Physics Model Paper 2025

Time Allowed: 2 Hours
Total Marks: 75

You must bring a soft pencil (preferably type B or HB), a clean eraser, and a dark blue or black pen.

Before attempting the paper, write your name, candidate number, centre name, and centre number clearly in the designated spaces.

Instructions for Candidates

- **Section A** contains multiple choice questions. You are required to attempt all questions by selecting the most appropriate option and marking it on the separate MCQ answer sheet using a soft pencil.
- **Section B** comprises both theoretical questions and a practical component. All questions in this section are compulsory. Answers must be written in the space provided on the question paper using a dark blue or black pen. You may use an HB pencil for any diagrams or graphs.
- You may use a scientific calculator.
- You should show all your working and use appropriate units.
- Do not use an erasable pen or correction fluid.
- Avoid writing over any barcodes printed on the paper.

Information for Candidates

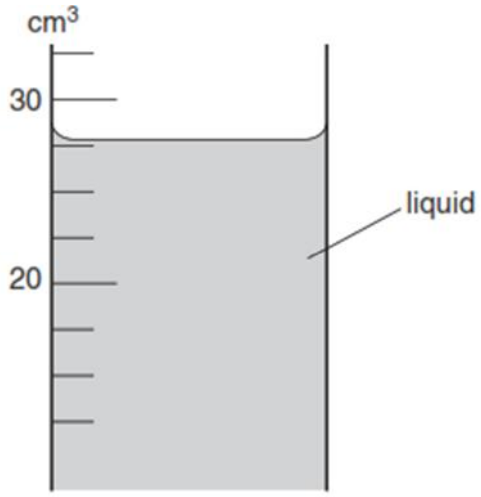
- This paper consists of a total of **75 marks**.
- **Section A** includes **20 multiple choice questions**, each carrying **1 mark**. There is no negative marking for incorrect answers.
- **Section B** carries a total of **55 marks**, divided as follows:
  Theoretical Questions: 30 marks
  Practical Component: 25 marks
- The number of marks for each question or part question is shown in brackets [ ].
- A formula sheet will be provided with this paper.

Please read all questions carefully and follow the instructions exactly to ensure your responses are properly evaluated.

Section A: Multiple Choice Questions (20 questions)

Question 1

The diagram shows the level of liquid in a measuring cylinder.



What is the volume of the liquid?

A 24 cm^3

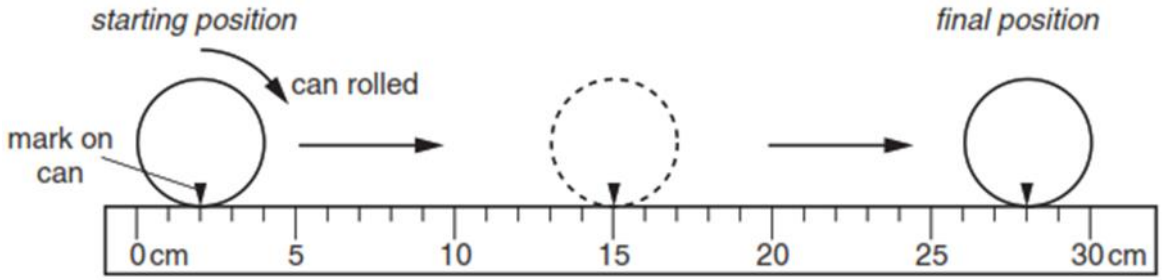
B 28 cm^3

C 29 cm^3

D 32 cm^3

Question 2

A cylindrical can is rolled along the ruler shown in the diagram.



The can rolls over twice.

What is the circumference (distance all round) of the can?

A 13 cm **B** 14 cm **C** 26 cm **D** 28 cm

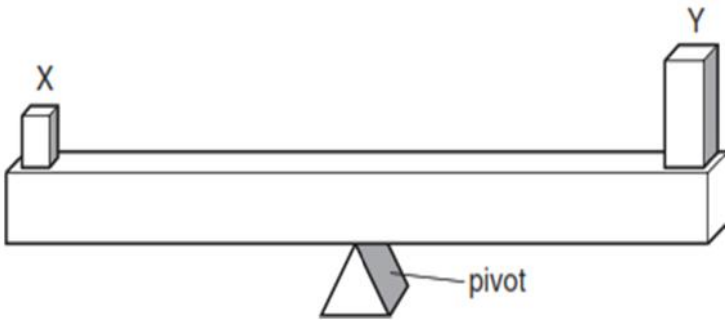
Question 3

What are correct units used for mass and for weight?

	mass	**weight**
A	Kg	Kg
B	Kg	N
C	N	Kg
D	N	N

Question 4

Two objects X and Y are placed on a beam as shown. The beam balances on a pivot at its centre.
What does this show about X and Y?



A They have the same mass and the same density.

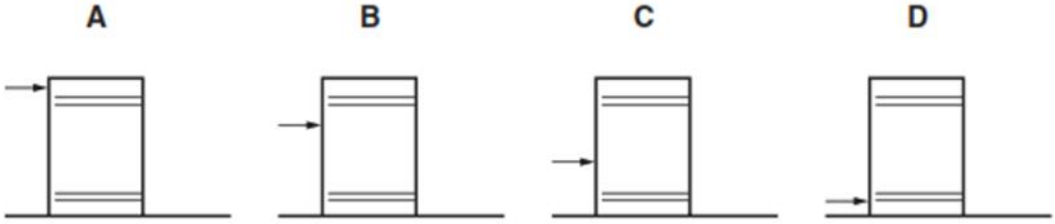
B They have the same mass and the same weight.

C They have the same volume and the same density.

D They have the same volume and the same weight.

