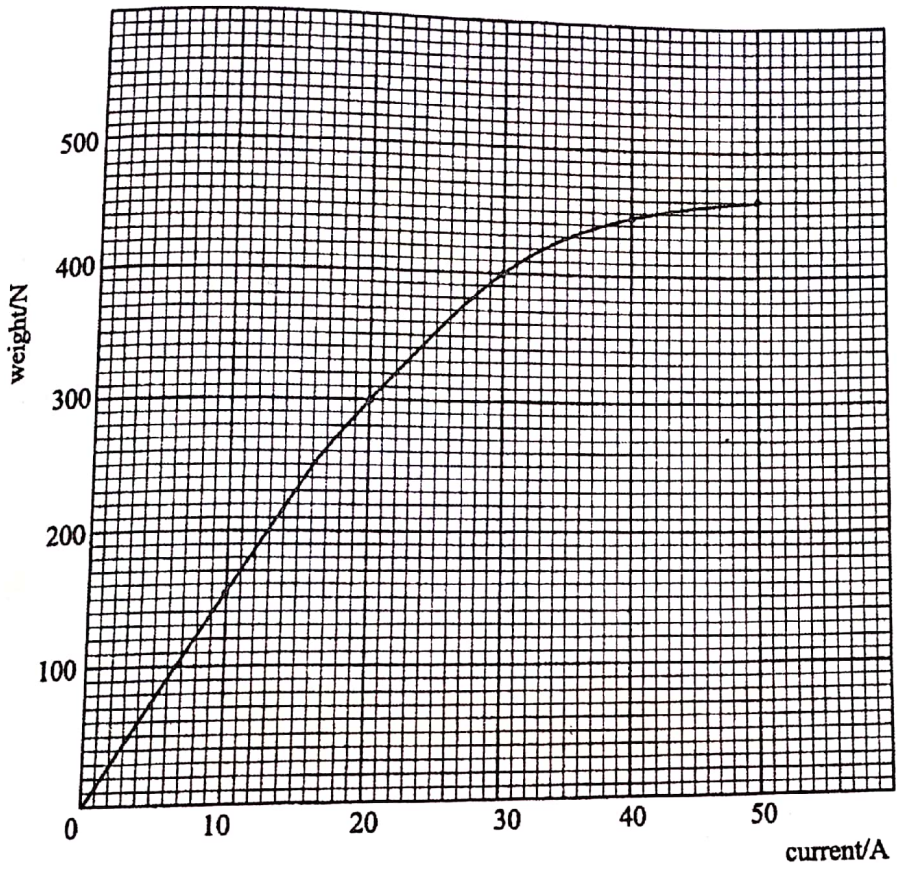


Fig.7.3

(i) Deduce the maximum weight lifted by the electromagnet.

_____ [1]

(ii) Suggest how the electromagnet can be changed so as to lift a weight larger than in (c) (i).

_____

_____

_____ [2]

Scanned with CamScanner

8 (a) Define *thermionic emission.*

[1]

(b) Explain how an output is produced on the screen.

[2]

(c) Describe how an electron gun works.

[2]

Scanned with CamScanner

Centre Number	Candidate Number

Section B

Answer any three questions from this section.

9 (a) (i) Define the term *momentum*.

_____ [1]

(ii) State Newton's third law and identify any **two** practical situations where it is applicable.

_____

_____

_____

_____

_____ [3]

(iii) A sledge of mass 40 kg is pulled along the ground by a horizontal force of 250 N. Due to friction the opposing force is 80 N.

Calculate the acceleration of the sledge.

[3]

Scanned with CamScanner

9 (b) (i) Calculate the momentum of a

1. car of mass 1 200 kg moving with a velocity of 30 ms^{-1},

[2]

2. lorry of mass 3 000 kg moving with a velocity of 30 ms^{-1}.

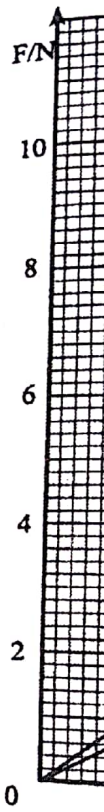
[2]

(ii) State and explain which of the two vehicles requires a greater force to stop it.

[2]

[Turn over

9



Scanned with CamScanner

9 (c) (i) State *Hooke's Law.*

_____

_____ [2]

(ii) **Fig. 9.1** shows a force extension graph of two springs.

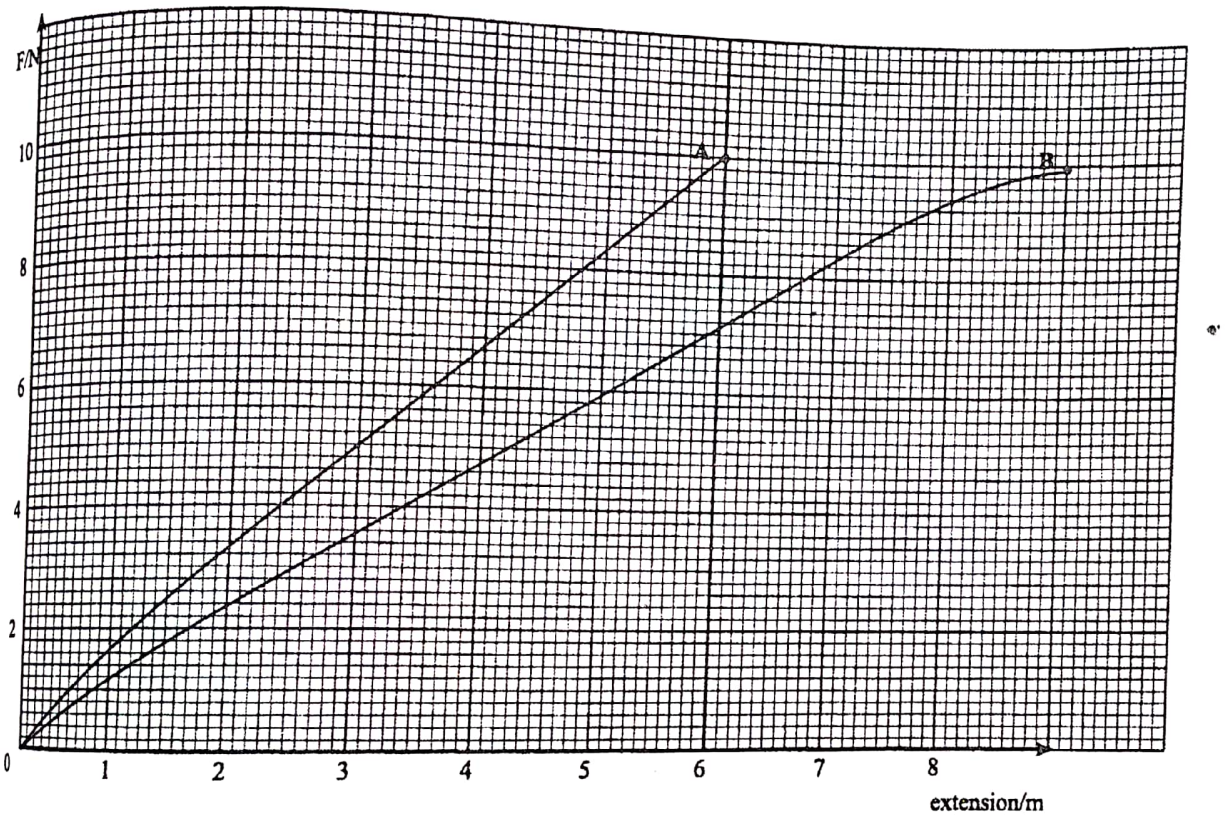


Fig. 9.1

Explain why spring **B** is easier to stretch than spring **A.**

_____

_____

_____ [1]

Scanned with CamScanner

(iii) When a force of 8N is applied on both springs, spring B reaches its limit of proportionality but spring A does not.

Explain how **Fig. 9.1** shows this.

_____

_____

_____ [1]

9 (d) (i) State the *principle of moments.*

_____

_____ [1]

(ii) **Fig.9.2** shows a car whose door is closed.

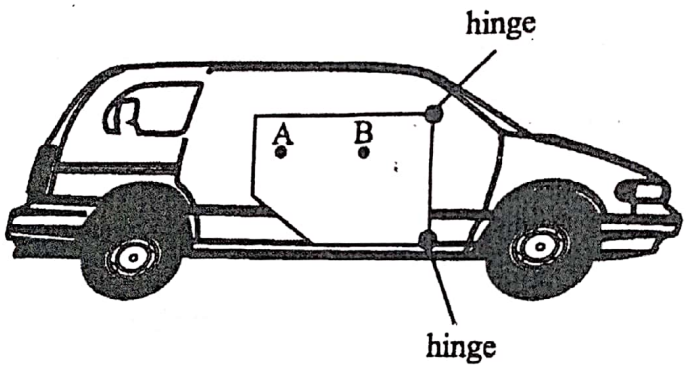


Fig.9.2

A car driver is about to push the door open from inside.

(iii) State with a reason which of the **two** points **A** or **B** will enable the driver to open the door with least force.

_____

_____

_____

_____ [2]

Scanned with CamScanner

10 (a) (i) Define a *beam*.

(ii) Describe the advantages of using a hollow cylindrical beam over a solid cylindrical beam.

(iii) State and explain **two** advantages of using trusses over simple beams.

[6]

(b) **Fig.10.1** shows a roof truss.

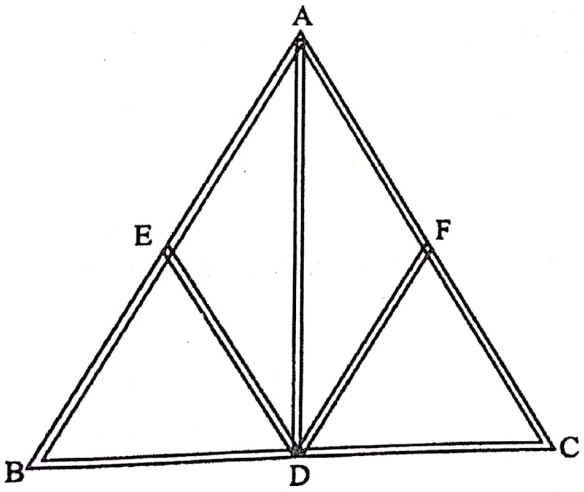


Fig.10.1

Identify members under

(i) compression,

Scanned with CamScanner

(ii) tension. [4]

10 (c) **Fig.10.2** shows a cross-section of the floor of a flat and a balcony beam.

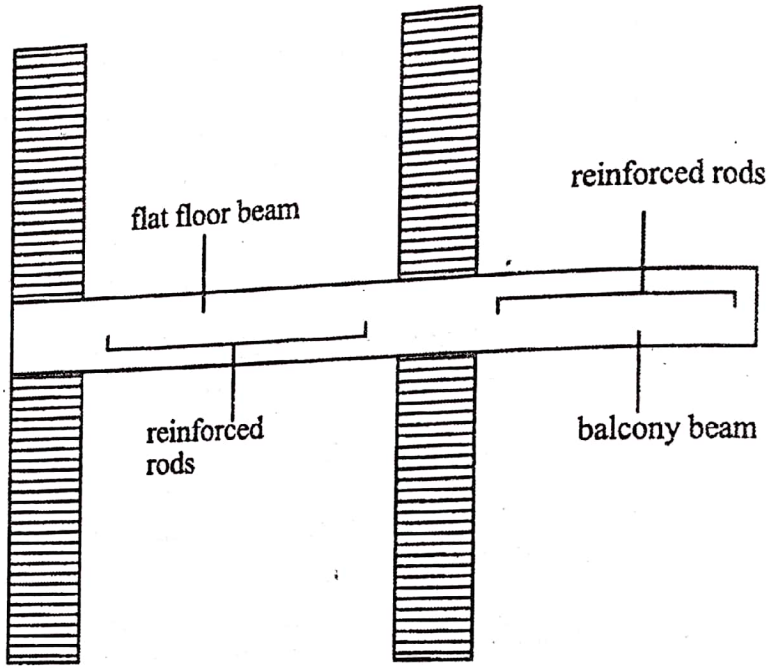


Fig.10.2

Explain why reinforced rods should be put on top for the concrete balcony and at the bottom for the concrete floor beam.

[4]

Scanned with CamScanner

10 (d) (i) Use a labelled diagram to illustrate a loaded cantilever.

(ii) On the diagram in (i) show regions under compression and regions under tension using arrows.

(iii) Indicate the neutral layer using a dotted line. [6]

11 (a) Distinguish between transverse waves and longitudinal waves, and give an example of each.

_____

_____

_____

_____

_____

_____ [4]

Scanned with CamScanner

11 (b) (i) **Fig.11.1** shows water waves moving from shallow water into deep water.

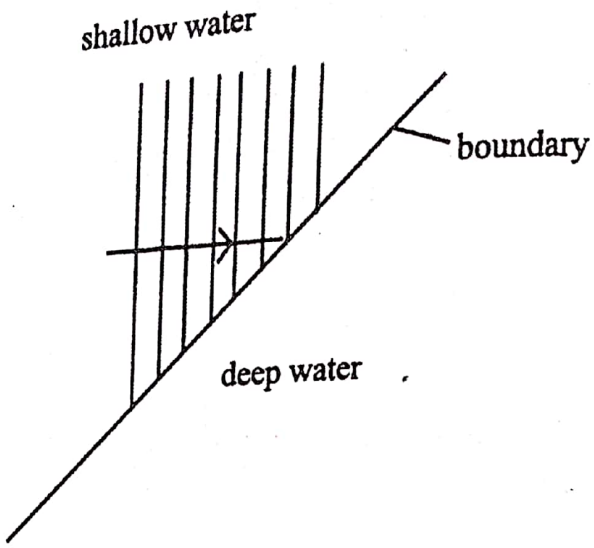


Fig.11.1

Complete **Fig.11.1** to show the wave fronts and the ray in deep water.

(ii) Deduce what happens to the speed, direction of travel and wavelength if waves in shallow water are incident perpendicular to the boundary.

1. speed of waves

_____

2. direction of travel

_____

3. wavelength

_____ [6]

Scanned with CamScanner

11 (c) **Fig.11.2** shows a child at the edge of a pond and a ball in the middle of the pond.

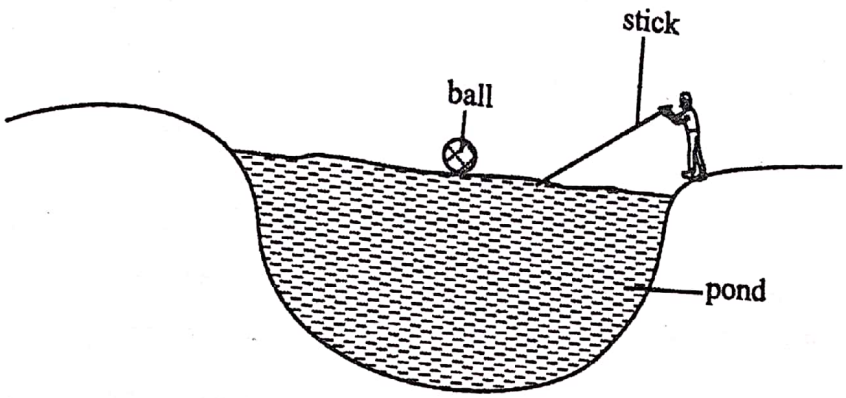


Fig.11.2

Deduce, with a reason, whether the ball will reach the other side of the pond, if the child hits the water continuously with a stick producing water waves.

_____

_____

_____

_____ [3]

(d) A ship transmits sound signal of frequency 30 kHz to the seabed. The signals take 2.5 seconds to be recovered by a ship detector after transmission.

[The speed of sound in water is 1 200 m/s.]

(i) Calculate the

1. wavelength of the sound used,

_____

Scanned with CamScanner

2. depth of the sea bed.

_____

_____

_____

11 (d) (ii) Suggest, with a reason, whether the sound used was detected using human ears.

_____

_____

_____ [7]

12 A radio active nucleus is denoted by the symbol $^{288}_{92}W$.

(a) State the number of protons and neutrons in the radioactive nucleus.

protons _____

neutrons _____ [2]

(b) An element W, undergoes radioactive decay as shown by the equations:

$^{288}_{92}W \rightarrow X + \propto -\text{particle}$

$X \rightarrow Y + \beta - \text{particle}$

$Y \rightarrow Z + \text{gamma emission}$

Deduce the nuclides X, Y and Z.

X _____

Y _____

Z _____ [6]

Scanned with CamScanner

(c) Suggest why $\propto$ – particles are considered better ionisers of gas than β – particles.

_____

_____

_____ [3]

12 (d) The average count rate of an $\propto$ – particle emitter is 256 per second.

Calculate the average count rate 20 days later if the half life is 5 days.

average count rate_____ [3]

(e) State any **three** uses of radioactive isotopes.

1. _____

2. _____

3. _____ [3]

(f) Explain the terms

(i) *random,*

_____

_____

Scanned with CamScanner

(ii) *spontaneous,*

_____

_____

(iii) *activity.*

_____

_____ [3]

Scanned with CamScanner

ZIMBABWE SCHOOL EXAMINATION COUNCIL

General Certificate of Education Ordinary Level

EXPECTED ANSWERS

NOVEMBER 2018

4023/2

PHYSICS

Scanned with CamScanner

1. **(i)** it is mass per unit volume / $d = \frac{m}{v}$

(b)(i) $1.3g/cm^3$ **or** $1333kg/m^3$

(ii) $0.3g/cm^3$

---

2. (a) $Efficiency = \frac{M.A}{V.R} \times 100$

(b)(i) $work\ done$ =500N x 20m = 10 000J or 10 000Nm

(ii) $Efficiency = \frac{500 \times 20}{10\ 200} \times 100\% = 98\%$

---

3. **(a)(i)** **1.** Particles (molecules) vibrate about their fixed positions

2. Liquid particles move within the liquid from one place to another.

3. Gas particles move at high speed in all directions

(ii) Heat is generated due to friction
Temperature of air increases in the tyre
Kinetic energies of particles increases resulting in more collisions.

---

4. **(a)** $PV = constant\ or\ P_1V_1 = P_2V_2$ provided temperature is constant.

(b) $V_2 = \frac{P_1V_1}{P_2} = \frac{2 \times 0,5}{1} = 1.0cm^3/1 \times 10^{-6}m^3$

(c) The density of bubble (air) is less than that of water.

Scanned with CamScanner

5. (a) -radio waves, visible light, ultra-violet, X-rays

(b) -same speed ($3 \times 10^8 ms^{-1}$) in a vacuum/air
-can be reflected, refracted, polarised, diffraction
-they are all transverse waves
-they transfer energy from one form to another
-they travel in a vacuum.

---

6. (a) $wavelength = 16.5m$

(b) $V = 330m/s$

(c) Sound waves.

---

7. (a) -concentric circles round the wire with anticlockwise direction

(b) -upper side (North) and lower side (south)

(c) (i) $460N$

(ii) -increase number of turns
-increase area of coil/thickness of coil

---

8. (a) -release/escape of electrons from a metal when heated.

(b) -electrons hit/strike screen
-screen produces light/fluoresces

(c) -heated metal cathode emits electrons

Scanned with CamScanner

5. (a) -radio waves, visible light, ultra-violet, X-rays

(b) -same speed ($3 \times 10^8 ms^{-1}$) in a vacuum/air
-can be reflected, refracted, polarised, diffraction
-they are all transverse waves
-they transfer energy from one form to another
-they travel in a vacuum.

---

6. (a) $wavelength = 16.5m$

(b) $V = 330m/s$

(c) Sound waves.

---

7. (a) -concentric circles round the wire with anticlockwise direction

(b) -upper side (North) and lower side (south)

(c) (i) $460N$

(ii) -increase number of turns
-increase area of coil/thickness of coil

---

8. (a) -release/escape of electrons from a metal when heated.

(b) -electrons hit/strike screen
-screen produces light/fluoresces

(c) -heated metal cathode emits electrons

Scanned with CamScanner

-electrons collimated by the anode.
-electrons accelerated by the anode.

---

9. (a) (i) -product of mass and velocity

(ii) -action and reaction are always opposite and equal
-boxer punching a bag
-man seated on chair
-earth and moon

(iii) $acceleration = 4.25ms^{-2}$

(b)(i) 1. momentum $= 36\,000kgms^{-1}$

2. momentum $= 90\,000kgms^{-1}$

(ii) Lorry – even though objects are moving with same speed, their momentum depends on mass - a lorry has greater mass/inertia

(c) (i) if the elastic limit is not exceeded, extension is directly proportional to the force applied.

(ii) Two forces values with $F_A > F_B$ for the same extension or two extension values with $e_B > e_A$ for the same force.

(iii) Idea that A is a straight line and B is not/ gradient constant in A but not in B.

(d) (i) at equilibrium clockwise moments are equal to anticlockwise moments.

Scanned with CamScanner

(ii) A – bigger distance from the hinge/pivot.

10.(a) (i) beam – bar suspended/supported which bears a load.

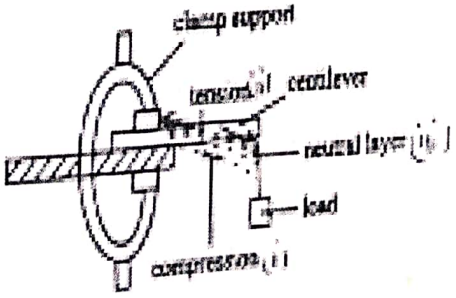
(ii) -hollow beam has greater strength to mass ratio
-hollow beam is lighter
-cost is less for hollow beam
-more economic, less materials

(iii) -truss has greater strength to mass ratio, unnecessary material is removed.
-trusses are more economical
-truss is made up of triangular shapes, this makes the structure rigid and stable

(b) -members in compression: AD, DE, and DF
-Member in tension: BC

(c) -top of balcony is under tension
-bottom of floor under tension,
-steel is strong in tension
-prevents collapse of structure due to tensile forces.

(d)



-cantilever
-support

Scanned with CamScanner

-load
-Area of compression
-Area of tension
-Neutral buyer

11. (a) -Transverse wave – vibrations are at right angles to the direction of travel.
-e.g. water waves, waves in a string, electromagnetic waves

(b) (i) -wave fronts separated
-ray bend away from normal
-ray perpendicular to wave fronts

(ii) 1. Speed – increase
2. Direction of travel –not changed
3. Wavelength – increase

(c) -Will not reach, ball will move up and down about same place; waves do not transmit materials of the medium.

(d) (i) 1. $wavelength = 0.04m$

2. $d = 1\,500m$

(ii) -Not human ear
-its frequency is not audible to human ear
-frequency beyond range of audible range

Scanned with CamScanner

12. (a) 92

196

(b)(i) $^{284}_{90}X$

$^{284}_{91}Y$

$^{284}_{91}Z$

(c) α -Particles have a much greater mass

α- Particles have a much greater charge

α – Particles are slower moving producing more ions.

(d) 16 counts per second

(e) -carbon dating
-sterilisation of medical equipment
-biochemical tracer
-radiotherapy
-power generation
-thickness monitoring

(f) (i) -cannot be predicted where, how and when it can start

(ii) -once started cannot be controlled or stopped by external influence.

(iii) -decay rate

Scanned with CamScanner

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

PHYSICS 4023/1

PAPER 1 Multiple Choice

NOVEMBER 2019 SESSION 1 hour

Additional materials:
Multiple Choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended.)
Electronic calculator

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Do not open this booklet until you are told to do so.
Write your name, centre number and candidate number on the answer sheet in the spaces provided unless this has already been done for you.

There are **forty** questions in this paper. Answer **all** questions. For each question, there are four possible answers, **A, B, C** and **D**. Choose the one you consider correct and record your choice in **soft pencil** on the separate answer sheet.

Read very carefully the instructions on the answer sheet.

INFORMATION FOR CANDIDATES

Each correct answer will score **one** mark. A mark will **not** be deducted for a wrong answer.
Any rough working should be done in this booklet.

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

Copyright: Zimbabwe School Examinations Council, N2019.

[Turn over

Scanned with CamScanner

1. Which one has the same unit as moment of a force?

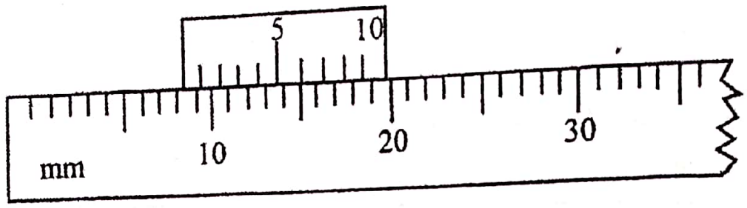
A force

B momentum

C power

D work

2. What is the reading shown on the vernier callipers?



A 8.4 mm

B 8.6 mm

C 14.5 mm

D 15.0 mm

3. What is the density of a piece of metal which has a mass of 450 g and a volume of 48 cm^3?

A 0.1 g/cm^3

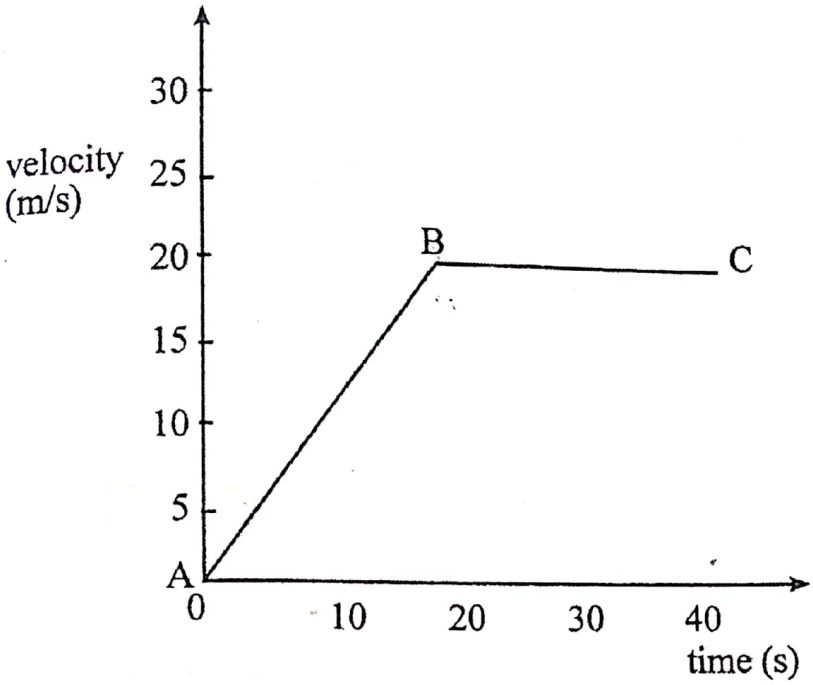
B 9.4 g/cm^3

C 402 g/cm^3

D 21 600 g/cm^3

Scanned with CamScanner

4. The graph shows the motion of a car from point A to C.



Which row best describes the motion of the car?

	A-B	B-C
A	uniform acceleration	uniform velocity
B	change in acceleration	uniform acceleration
C	uniform velocity	uniform acceleration
D	change in velocity	uniform acceleration

5. Which statement is correct for a rock falling freely?

A Acceleration is constant.

B Acceleration increases.

C Acceleration decreases.

D Acceleration is zero.

Scanned with CamScanner

6. Which changes result in an increase in the stability of an object?

A increased base area and increased height of centre of gravity

B decreased base area and increased height of centre of gravity

C increased base area and decreased height of centre of gravity

D decreased base area and decreased height of centre of gravity

7. Inertia is

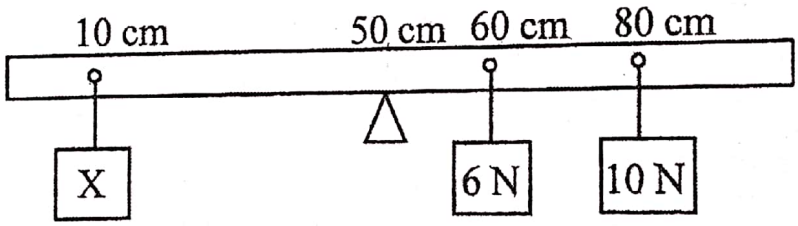
A resistance to change of state of motion.

B pressure due to change of motion.

C a force which opposes motion.

D a force which causes motion.

8. The diagram shows a uniform metre rule in equilibrium.



What is the value of X?

A 8 N

B 9 N

C 16 N

D 60 N

Scanned with CamScanner

9. Which statement is correct for a body moving in a circle at constant speed?

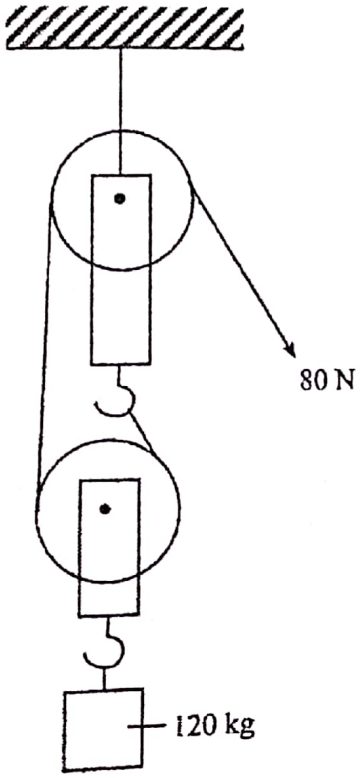
A There is no force acting on it.

B There is no force producing an acceleration.

C There is a force acting at a tangent to the circle.

D There is a force acting towards the centre of the circle.

10. The diagram shows a pulley system.



What is the mechanical advantage of the pulley system?

A 0.067

B 0.670

C 1.50

D 15.00

Scanned with CamScanner

11. Which quantity is calculated by multiplying force and distance?

A work

B power

C pressure

D momentum

12. Gravitational potential energy is transformed to kinetic energy when

A a car is travelling on a flat horizontal ground.

B a mango falls from a mango tree.

C a car is travelling up a hill.

D an object is thrown upwards.

13. One watt is equivalent to one

A volt per second.

B joule per second.

C coulomb per second.

D ampere per second.

14. Which source of energy is renewable?

A coal

B tides

C generators

D batteries

Scanned with CamScanner

15. Which factor affects the strength of joints?

A size of load

B size of contact area

C size of materials

D size of dowels

16. What causes the production of soot in a petrol engine?

A blocked jets

B worn-out jets

C worn out radiator

D blocked petrol filter

17. A compressional force is a

A rotational force.

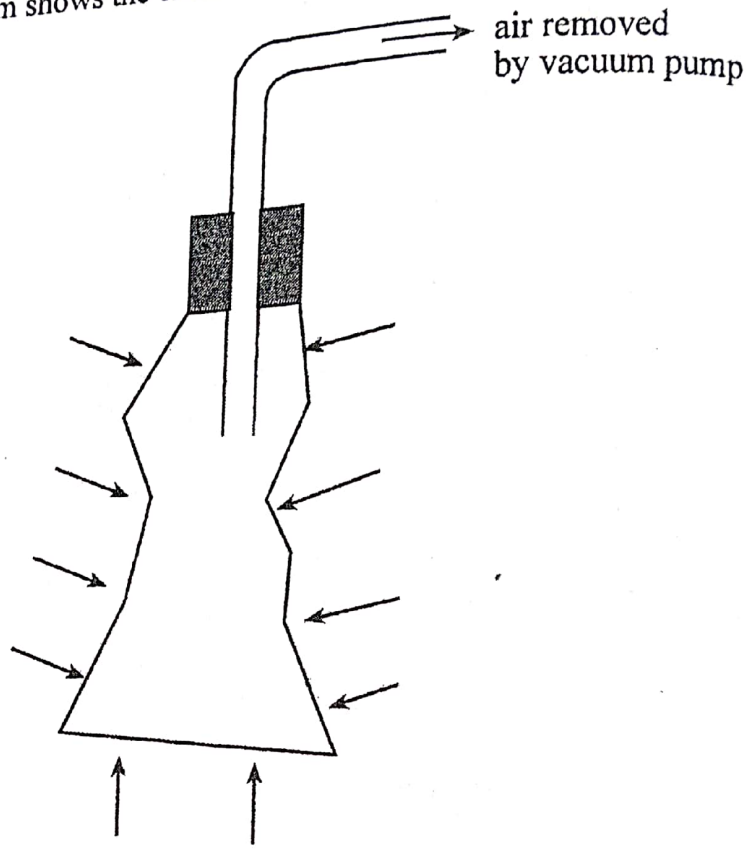
B stretching force.

C crushing force.

D twisting force.

Scanned with CamScanner

18. The diagram shows the effect of removing air from a can.



Why does the can crush?

A The pressure inside the can is greater than outside pressure.

B The pressure inside the can is equal to outside pressure.

C The pressure inside the can is less than outside pressure.

D The pressure inside the pump is equal to the outside pressure.

19. Which row shows what happens to the melting point of ice and the boiling point of water when the pressure is reduced?

	melting point	boiling point
A	increases	increases
B	increases	decreases
C	decreases	decreases
D	decreases	increases

Scanned with CamScanner

20. Which statement best explains why water is **not** used in thermometers?

A It adheres to glass.

B It has a low heat capacity.

C It does not expand when heated.

D It has unusual behaviour.

21. What happens to the temperature of a substance during change of state?

A it increases

B it decreases

C it remains constant

D it fluctuates

22. What increases the loudness of a sound note?

A increase in frequency

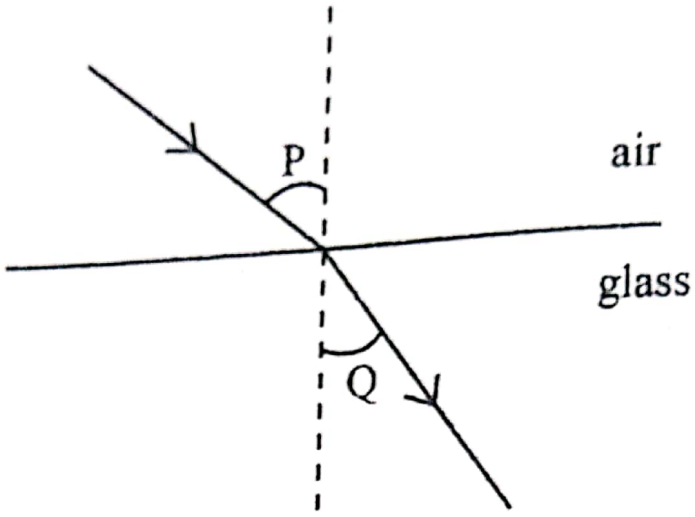
B decrease in frequency

C decrease in amplitude

D increase in amplitude

Scanned with CamScanner

23. The diagram shows a ray of light travelling from air to glass.



Which ratio represents the refractive index of glass?

A $\frac{P}{Q}$

B $\frac{Q}{P}$

C $\frac{Sin\ P}{Sin\ Q}$

D $\frac{Sin\ Q}{Sin\ P}$

24. Which electromagnetic wave is used in data communication?

A X-rays

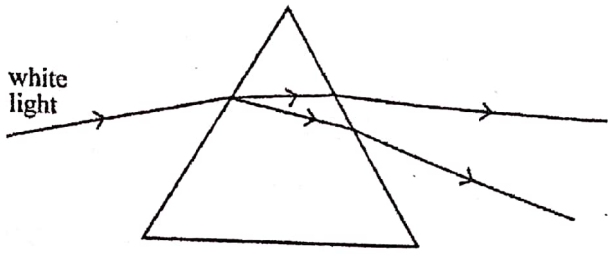
B infra-red

C ultra-violet

D microwave

Scanned with CamScanner

25. The diagram shows a ray of white light passing through a glass prism.



Which component of the light is refracted the most?

A violet

B green

C blue

D red

26. The depolariser used in a dry cell is

A ammonium (II) chloride.

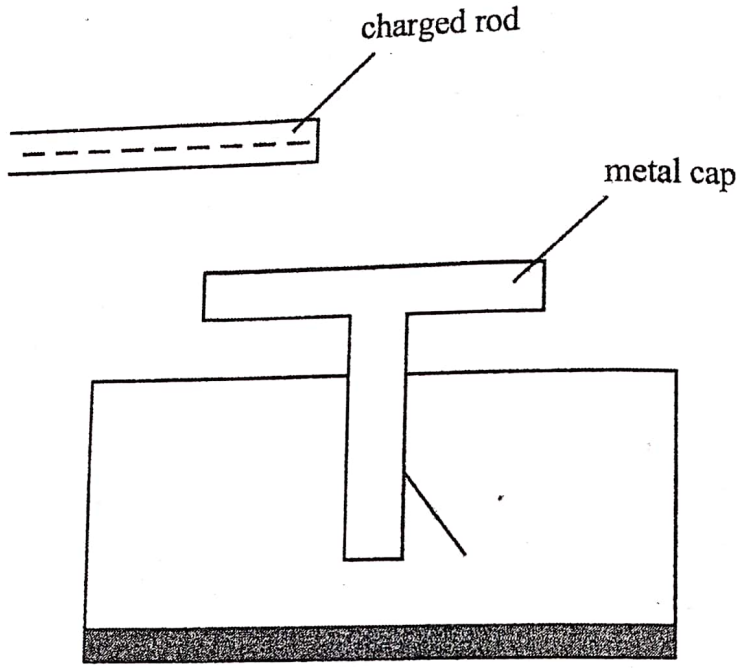
B manganese (IV) oxide.

C zinc (II) sulphate.

D zinc (II) chloride.

Scanned with CamScanner

27. The diagram shows a charged rod brought close to a gold leaf electroscope.



The leaf diverges because

A negative charges move from the charged rod to the gold leaf.

B negative charges are repelled from the metal cap to the gold leaf.

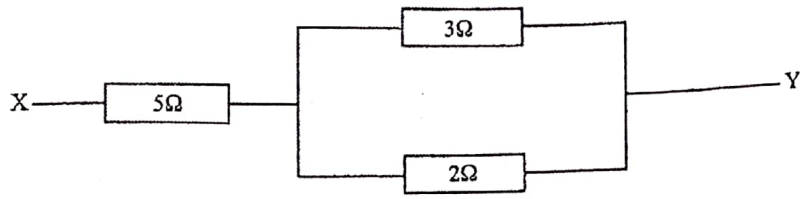
C positive charges are attracted from the gold leaf to the metal cap.

D positive charges are attracted from the gold leaf to the charged rod.

28.

Scanned with CamScanner

28. The diagram shows a network of resistors.



What is the effective resistance across XY?

A 5.2 Ω

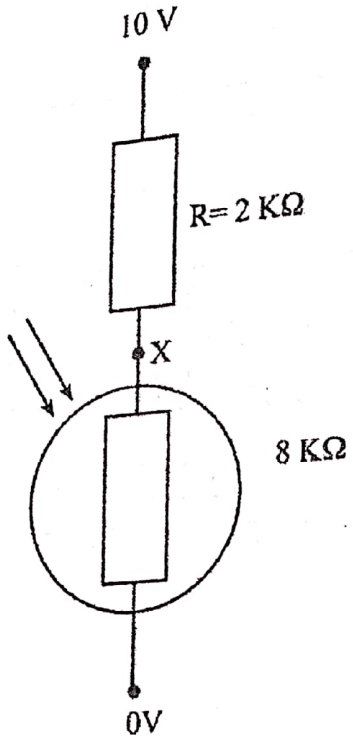
B 5.8 Ω

C 6.2 Ω

D 10.0 Ω

Scanned with CamScanner

29. The diagram shows a potential divider circuit consisting of an LDR and a fixed resistor, R.



What is the potential at X?

A 2.0 V

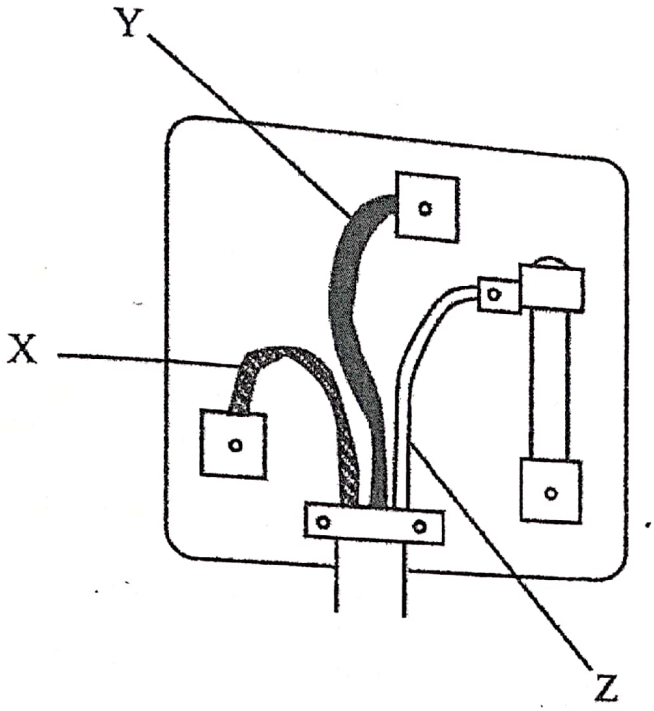
B 2.5 V

C 5.0 V

D 8.0 V

Scanned with CamScanner

30. The diagram shows a three-pin plug.



Which combination correctly identifies wires X, Y and Z?

	X	Y	Z
A	live	neutral	earth
B	neutral	earth	live
C	neutral	live	earth
D	live	earth	neutral

31. Which one **cannot** be used for demagnetisation?

A heating

B hammering

C direct current

D alternating current

Scanned with CamScanner

32. Alternating current generators are different from direct current generators because they have

A carbon brushes.

B split rings.

C commutators.

D slip rings.

33. Lenz's law states that

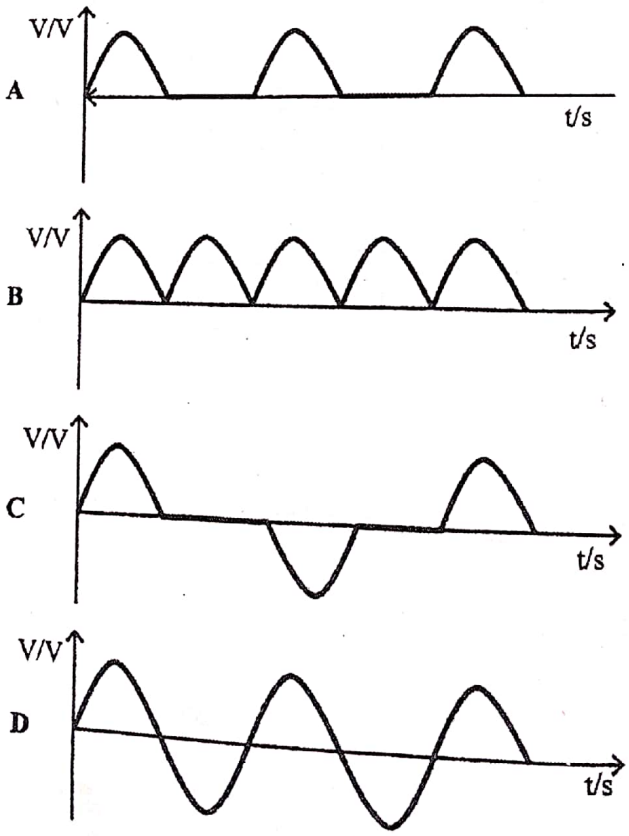
A current is proportional to voltage provided temperature remains constant.

B direction of induced emf is such as to oppose the effect causing it.

C induced emf is directly proportional to the rate of change of magnetic flux.

D energy is neither created nor destroyed but changed from one form to another.

34. Which diagram shows the variation of a.c voltage with time after a full-wave rectification process?



Scanned with CamScanner

35. A transformer with an input voltage of 2 400 V and an output voltage of 240 V has 2 000 turns on the primary coil.
What is the number of turns on the secondary coil?

A 10

B 200

C 2 160

D 20 000

36. What name is given to the process of directing electrons into a fine beam in the cathode ray oscilloscope?

A emission

B acceleration

C collimation

D deflection

37. The table shows a truth table for a logic gate.

INPUTS		OUTPUT
0	0	0
1	0	1
0	1	1
1	1	1

Which logic gate is represented by the truth table?

A OR

B AND

C NOR

D NAND

Scanned with CamScanner

38. Which electrical component uses a low-current circuit to switch a high current circuit on or off?

A relay

B diode

C thermistor

D capacitor

39. Isotopes of the same element contain the same number of

A electrons.

B electrons and neutrons.

C neutrons and protons.

D neutrons.

40. What is the half-life of a radioactive source whose count rate falls from 4 000 to 500 in 30 minutes?

A 3.75 minutes

B 7.5 minutes

C 10 minutes

D 15 minutes

Scanned with CamScanner

ZIMBABWE SCHOOL EXAMINATION COUNCIL

General Certificate of Ordinary Level

EXPECTED ANSWERS

PHYSICS	NOVEMBER 2019	4023/1

1	D
2	B
3	B
4	A
5	A
6	C
7	A
8	B
9	D
10	D
11	A
12	B
13	B
14	B
15	B
16	B
17	C
18	C
19	C
20	D

21	C
22	D
23	C
24	D
25	A
26	B
27	B
28	C
29	D
30	B
31	C
32	D
33	B
34	B
35	B
36	C
37	A
38	A
39	A
40	C

Scanned with CamScanner

Candidate Name | Centre Number | Candidate Number

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

4023/2

PHYSICS

PAPER 2 Theory

2 hours 15 minutes

NOVEMBER 2019 SESSION

Candidates answer on the question paper.

Additional materials: Electronic calculator

Allow candidates 5 minutes to count pages before the examination.

This booklet should not be punched or stapled and pages should not be removed.

Time 2 hours 15 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page and centre and candidate number in the boxes on the top right corner of every page of this paper. Check if the booklet has all the pages and ask the invigilator for a replacement if there are duplicate or missing pages.
Do not fasten the booklet.

Section A

Answer **all** questions.
Write your answers in the spaces provided on the question paper.

Section B

Answer any **three** questions.
Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

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

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

Copyright: Zimbabwe School Examinations Council, N2019.

Scanned with CamScanner

Candidate Name | Centre Number | Candidate Number

Section A

*Answer **all** questions from this section.*

1. **(a)** The total mass of a cyclist and the bicycle is 90 kg. The cyclist accelerates from rest with a driving force of 135 N against a frictional force of 30 N.

Calculate the acceleration.

[3]

(b) State any **two** factors that affect the size of the frictional force in **(a)**.

.....

.....

[2]

Scanned with CamScanner

2 (a) Distinguish between displacement and distance.

.....

.....

.....

[1]

(b) **Fig. 2.1** shows a stone attached to a string being whirled around at a constant speed of 10 m/s.

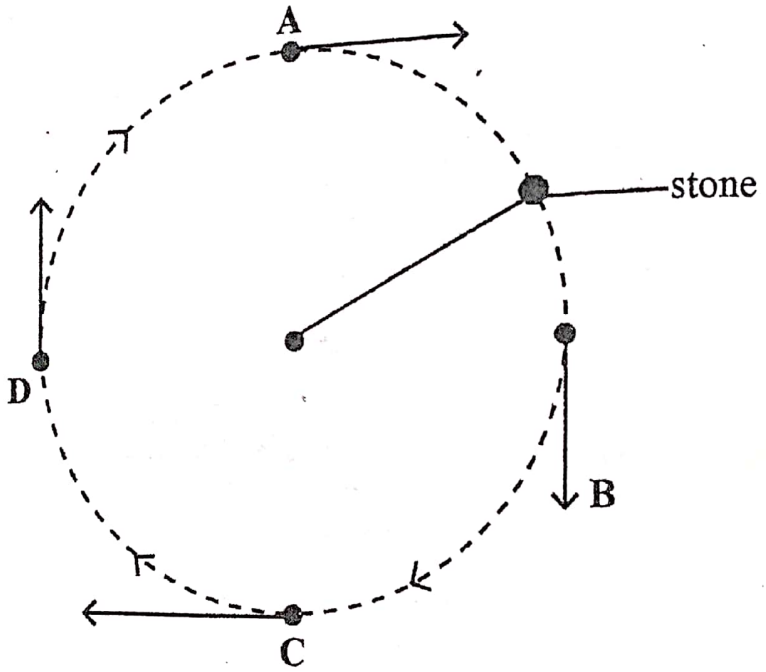


Fig. 2.1

(i) State the velocity at B and velocity at D.

velocity at B .....

velocity at D .....

.....

[2]

(ii) Explain why the stone in **Fig. 2.1** is accelerating.

.....

.....

.....

.....

[2]

Scanned with CamScanner

3. (a) State any **two** reasons why concrete dam walls are usually arch shaped.

1 .....

2 .....

[2]

(b) Suggest any **three** environmental hazards associated with dam construction.

1 .....

2 .....

3 .....

[3]

4. (a) **Fig. 4.1** shows a liquid being heated.

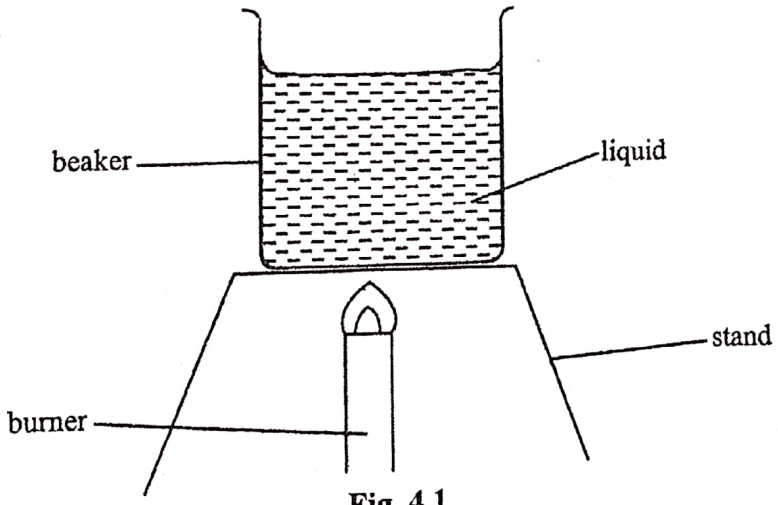


Fig. 4.1

Draw arrows to show convection currents on **Fig.4.1**. [1]

(b) Explain how convection currents are produced when a liquid is heated.

.....

.....

.....

[2]

Scanned with CamScanner

(c) Describe heat transfer by conduction.

.....

.....

.....

[2]

5. (a) Define *specific latent heat*.

.....

.....

.....

[2]

(b) Calculate the amount of heat required to melt 80 g of ice at 0 °C.
[specific latent heat of fusion of ice = 330 J/g]

heat required = _____ J.

[2]

(c) State the effect of impurities on the melting point of ice.

.....

.....

[1]

Scanned with CamScanner

6. (a) In an experiment, a plastic rod was charged by rubbing it on a piece of cloth.

State the type of charge on the cloth.

.....

[1]

(b) Describe how the rod became charged.

.....

.....

.....

.....

[2]

(c) The charged rod was brought close to small pieces of paper.
Explain why the pieces of paper were attracted to the rod.

.....

.....

.....

.....

[2]

7. (a) State any **one** limitation of Ohm's law.

.....

[1]

(b) Sketch an I-V characteristic graph for a filament lamp.

[2]

Scanned with CamScanner

(c) A 3 Ω resistor is connected to a 1.5 V supply. Calculate the amount of current passing through the resistor.

[2]

8. (a) Two atoms of mass numbers 20 and 21 have a proton number of 10.

(i) State the name given to the atoms.

.....

[1]

(ii) Determine the number of neutrons in the atom of mass number 21.

.....

[1]

(b) A radioactive sample has a mass of 10 g and a half-life of 5 days.

Calculate the number of days taken for the sample to decay to 1.25 g.

[3]

Scanned with CamScanner

Candidate Name | Centre Number | Candidate Number

Section B

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

9. (a) (i) State the SI unit of density.

.....

[1]

(ii) Describe how the density of a regular object is measured.

.....

.....

.....

.....

.....

.....

[3]

(iii) Explain why ice floats on water.

.....

.....

.....

.....

[2]

Scanned with CamScanner

(b) **Fig. 9.1** shows a velocity-time graph of a body in motion.

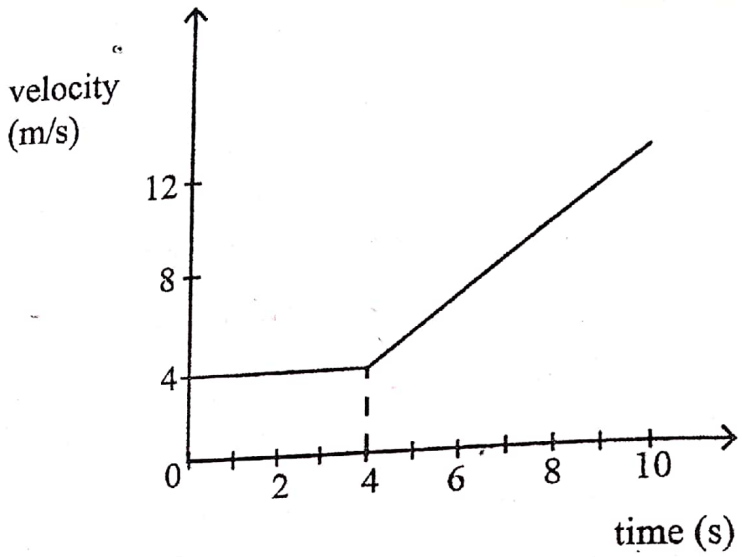


Fig. 9.1

(i) Define *acceleration*.

.....

.....

[1]

(ii) Calculate the distance covered in 10 seconds.

[3]

Scanned with CamScanner

(iii) Determine the acceleration between 4 seconds and 10 seconds.

[2]

(c) (i) State the conditions for an object to experience free fall.

.....

.....

.....

.....

[2]

(ii) Describe how a falling body attains terminal velocity.

.....

.....

.....

.....

.....

.....

[4]

(iii) Suggest good experimental techniques to be observed during an experiment to determine terminal velocity of an object dropped into oil.

.....

.....

.....

.....

[2]

Scanned with CamScanner

10. (a) **Fig. 10.1** shows a pulley system used to lift a load of mass 20 kg with an effort of 95 N.

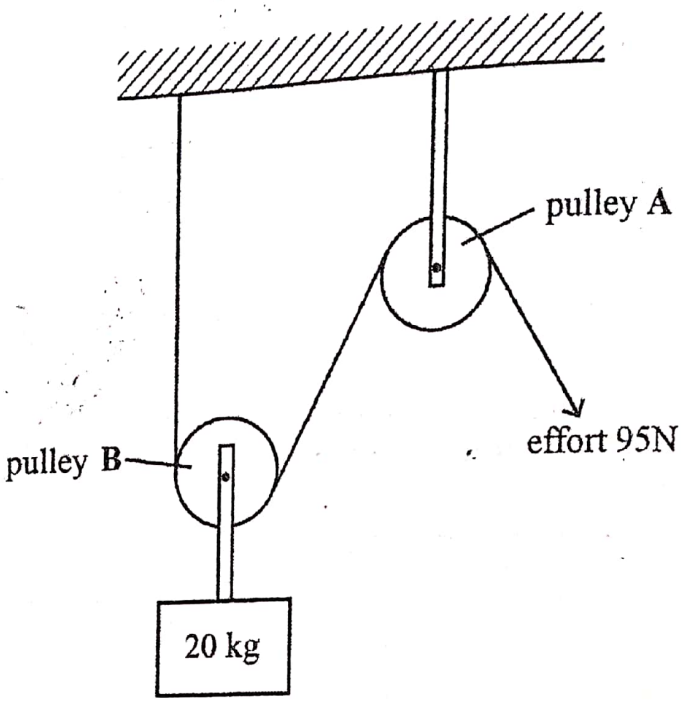


Fig .10.1

(i) Name a single pulley that has the same velocity ratio as the pulley system in **Fig. 10.1**.

.....

[1]

(ii) State the purpose of pulley A.

.....

[1]

Scanned with CamScanner

(iii) Calculate the mechanical advantage of the pulley system.

[2]

(iv) Suggest why the mechanical advantage can never be greater than the velocity ratio for any pulley system.

.....

.....

[2]

(b) Water in a river flows over a cliff 70 m high.

(i) Calculate the change in gravitational potential energy of each kilogram of the water.

[$g = 10\ ms^{-2}$]

[2]

Scanned with CamScanner

(ii) Determine the speed at which a kilogram of the water hits the bottom of the cliff.

[3]

(iii) State the assumption made in **(ii)**.

.....

[1]

(c) (i) Name **two** methods of welding.

1 .....

2 .....

[2]

(ii) State any **two** safety precautions taken during welding.

1 .....

2 .....

[2]

(iii) Give a reason for cleaning metal surfaces before welding.

.....

.....

[1]

Scanned with CamScanner

(iv) Suggest, giving **two** reasons, a method of joining a capacitor to a computer motherboard.

Method .....

Reasons .....

1 .....

2 .....

[3]

11. (a) (i) State what happens to electromagnetic waves when they

1.change medium, ...

.....

2. pass through a magnetic field. .....

.....

[2]

(ii) State any **two** uses of visible light.

.....

.....

.....

[2]

(iii) Explain why the frequency of ultra violet light is greater than that of microwaves.

.....

.....

.....

.....

[2]

Scanned with CamScanner

(b) **(i)** Define a *wavefront*.

.....

.....

.....

[1]

(ii) Sketch a diagram showing straight wavefronts for a water wave passing normally from shallow end to deep end.

[3]

(iii) State **two** characteristics of a wave which will change if the water in **(ii)** passes the boundary at an angle.

.....

.....

.....

.....

[2]

Scanned with CamScanner

(c) Temperature measurement involves two fixed points.

(i) Define the

1. lower fixed point, ...

.....

..... [2]

2. upper fixed point. .....

.....

..... [2]

(ii) The length of a mercury thread in a thermometer is 10 mm at ice point and 110 mm at steam point.

Calculate the temperature that corresponds to 70 mm length of mercury.

[3]

(iii) Suggest, with a reason why a mercury in glass thermometer **cannot** measure melting point of carbon dioxide.

.....

.....

[1]

Scanned with CamScanner

12. **(a)** **(i)** Describe how electricity may be used to

1. make a permanent magnet, ...

.....

2. demagnetise a magnet. .....

.....

.....

[4]

(ii) Explain why an electric current can be used to separate iron from copper.

.....

.....

.....

.....

[2]

(b) **(i)** State **two** differences between the magnetic properties of iron and steel.

iron	steel

[4]

(ii) A piece of metal was found in the school yard.
Describe how a student may determine whether the metal is a magnet or not.

.....

.....

.....

.....

[2]

Scanned with CamScanner

(c) In household circuits, several components are connected across two common points.

(i) Suggest **two** advantages of connecting the components in this way.

1. .....

.....

2. .....

.....

.....

[2]

(ii) State **two** dangers of electricity.

1. .....

2. .....

[2]

(iii) Suggest a suitable rating for a fuse to be used on an appliance rated 800 W, 240 V.

[3]

(iv) Explain why the fuse must be connected to the live wire.

.....

.....

.....

[1]

Scanned with CamScanner

ZIMBABWE SCHOOL EXAMINATION COUNCIL

General Certificate of Education Ordinary Level

EXPECTED ANSWERS

NOVEMBER 2019

PHYSICS

4023/2

Scanned with CamScanner

1. (a) $Acceleration = 1.17ms^{-2}$

(b) -combined weight of cyclist and bicycle.
-mass
-nature of surfaces in contact whether smooth or rough.

2. (a) -displacement is a vector whilst distance is a scalar
-distance is any length covered by a moving object whilst displacement is distance covered in a specific direction.

(b) (i) -velocity at B – 10m/s due south/downwards/in the negative direction

--velocity at D – 10m/s due north/upwards/in the positive direction

(ii) -velocity is changing, since direction is also changing.

3. (a) - distribute force/thrust
-concrete is strong in compression.
-arc shape is strong in compression.

(b) -death of animals
-flooding up and down stream
-damage of ecosystem/vegetation
-results in diseases

4. (a)

(b) -heated liquid expands, become less dense and
-cold and dense liquid particles sink to the bottom

(c) -particles near/close to heat source gain energy and vibrate more
-pass energy to neighbouring particles (electron particles).

Scanned with CamScanner

5. (a) -amount of heat required to change state of a substance per unit mass at constant temperature.

(b) $Q = ml = 80 \times 330 = 26\,400J$

(c) lowers/decreases

---

6. (a) -positive charge

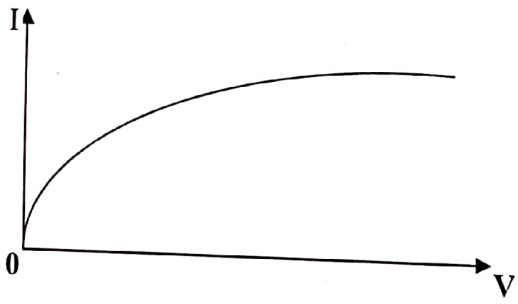
(b) -electrons move from cloth to plastic rod.
-negative charge produced as a result of excess electrons

(c) -electrons repelled from the top of the paper leaving a positive charge
-unlike charges attract.

---

7. (a) -temperature must remain constant
-physical conditions like tension, length, cross sectional area, magnetic field must remain constant

(b)



(c) $I = \frac{V}{R} = \frac{1.5V}{3\Omega} = 0.5A$

---

8. (a) (i) Isotope

(ii) $21 - 10 = 11protons$

(b) $m = \frac{m_0}{2^n}$

Scanned with CamScanner

$1.25 = \frac{10}{2^n}$

15 days

9. (a) (i) kg/m^3

(ii) -measure mass using a balance
-determine volume considering dimensions
- $density = \frac{mass}{volume}$

(iii) -when water freezes its volume increases.
-mass remains the same
- Therefore $density = \frac{mass}{volume}$ decreases

(b) (i) the rate of change of velocity

(ii) Displacement = 64m

(iii) Acceleration = $1.3ms^{-2}$

(c) (i) -No force of air resistance
-objects will fall out with the same rate of acceleration/ acted upon by gravity only.

(ii) -initially weight is greater than air resistance
-air resistance increases with speed of falling object.
-acceleration of object decreases as a result.
-eventually upward air resistance equals weight of body acting downwards.
-resistant force being zero, object falls at constant velocity which is terminal velocity.

(iii) -coat object with oil to avoid bubbles.
-release object near oil surface
-avoid splashing of oil
-repeat experiment several times and find the average of results.

Scanned with CamScanner

10. **(a)** **(i)** single movable pulley

(ii) -to change direction of effort/Force

(iii) $MA = 2.1J$

(iv) $-if\ MA > VR$

$E = \frac{MA}{VR}$

-efficiency will be greater than 100% which is not possible

(b) **(i)** $\Delta PE = mgh$

$= 1 \times 10 \times 70$

$= 700J$

(ii) $E_p = E_k$

$E_k = \frac{1}{2}mv^2$

$= 37.4ms^{-1}$

(iii) -no energy losses/ energy is conserved
-no air resistance

(c) **(i)** -Arc/Electric current
-gas/Oxyacetylene
-Plastic Welding
-Laser welding
-spot welding

(ii) -wearing goggles

Scanned with CamScanner

-wearing heat proof materials
-good ventilation
-protective clothing (e.g. gloves, safety shoes)

(iii) -to remove impurities/ oxide layer

(iv) - soldering
- joining at a point (small area)
- solder conducts electricity
- solder has low melting point
- solder sets/dry quickly
- does not damage motherboard

---

11. **(a)** **(i)** **1.** -their speed/wavelength changes
-they are refracted/change direction

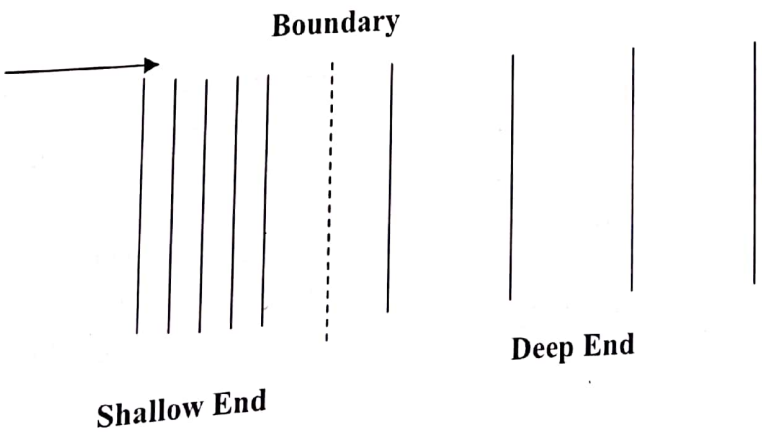
2. -they are not deflected

(ii) -stimulating retina enabling vision
-for photosynthesis in plants
-in photography/taking pictures
-generating electricity (solar panels)
-use in projectors
-endoscope, microscope, periscope

(iii) -ultra violet has shorter wavelength than microwave

(b) **(i)** **A** line joining points of the same crests or troughs

(ii)



(iii)

Scanned with CamScanner

-angle changes
-velocity changes
-wavelength changes.

(c) **(i)** -temperature of pure melting ice at standard atmospheric pressure
-temperature of pure boiling water at standard atmospheric pressure

(ii) $\theta = \frac{x_\theta - x_0}{x_{100} - x_0} \times 100°C$

$$\theta = \frac{70 - 10}{110 - 10} \times 100°C$$

$$= 60°C$$

(iii) - mercury freezes at $-39°C$/ mercury will be frozen at $-56°C$

---

12. (a) **(i) 1.** -Insert a piece of steel into a solenoid
-pass direct current through the solenoid

2. -Insert the magnet into a solenoid and pass alternating current
-withdraw the magnet slowly in a west-east direction

(ii) -flowing current produces a magnetic field
-iron (easily) gets attracted to a magnet
-copper is not attracted to a magnet

(b) **(i)**

Iron	**Steel**
- Easily magnetised	-difficult to magnetise
- Easily demagnetised	-retains its magnetism
- Soft magnetic material	- Hard magnetic material
- Suitable for use in temporary magnets	-Suitable for use in permanent magnets

Scanned with CamScanner

(ii) -bring the ends of the metal close to a known permanent magnet.
- One end of the magnet must repel the permanent magnet.

(c) (i) 1. -each component receives maximum voltage
2. -each circuit can be operated independently

(ii) 1. -electric shock
-electrocution/death
-fires
-damage of property

(iii) $current\ I = \frac{P}{V} = \frac{800}{240}$

$= 3.33A$

-suitable fuse 5A

(iv) -when the fuse blows the appliance will not remain live
-live wire is disconnected

Scanned with CamScanner

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

4023/1

PHYSICS

PAPER 1 Multiple Choice

SPECIMEN PAPER

1 hour

Additional materials:
Multiple Choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)
Electronic calculator and/or Mathematical tables

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Do not open this booklet until you are told to do so.
Write your name, Centre number and candidate number on the answer sheet in the spaces provided unless this has already been done for you.

There are **forty** questions in this paper. Answer **all** questions. For each question there are four possible answers, **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice in **soft pencil** on the separate answer sheet.

Read very carefully the instructions on the answer sheet.

INFORMATION FOR CANDIDATES

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

This specimen paper consists of 16 printed pages.

Copyright: Zimbabwe School Examinations council, Specimen Paper

©ZIMSEC SPECIMEN PAPER

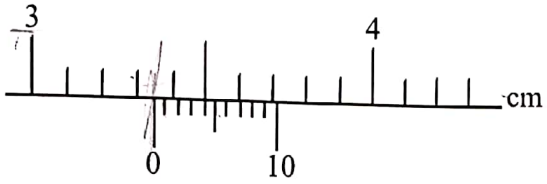
[Turn over

Scanned with CamScanner

1 Which of the quantities is a base quantity?

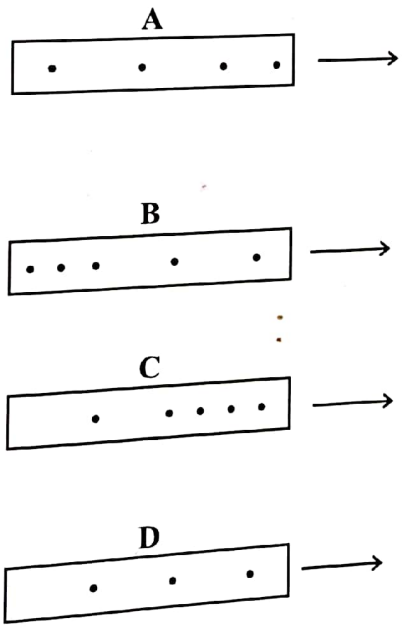
A energy
B force
C time
D volume

2 What is the reading shown on the vernier scale?



A 3.34cm
B 3.42cm
C 3.70cm
D 3.73cm

3 The diagrams show different sections of a ticker tape being pulled from left to right by a trolley.



Which section **A**, **B**, **C** or **D** shows the decreasing speed of the trolley?

Scanned with CamScanner

4 Which statement is true about two objects of different masses in free fall near the earth's surface?

A greater acceleration for the bigger object
B greater acceleration for the smaller object
C less acceleration for the mass with less speed
D same acceleration for both masses

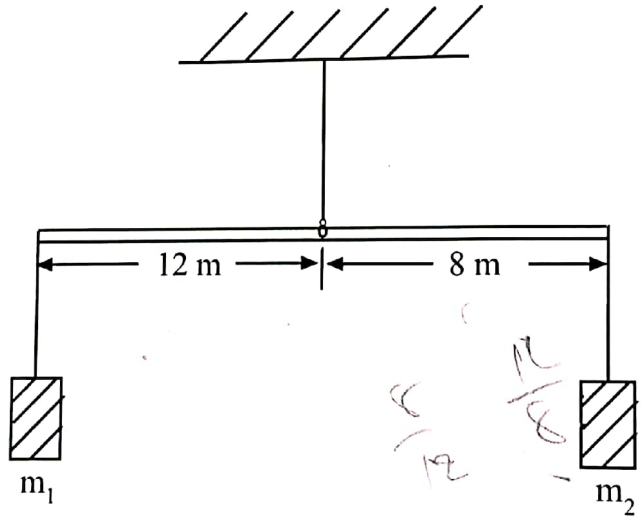
5 A load of 50 N is added to a steel spring of length 10 cm, its length increases to 17 cm, What is the spring constant?

A 0.14 N/cm
B 2.94 N/cm
C 5.00 N/cm
D 7.14 N/cm

6 Which of the following can **not** be changed by a force?

A acceleration
B mass
C momentum
D volume

7 The diagram shows a system in equilibrium. What is the mass ratio $\frac{M2}{M1}$?



A $\frac{2}{3}$

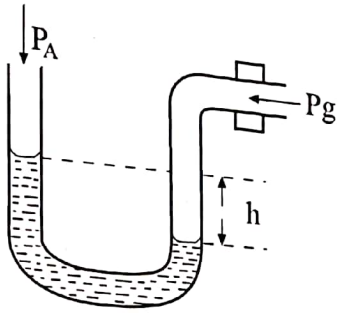
B $^3/_2$

C $^1/_2$

D $\frac{2}{1}$

Scanned with CamScanner

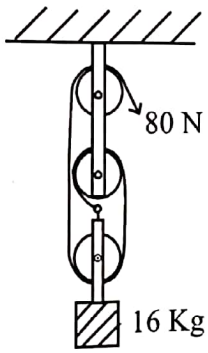
8 The diagram shows a U-tube manometer.



What is the formula for calculating gas pressure?

A pgh
B h + pgh
C P_A + hpg
D pgh − h

9 The diagram shows a pulley system.

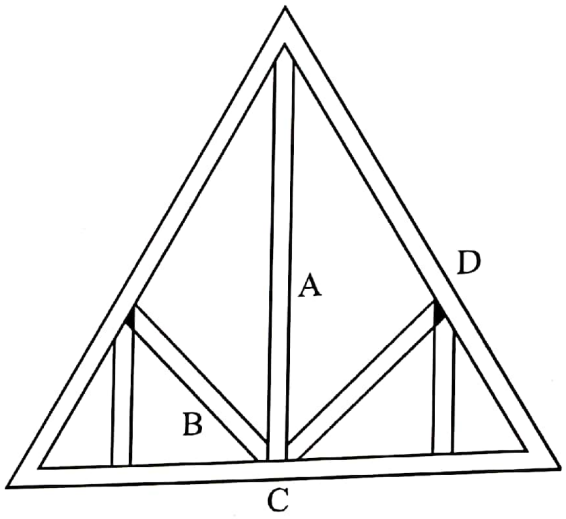


What is the V.R?

A 1.6
B 2.0
C 3.0
D 5.0

Scanned with CamScanner

10 The diagram below shows a truss.



Which part **A**, **B**, **C** or **D** shows where compressional forces are acting?

11 Which is the best method of joining steel blocks together?

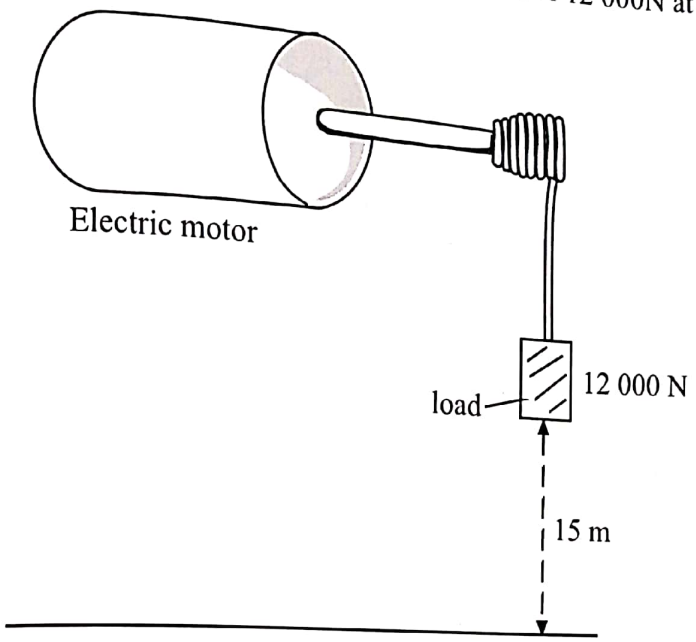
A brazing
B glueing
C soldering
D welding

12 Bricks are used in construction because they

A resist compressional forces.
B resist tensile forces.
C resist shear forces.
D resist heat.

Scanned with CamScanner

13 The diagram shows an electric motor supporting a load of 12 000N at a height of 15m.



What is the work done by the electric motor?

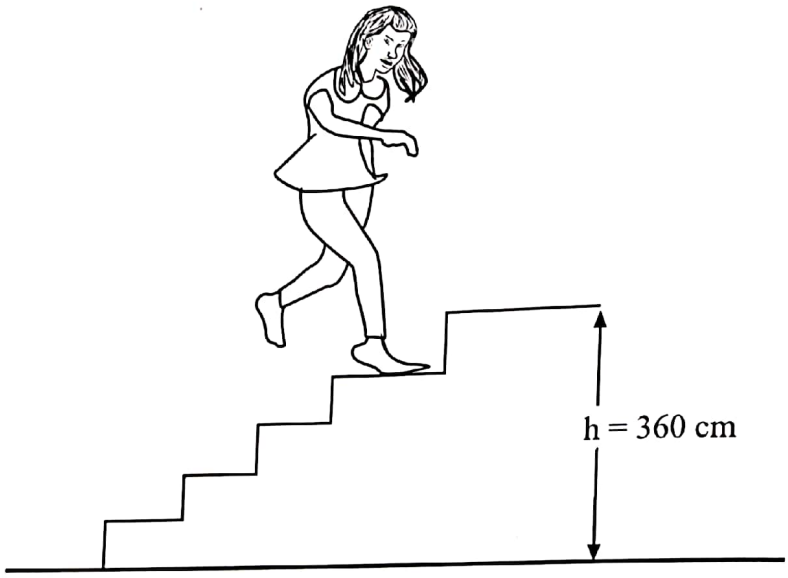
A 0 J
B 800J
C 12 000J
D 180 000J

14 Which of the following energy conversion takes place in an electric bulb when it is operating?

A light to heat.
B heat to light.
C chemical to light.
D electrical to heat.

Scanned with CamScanner

15 The diagram shows a girl of weight 400N running up the stairs of total height of 360cm.



What is the workdone by the girl?

A 144 000 J
B 14 400 J
C 1 440 J
D 144 J

16 Why do temperatures of the sea rise and fall very slowly compared to that of the land?

A Water absorbs large amount of heat for a very small temperature rise.
B Land absorbs large amount of heat for a very small temperature rise.
C Sea surface is bigger than land surface.
D Land surface is bigger than sea surface.

17 In good conductors of heat, thermal energy is transferred by

A density changes only.
B particle vibration only.
C density change and electron diffusion.
D particle vibration and electron diffusion.

18 Oil is used in car engines because

A it increases the efficiency of the engine.
B it cools the engine.
C it is used as a fuel.
D it cleans the engine.

Scanned with CamScanner

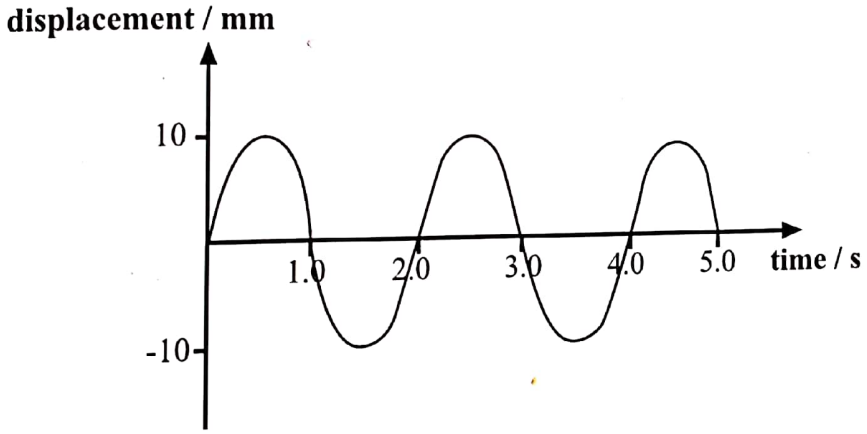
19 A petrol filter is used for

A storing petrol.
B cleaning the petrol.
C spraying petrol into the carburetor.
D controlling amount of petrol into the carburetor.

20 Light waves in glass have a wavelength of 6.0×10^{-7}m and a speed of 2.0×10^{8}ms^{-1}. They enter into water and their speed becomes 2.3×10^{8}ms^{-1}. What is the wavelength of the waves in water?

A 6.9×10^{-7}m
B 5.2×10^{-7}m
C 1.9×10^{6}m
D 1.4×10^{6}m

21 The diagram shows the variation of displacement of a wave with time.



What is the frequency of the wave?

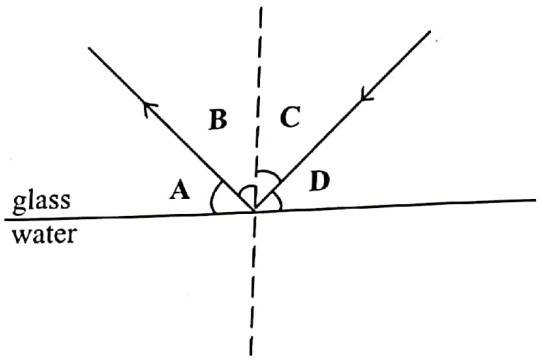
A 2.0 Hz
B 1.0 Hz
C 0.5 Hz
D 0.02 Hz

22 Loudness of sound is related to

A amplitude.
B frequency.
C speed.
D wavelength.

Scanned with CamScanner

23 The diagram shows a light ray incident on a glass-water boundary.

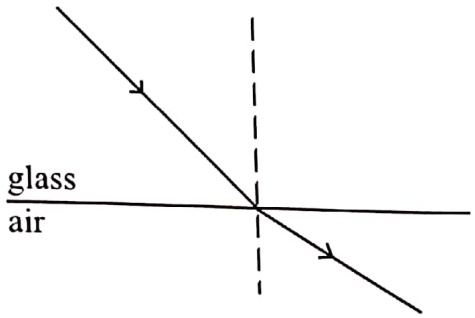


Which letter **A**, **B**, **C** or **D** represents the angle of reflection?

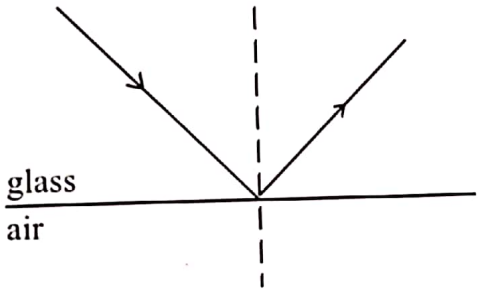
Scanned with CamScanner

24 Which diagram shows a light ray incident on a glass-air boundary at an angle of incidence greater than the critical angle?

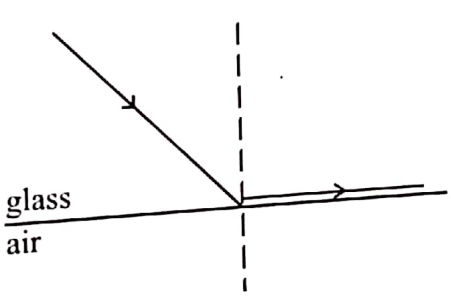
A



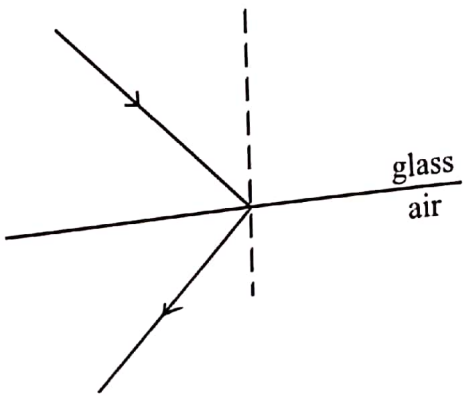
B



C



D



Scanned with CamScanner

25 What is the nature of an image formed by a diverging lens?

A magnified, real
B magnified, virtual
C diminished, real
D diminished, virtual

26 A neutral atom contain equal number of

A neutrons and electrons.
B neutrons and protons.
C protons and electrons.
D electrons and nucleons.

27 Which combination results in the resistance of a wire being doubled?

	Cross-sectional area	length
A	double	double
B	double	no change
C	halve	halve
D	halve	no change

28 An electric kettle is rated 240V, 10A. How much will it cost to run it for an hour at 10cents per unit?

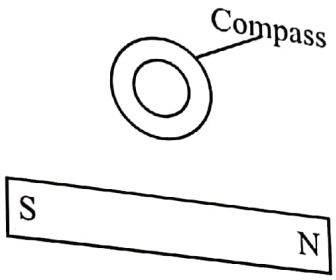
A 24 c
B 240 c
C 2 400 c
D 24 000 c

29 Which pair of metals will be picked up by an electromagnet?

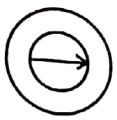
A aluminium and brass
B brass and copper
C copper and iron
D nickel and cobalt

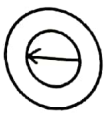
Scanned with CamScanner

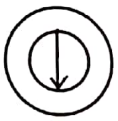
30 A compass is placed beside a bar magnet as shown.

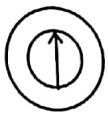


In which direction will the compass needle point?

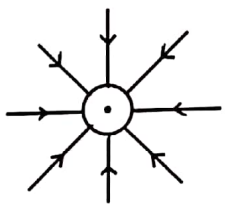
A 

B 

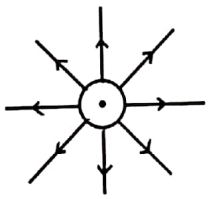
C 

D 

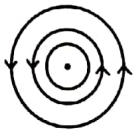
31 Which diagram shows field lines for a current carrying conductor with current coming out of the paper?



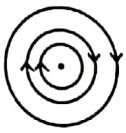
A



B



C



D

32 Which is **not** a factor affecting magnitude of induced emf?

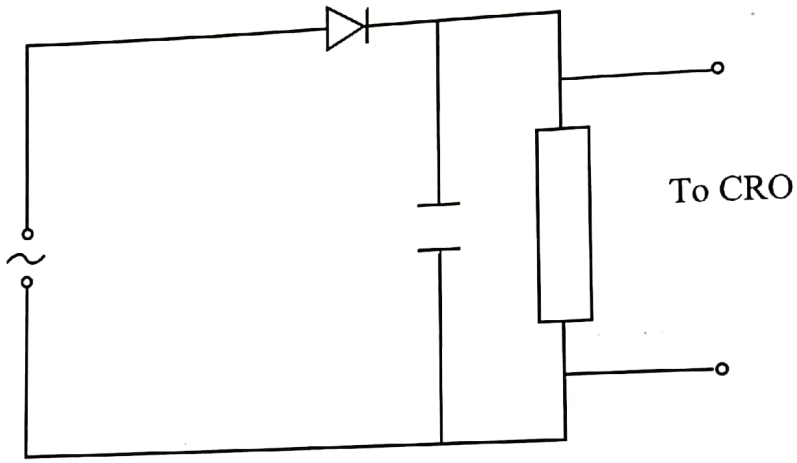
A amount of current flowing
B number of turns on the coil
C speed of magnet
D strength of magnet

Scanned with CamScanner

33 The advantage of alternating current over direct current is that it

A can be used for industrial purposes.
B is used by most electronic components.
C can be easily stepped up or down.
D has more power.

34 The diagram shows an electronic circuit.



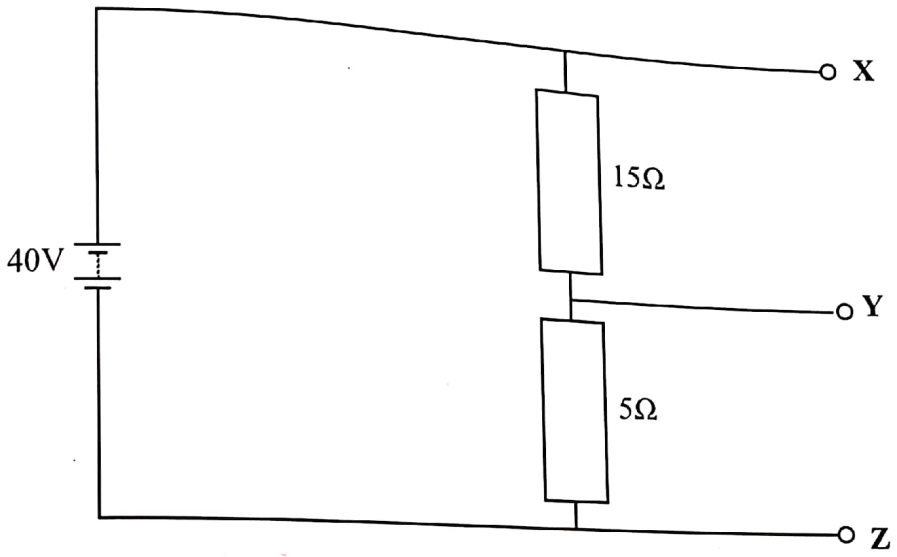
The circuit is used in

A full wave rectification only.
B half wave rectification only.
C full wave rectification and smoothing.
D half wave rectification and smoothing.

Scanned with CamScanner

35 The diagram shows the potential divider circuit.

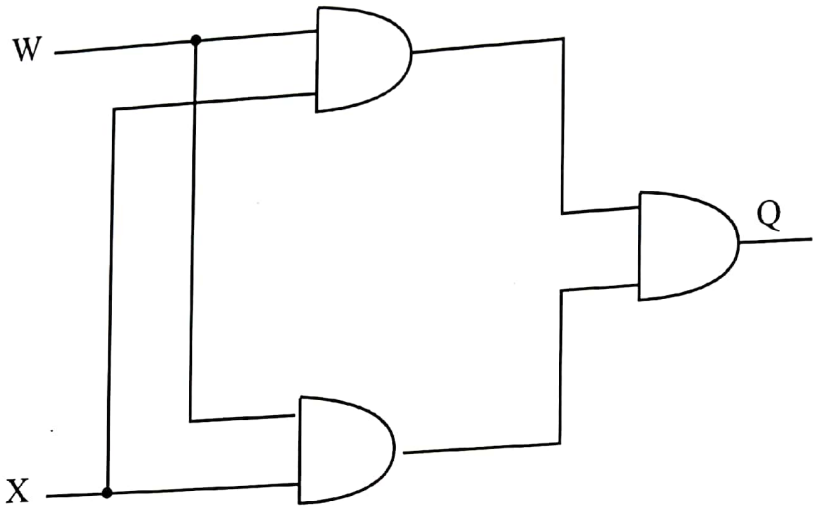
What is the potential difference across **XY**?



A 5V
B 10V
C 15V
D 30V

Scanned with CamScanner

36 The diagram shows a logic circuit.



Which of the outputs **A**, **B**, **C** or **D** is the correct output for the circuit?

INPUTS		OUTPUTS			
X	W	**A**	**B**	**C**	**D**
0	0	0	0	0	1
0	1	0	1	1	0
1	0	0	1	1	0
1	1	1	1	0	0

37 Which pair of nuclides are isotopes?

A $^{59}_{24}X$ and $^{58}_{25}Y$

B $^{59}_{24}X$ and $^{59}_{23}Y$

C $^{57}_{24}X$ and $^{59}_{26}Y$

D $^{58}_{23}X$ and $^{56}_{23}Y$

Scanned with CamScanner

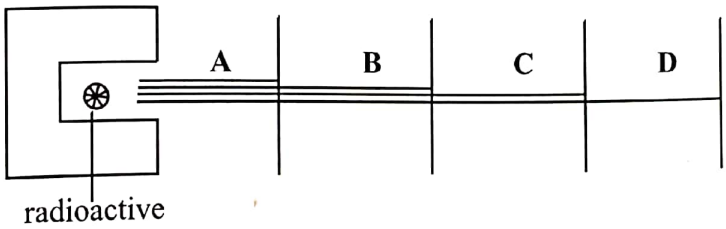
38 Which type of radiation is a fast moving electron?

A alpha.
B beta.
C gamma.
D x-rays.

39 The most dangerous radiation once inside the human body is

A alpha.
B beta.
C gamma.
D x-rays.

40 The diagram shows radiation from a source passing through different materials.



Which radiation **A**, **B**, **C** or **D** shows gamma radiation?

Scanned with CamScanner

ZIMBABWE SCHOOL EXAMINATION COUNCIL

General Certificate of Ordinary Level

EXPECTED ANSWERS

PHYSICS	SPECIMEN PAPER	4023/1

1	C
2	A
3	C
4	D
5	D
6	B
7	B
8	C
9	C
10	D
11	D
12	A
13	D
14	A
15	B
16	A
17	D
18	B
19	B
20	A

21	C
22	A
23	B
24	B
25	B
26	C
27	D
28	A
29	D
30	B
31	C
32	A
33	C
34	D
35	D
36	A
37	D
38	B
39	A
40	D

Scanned with CamScanner

Surname | Other name(s) | Centre Number | Candidate Number

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

PHYSICS

PAPER 2: Theory

4023/2

SPECIMEN PAPER

Additional materials: Electronic calculator and/or Mathematical table
Graph paper

2 hours

Allow candidates 5 minutes to count pages before the examination

This booklet should not be punched or stapled and pages should not be removed.

TIME: 2 hours

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page and Centre number and candidate number on top of the right corner of every page of this paper.
Check if the booklet has all the pages and ask the invigilator for a replacement if there are duplicate or missing pages.

Section A

Answer **all** questions.
Write your answers in the spaces provided on the question paper.

Section B

Answer any **three** questions.
Write your answers on the spaces provided on the question paper
Do not fasten the booklet

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question paper.
Candidates are reminded that **all** quantitative answers should include appropriate units.
Candidates are advised to show **all** their working in a clear and orderly manner, as more marks are awarded for sound use of Physics than for correct answers.

This question paper consists of 21 printed pages and 3 blank pages.

Copyright: Zimbabwe School Examinations Council, Specimen paper.

[Turn over

Scanned with CamScanner

Section A

*Answer **all** questions from this section.*

1 **Figure 1.1** shows an instrument used to measure diameter of a wire.

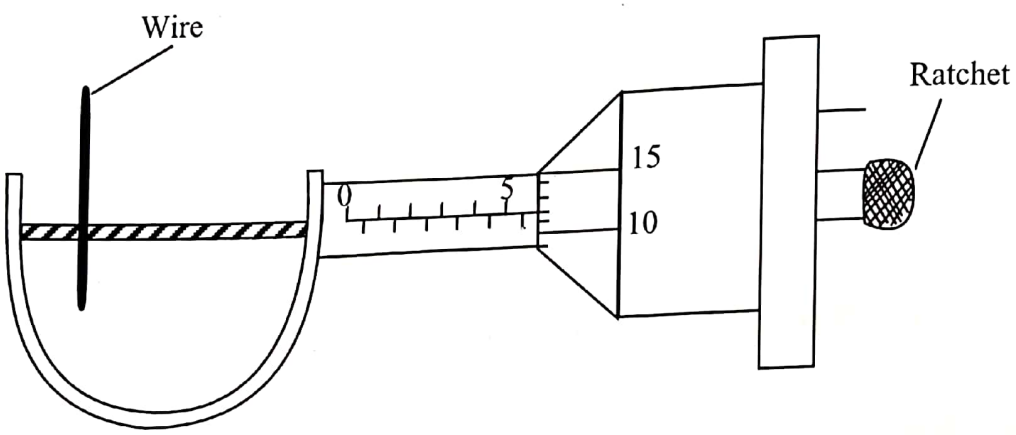


Fig. 1.1

(a) Name the instrument in **Fig. 1.1**.

_____ [1]

(b) State the reading shown on the instrument.

_____ [1]

(c) State **three** precautions which should be taken when using the instrument in **Fig. 1.1** to measure the diameter of the wire.

_____

_____

_____

_____ [3]

Scanned with CamScanner

(a) Define velocity.

2

[1]

(b) A car travels at a constant speed of 10 ms^{-1} for 8.0 s and is then brought to rest in 4.0 s by a constant braking force.

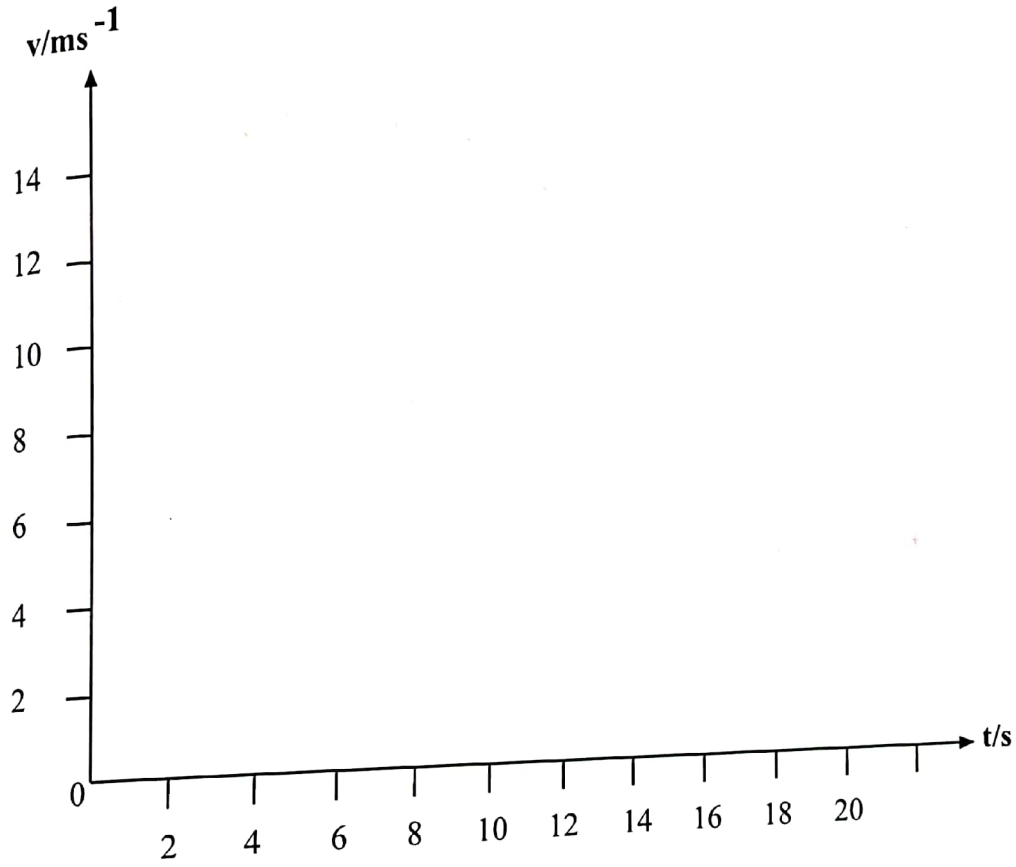


Fig. 2.1

(i) Draw a graph on **Fig. 2.1** to represent the car's motion. [2]

(ii) Determine the total distance travelled by the car.

[2]

Scanned with CamScanner

3 (a) (i) State **one** non-renewable source of energy.

_____ [1]

(ii) Explain why charcoal is a renewable source of energy.

_____

_____ [1]

(iii) Describe the main energy conversions which occur at Hwange Thermal Power Station.

_____

_____

_____ [3]

4 (i) State any **two** renewable resources.

_____

_____

_____ [2]

(ii) State the advantage of using multiple cylinders in an engine.

_____ [1]

(iii) Explain the effect of worn out fuel jets on the efficiency of an engine.

_____

_____

_____ [2]

Scanned with CamScanner

5 **Figure 5.1** shows an electric circuit.

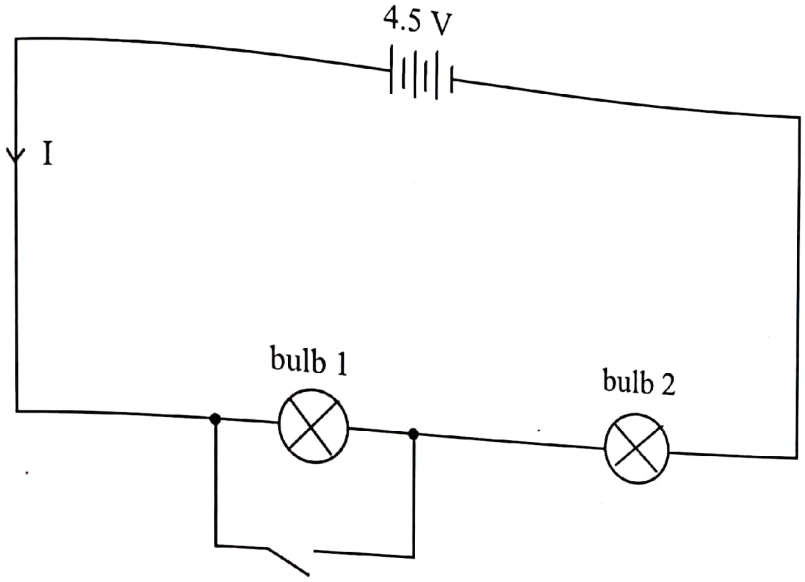


Fig. 5.1

Each bulb has a resistance of 5Ω.

(i) Calculate the current I when the bulbs are at maximum brightness.

[2]

(ii) The switch is then closed. Deduce what happens to:

1. the current I,

_____

2. bulb 1,

_____

3. bulb 2.

_____ [3]

Scanned with CamScanner

6 **Fig. 6.1** shows an incomplete ray diagram to show the image formed by a plane mirror.

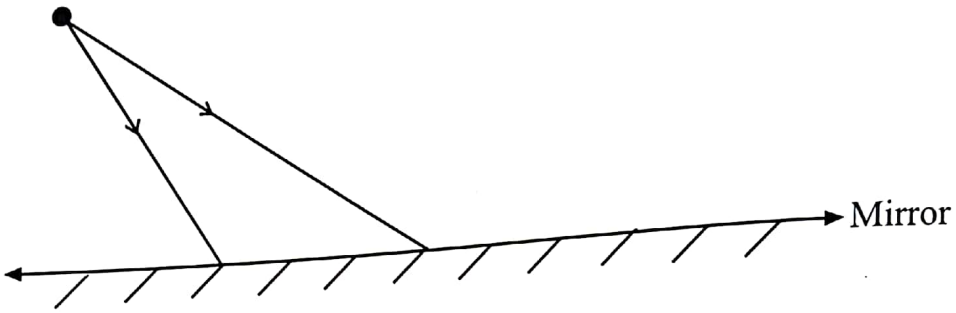


Fig. 6.1

(i) Complete the rays to show the position of the image. [3]

(ii) State the properties of the image in **Fig. 6.1**.

_____

_____

_____

_____ [2]

7 **(a)** Define the term *radioactive decay*.

_____

_____

_____ [2]

(b) An isotope has a mass of 64mg and a half life of 4 days.

(i) Calculate the mass of the isotope that remains after 16 days.

mass ..... [2]

Scanned with CamScanner

(ii) Suggest a reason why radioactive isotopes of very short half lives are used in medicine.

[1]

8 **Fig 8.1** shows the symbol of a logic gate.

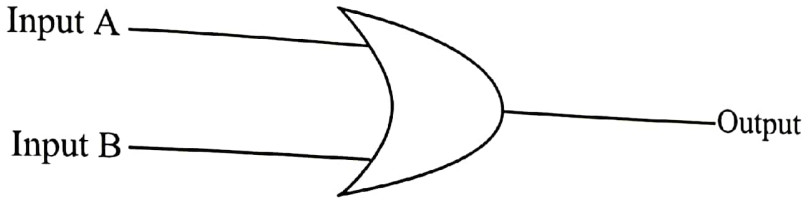


Fig. 8.1

(a) Name the logic gate shown in **Fig. 8.1**

[1]

(b) Construct a truth table for this logic gate.

[1]

Scanned with CamScanner

(c) Fig 8.2 shows a system designed to warn an owner if someone tries to steal his/her TV set.

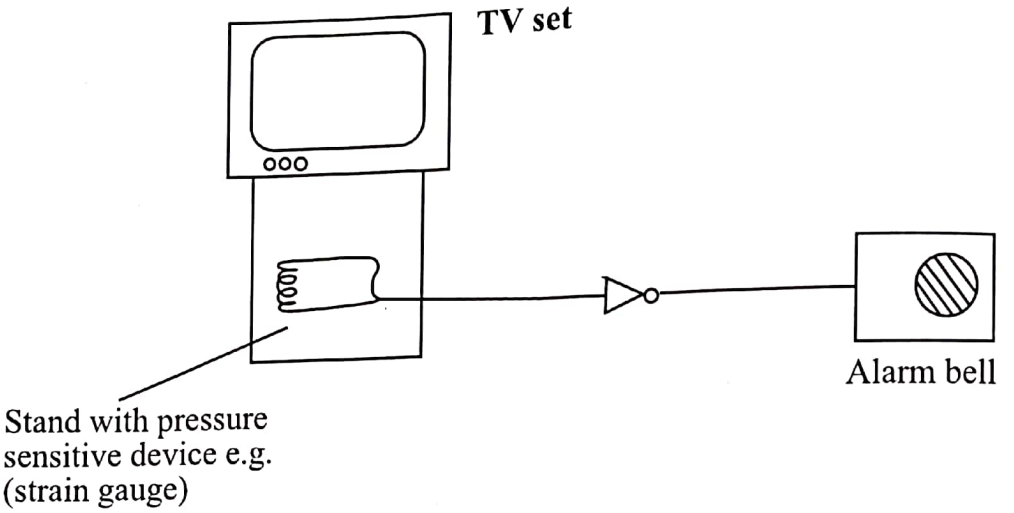


Fig 8.2

Suggest how the system works.

[3]

Scanned with CamScanner

SECTION B

Answer any **three** questions.

9 **(a)** Two boats start together and race across a 20km wide lake and back. Boat **A** goes across at 20kmh^{-1} and returns at 20kmh^{-1}. Boat **B** goes across at 40 kmh^{-1} and returns at10 kmh^{-1}.

(i) Deduce the average speed of Boat **A**.

_____ [1]

(ii) Explain your answer in **(i)**.

_____ [1]

(iii) State **two** similarities between distance and displacement.

_____

_____

_____ [2]

Scanned with CamScanner

(b) **Fig 9.1** shows the motion of a car.

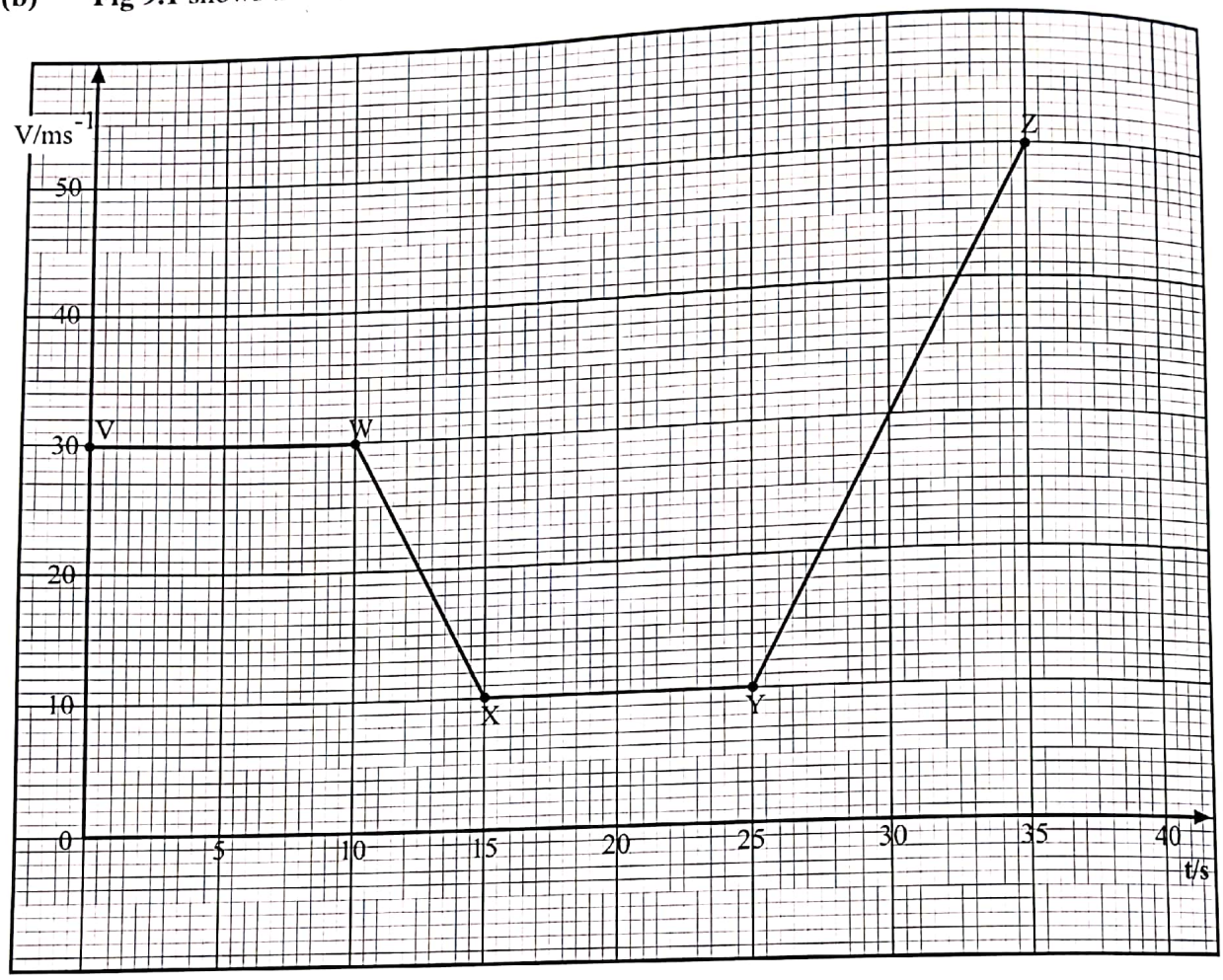


Fig 9.1

(i) Calculate the distance between X and Y.

_____

_____

_____

_____ [2]

Scanned with CamScanner

(ii) Calculate the acceleration of the car between Y and Z.

[2]

(iii) Calculate the car's average speed from V to X.

[3]

(iv) Describe the car's motion from W to Z.

[3]

(v) Use **Fig 9.1** to show that the deceleration of the car has the same numerical value as its acceleration.

[2]

Scanned with CamScanner

(c) Explain why an object going round a circle cannot have constant velocity even though the speed is constant.

[2]

(d) A parachutist falls from an aircraft which is flying. The parachute opens sometime after the start of the fall and attains terminal velocity. Explain how terminal velocity is attained.

[2]

Scanned with CamScanner

10 (a) (i) Distinguish between a petrol and a diesel engine.

[4]

(ii) Describe the operation of a four stroke petrol engine in relation to the movement of position and condition of valves.

[8]

(b) (i) State the role of the carburetor.

[2]

Scanned with CamScanner

(ii) Explain what you understand by the efficiency of an engine.

[1]

(iii) Suggest **two** ways in which the efficiency of a petrol engine may be reduced.

[2]

(c) Describe the economic implication of using fuels.

[3]

Scanned with CamScanner

11 **(a)** **(i)** Define refractive index.

[1]

(ii) **Fig 11.1** shows a ray of light entering a glass block of refractive index 1.5.

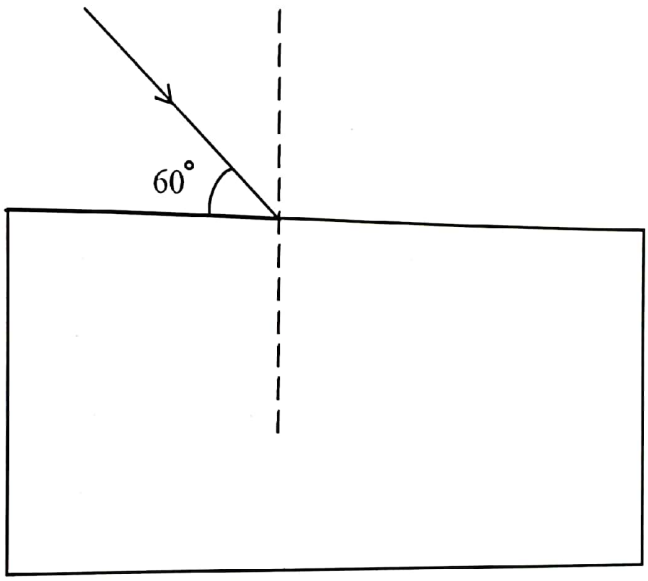


Fig. 11.1

Complete **Fig 11.1** to show the path followed by the ray **in** and **out** of the block. [2]

(iii) Calculate the **1.** angle of refraction,

[2]

2. speed of light in glass if the speed of light in air is 300 000 km/s.

[2]

Scanned with CamScanner

(iv) Explain what causes refraction of light.

_____

_____

_____ [2]

(b) **(i)** Define the term *critical angle*.

_____

_____ [2]

(ii) **Fig 11.2** shows an optical fibre used in telecommunications.

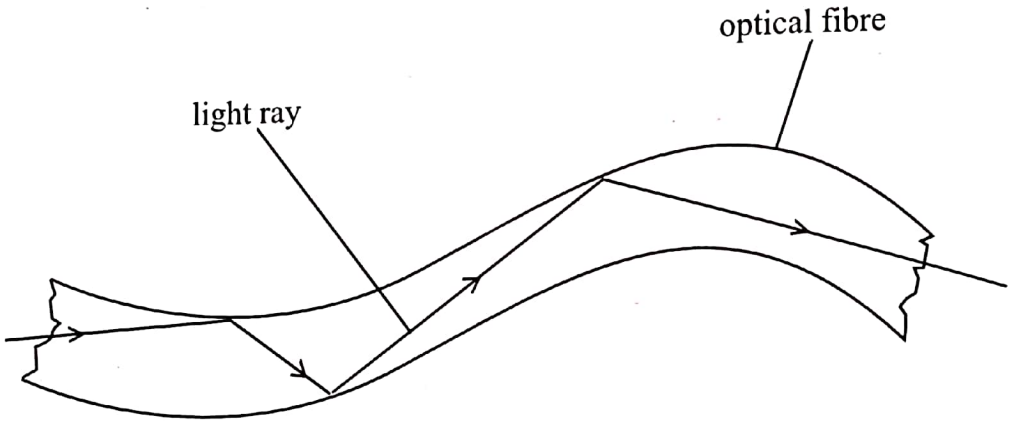


Fig 11.2

(iii) 1. Explain what happens to the ray in the fibre.

_____ [1]

2. State **one** advantage of using optical fibres over radio waves in telecommunications.

_____

_____

_____ [1]

Scanned with CamScanner

(c) **(i)** Distinguish between a real and virtual image formed by a lense.

[2]

(ii) 1. Illustrate with the aid of a diagram the term long sight.

[3]

2. Explain how long sight can be corrected.

[2]

Scanned with CamScanner

12 (a) **Fig 12.1** shows a transformer.

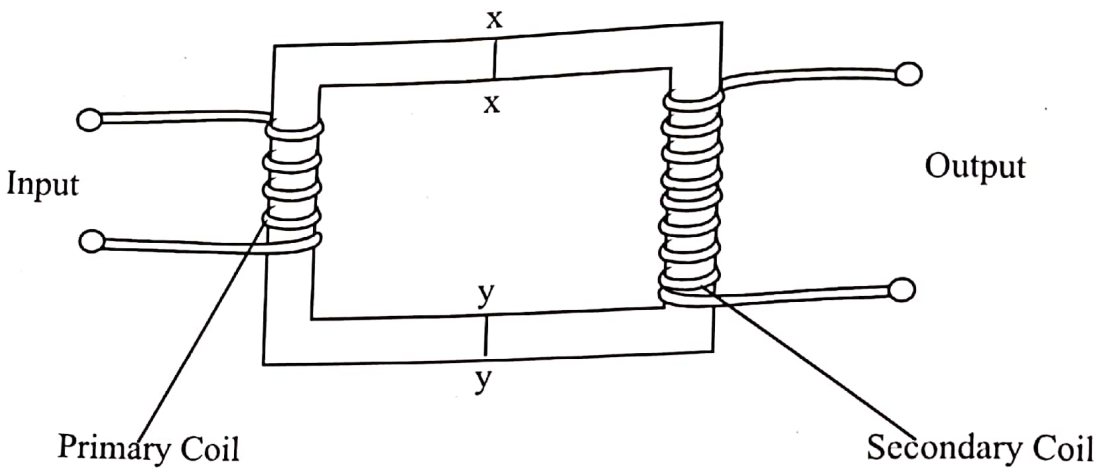


Fig 12.1

(i) Explain how the transformer works.

[5]

(ii) Suggest what could be done to **Fig 12.1** to make the output voltage smaller than the input voltage.

[1]

(iii) Name the type of transformer in **(a)**.

[1]

Scanned with CamScanner

(iv) Suggest with reasons, what will happen to the working of the transformer if the core is split at xx and yy then separated by 35cm.

[3]

(v) Suggest why the core is made of soft iron.

[1]

(b) An ideal transformer is used to step up the voltage supply from 200 V to 400 V. A resistor is connected to the output. The current in the primary coil is 3A.

Calculate the current in the secondary coil.

[3]

Scanned with CamScanner

12 (c) **Fig 12.2** shows a model generator.

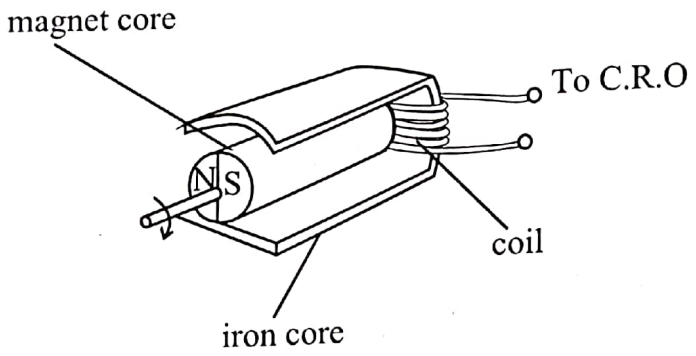


Fig 12.2

Fig 12.3 shows a trace on the C.R.O. as the magnet rotates.

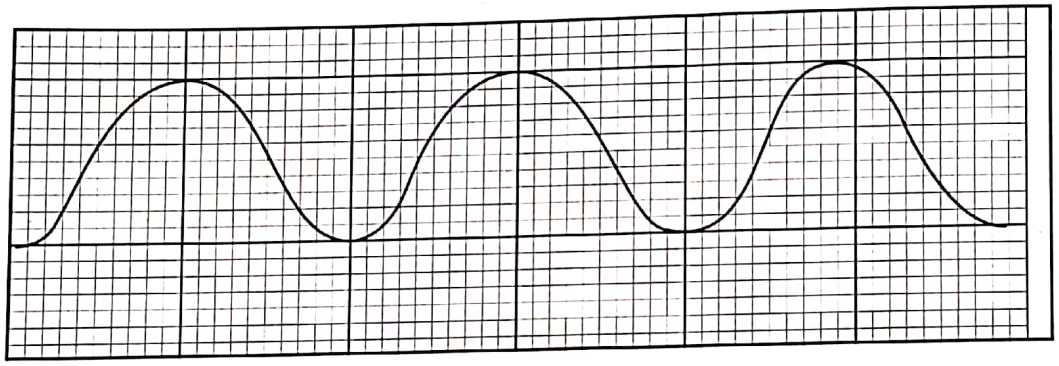


Fig 12.3

On **Fig 12.3b, 12.3c** and **12.3d,** draw new traces produced for each of the following changes.

(i) Magnet rotates at the same speed but in the opposite direction.

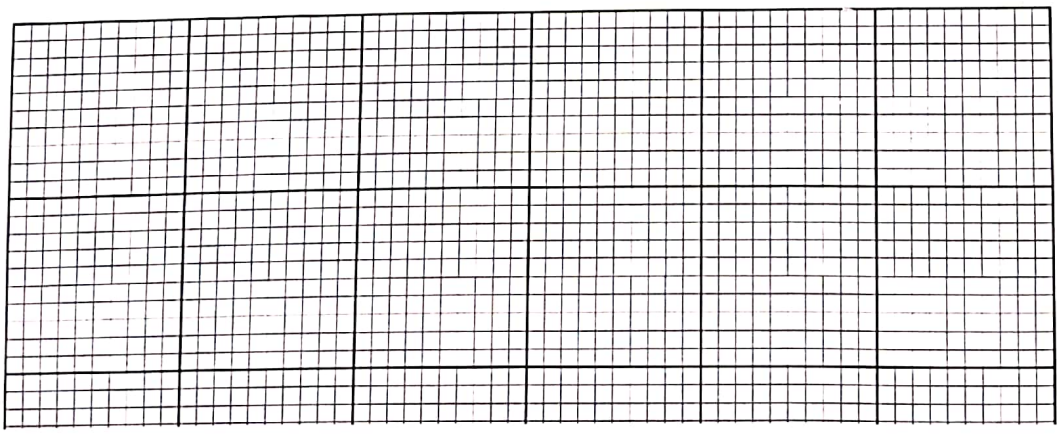


Fig. 12.3b

[1]

Scanned with CamScanner

(ii) The magnet rotates at the same speed, in the same direction as the original, but the number of turns of the coil is doubled.

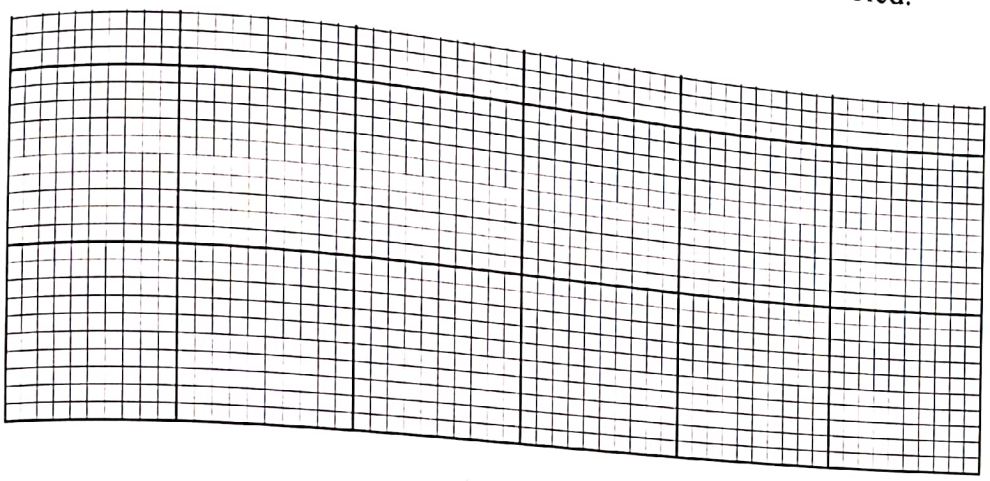


Fig 12.3c

[1]

(iii) The magnet rotates at twice the speed, in the same direction, with the original number of turns of the coil.

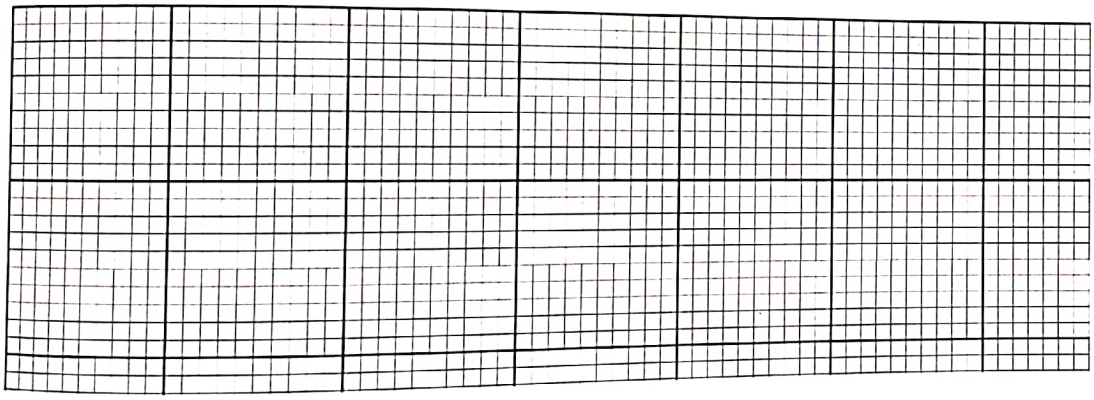


Fig 12.3d

[1]

(iv) Suggest three reasons why the power input is greater than the power output in practical transformers.

[3]

Scanned with CamScanner

ZIMBABWE SCHOOL EXAMINATION COUNCIL

General Certificate of Education Ordinary Level

EXPECTED ANSWERS

SPECIMEN PAPER

4023/2

PHYSICS

Scanned with CamScanner

1. **(a)** Micrometer screw gauge

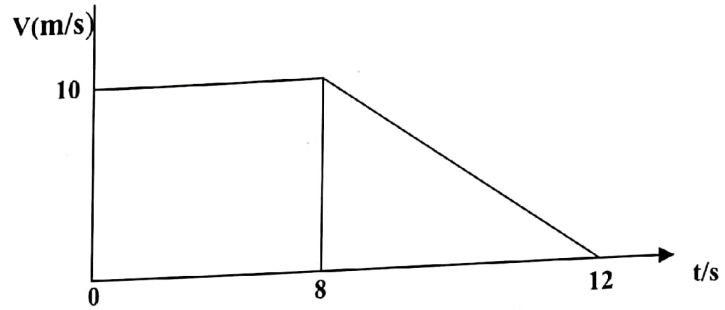
(b) 5.62mm

(c) -wipe the ends of the spindle
-note the zero error
-avoid parallax error
-use ratchet to avoid over tightening

---

2. **(a)** –rate of change of displacement

(b)(i)



(ii) $distance\ travelled = area\ under\ graph$

$area = (80 \times 10) + \frac{1}{2} \times 4 \times 10 = 100m$

---

3. **(a)(i)** -coal; oil; gas

(ii) -chemical energy from coal to thermal energy in heating coal (produce steam) to kinetic energy (turbines) to electrical energy

---

4. **(i)** -wind; solar; biomass; tidal; wood; ethanol

(ii) -increase smoothness of running of engine
-ensure even (smooth) firing
-ensure power distribution

(iii) -limited fuel

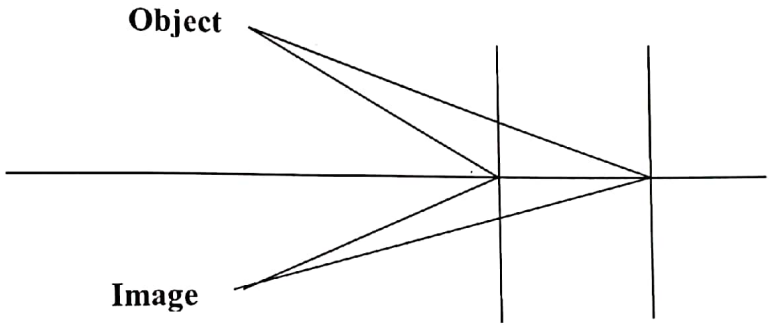
Scanned with CamScanner

-incomplete combustion
-less efficient

5. (i) $V = IR$

(ii) **1.** Increases
2. Will not light
3. Increases brightness

6. (i)



(ii) -image is virtual
-image is upright
-laterally inverted
-not magnified, same size as the object – equidistant

7. (a) -the random and spontaneous decay of an unstable nucleus or radioactive isotope.

(b) (i) $m = m_0 \left(\frac{1}{2}\right)^n$ where n(No of half lives) $= \frac{t}{t_{\frac{1}{2}}} = \frac{16}{4} = 4$

$m_0 = 64\text{mg}$

After substitution in the formula $m = 64\text{mg}$

(ii) -heal the patient very fast
-will not stay in the body for a long period of time

Scanned with CamScanner

8. (a) - OR Gate

(b)

INPUT	INPUT	OUTPUT
A	B	
0	0	0
0	1	1
1	0	1
1	1	1

(c) -when the TV is on the stand, there is pressure on the strain gauge logic 1.
- From a NOT gate the output is logic zero. The alarm will not ring.
- When the TV is removed, the pressure on the strain gauge is removed, logic zero.
- The output from the NOT gate will be logic 1 and the alarm will ring.

---

9. (a) (i) $20km/hr$

(ii) -both are measured using (metre rule, tape measure etc)
-they have the same unit (metre, cm, etc)

(b) (i) $-distance = area\ under\ graph$

$= 10 \times 10 = 100m$

(ii) $a = \frac{v-u}{t} = \frac{50-10}{10} = 4m/s^2$

(iii) $average\ speed = \frac{total\ distance}{total\ time}$

Total distance = Area under graph

$= 10 \times 30 + \frac{1}{2}(30 + 10) \times 5 = 400m$

Scanned with CamScanner

$$speed = \frac{400}{15} = 26.7m/s$$

(iv) -the car decelerated uniformly from a velocity of 30m/s to 10m/s or accelerated at $-4m/s^2$
-the car then moved at a constant velocity of 10m/s for 5s
-it the accelerated uniform from a velocity of 10m/s to 50m/s for 5s (it accelerated at $4m/s^2$)

(v) $decelaration = \frac{v-u}{t} = \frac{30-10}{10} = 4m/s^2$

(c) -direction will be changing
-hence velocity will be changing but at constant speed.

(d) -initially the weight of the parachute will be greater than the air resistive force and up thrust.
-as velocity increases, the air resistive force also increases.
-the resultant force will be zero, and acceleration will be zero.
-the parachute now moves at constant velocity called terminal velocity.

---

10. **(a)** **(i)**

DIESEL	**PETROL**
-Heavy weight	-Light Weight
-Higher maintenance cost	-Low maintenance cost
-Diesel sprayed by fuel injector on compressed hot air, less carbon monoxide, more efficient	-Spark plug ignites petrol air mixture, more carbon monoxide
-Generates more power	- Generates less power

(ii) **Air intake stroke**-the piston downwards, inlet valves opens and air is drawn into the cylinder.

Compression stroke-both valves closed. Air is compressed to one sixth of its original volume very quickly.

Scanned with CamScanner

-the piston upwards. The compression air jets are very hot at the end of the compression stroke.

Ignition (Power) stroke-both valves closed, the piston moves down. Diesel is injected into the hot air at the end of the compression stroke. Diesel immediately ignites and drives.

Exhaust stroke-exhaust valves open. Exhaust fumes removed from cylinder.

(b) **(i)** -mixes petrol; and air
-or fuel and air supply

(ii) $Efficiency = \frac{Energy\ Output}{Energy\ input}$

-it is measured by fuel economy (km per litre used).

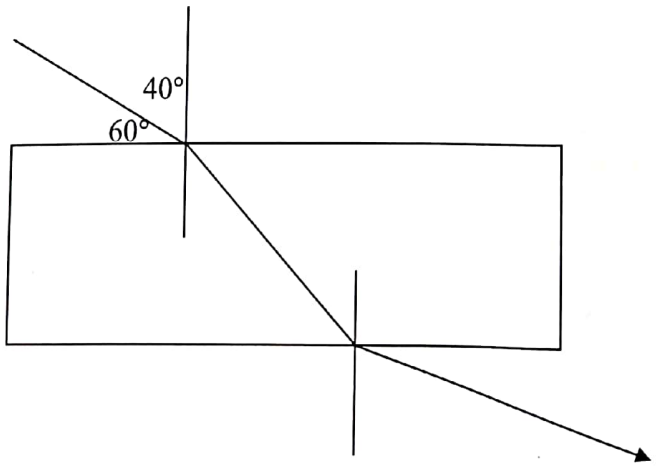
(iii) -Worn out jets - limited fuel, incomplete combustion,
-Sticking choke control – limited air, incomplete combustion
-Blocked filter – limited air/fuel, incomplete combustion

(iv) -cutting down wood for fire wood causes deforestation /desertification.
-soil erosion due to cutting down of trees.
-carbon dioxide causes global warming
-depletion of the ozone layer

---

11. (a) **(i)** refractive index = $\frac{\sin r}{\sin i}$ where ***r*** is the angle of refraction and ***i*** is the angle of incidence.

(ii)



Scanned with CamScanner

(iii) $\mathbf{n} = \frac{\sin r}{\sin i}$

$$sinr = \frac{\sin 40}{1.5}$$

$$r = 25.4°$$

$$n = \frac{speed\ of\ light\ in\ air}{speed\ of\ light\ in\ glass} = \frac{speed\ of\ light\ incident\ ray}{speed\ of\ refracted\ ray}$$

$$speed\ of\ light\ in\ glass = \frac{300\ 000}{1.5}$$

$$= 200\ 000 km/s$$

(iv) -the change in optical density of different mediums.

2. $d = 1\ 500m$

(b) (i) -is the angle of incidence; above which total internal reflection occurs/ that forms the angle of refraction of $90°$

(iii) **1.** It is totally internally reflected because it enters at an angle of incidence which is greater than the critical angle.

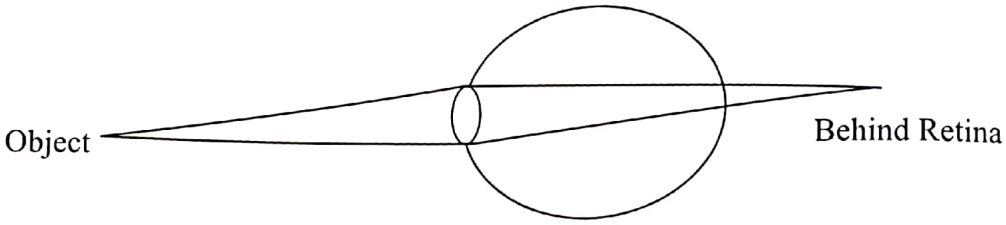
2. -cheap
-fast data transfer
-large data volumes and bandwidth
-conserve energy
-immune to physical conditions e.g. rain, wind
-secure (no cross talk)
-very little intensity is lost
-little maintenance required over longs period.

(c) (i) - real can be formed on the screen but virtual cannot
-real images are always inverted but virtual images can be inverted or upright.

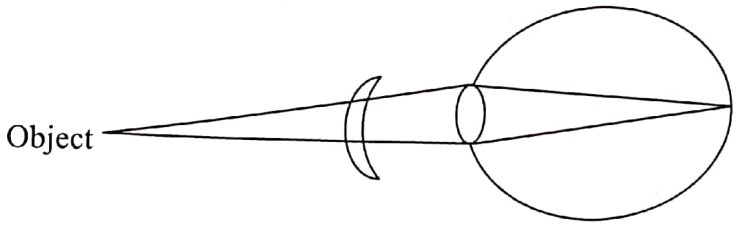
Scanned with CamScanner

-light passes through a real image but light does not pass through a virtual image.

(ii) **1.** -the rays for a near object converges behind the retina



2. -by placing a converging lens, before the rays.



---

12. (a) (i) -alternating current in the primary coil sets up a charging magnetic field/flux

-the magnetic field is channelled to the secondary coil by the soft iron core.

-the magnetic field lines are cut by the secondary coil

-then e.m.f or current is induced

(b) (ii) - reduce the number of turns on the output, so that number of turns at input is greater than number of turns at output.

(iii) -step up transformer

(iv) -energy loses due to loss of magnetic field lines.

-changing magnetic field is set up by the A.C in the primary coil and channelled by the core before it is broken apart.

-some of the field lines are lost, and very few are channelled to the secondary coil and cuts the secondary coil.

-little voltage is produced at secondary.

(v) -it is easy to magnetise and demagnetise.

-it concentrates magnetic field lines.

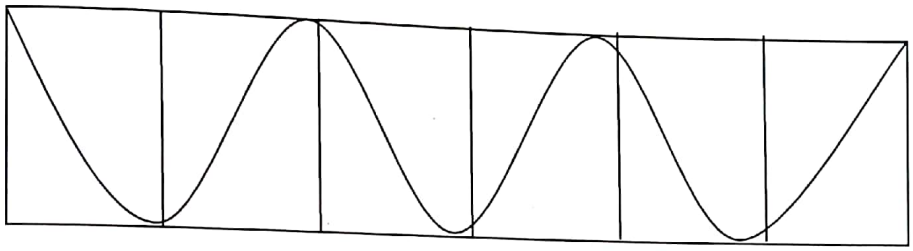
Scanned with CamScanner

(b) (i) -for an ideal transformer

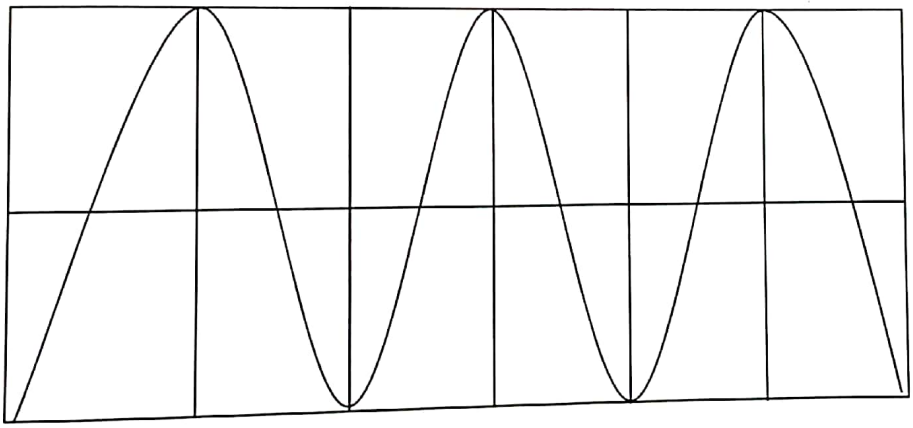
$$power\ in\ the\ primary = power\ at\ the\ secondary$$

$$I_s = \frac{I_p V_p}{V_s} = \frac{3 \times 200}{400} = 1.5A$$

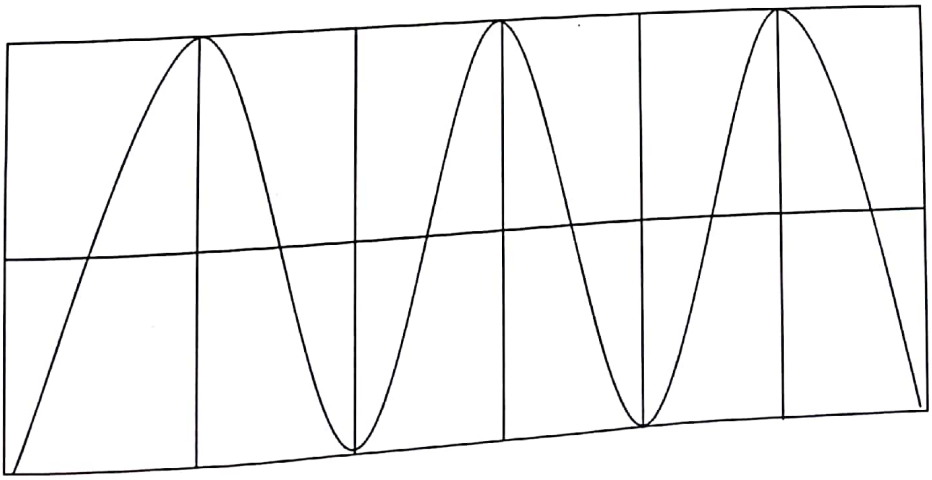
(c) (i)



(ii) -voltage also doubles. Since voltage is directly proportional to the number of turns



(iii) -voltage also doubles as the speed doubles.



Scanned with CamScanner