Question 5

A child tries to push over a large empty oil drum.
Where the drum should be pushed to topple it over with least force?



Question 6

Which device is designed to convert chemical energy into kinetic energy (energy of motion)?

A an a.c. generator

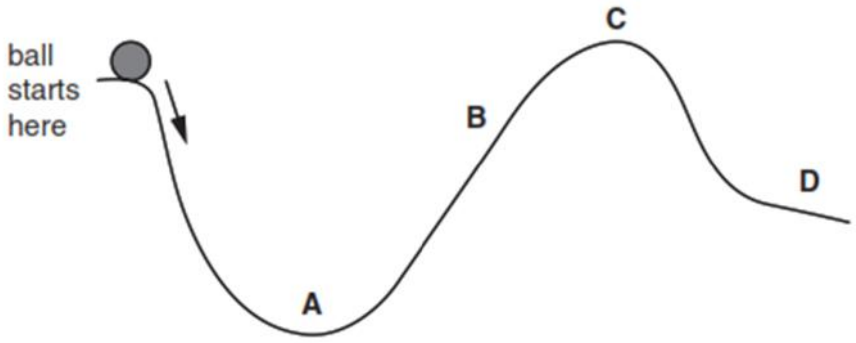
B a battery-powered torch

C a car engine

D a wind-up mechanical clock

Question 7

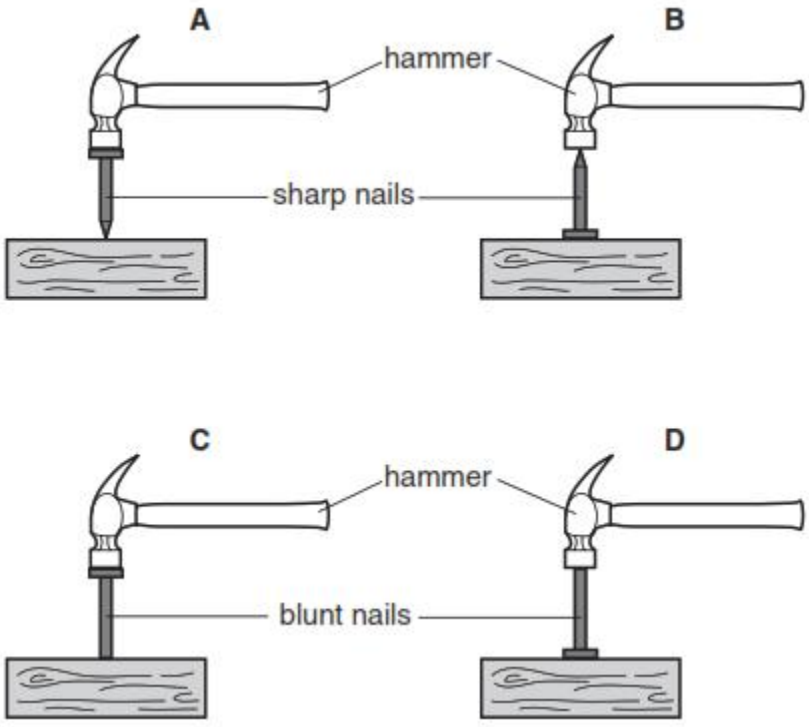
A ball is released from rest and rolls down a track from the position shown.
What is the furthest position the ball could reach?



Question 8

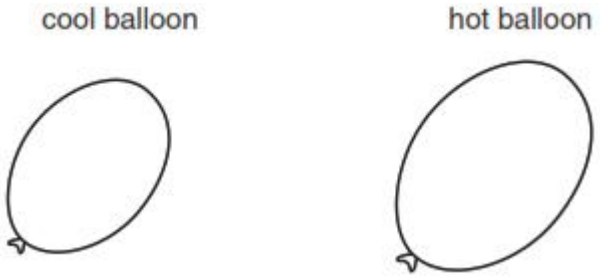
Two sharp nails and two blunt nails are held on a piece of wood. Each nail is hit with the same hammer with the same amount of force.

When it is hit, which nail causes the greatest pressure on the wood?



Question 9

The size of a balloon increases when the pressure inside it increases.
The balloon gets bigger when it is left in the heat from the Sun.



Why does this happen?

A The air molecules inside the balloon all move outwards when it is heated.

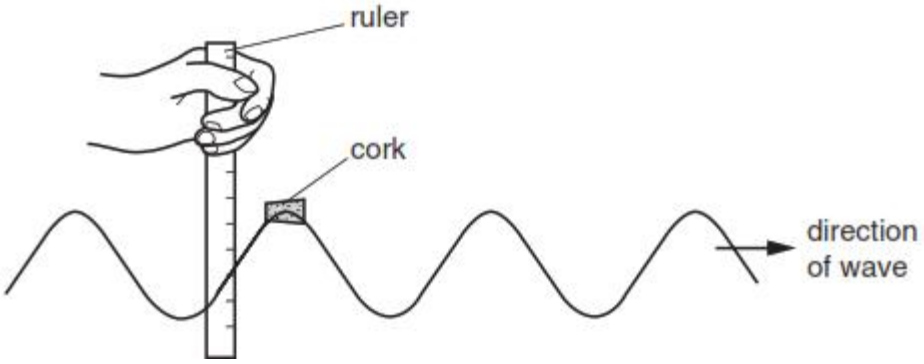
B The air molecules inside the balloon are bigger when it is heated.

C The air molecules inside the balloon move more quickly when it is heated.

D The number of air molecules inside the balloon increases when it is heated.

Question 10

A student measures how far a cork moves up and down on a wave in a tank of water.



Which quantity can he obtain from his measurement?

A amplitude

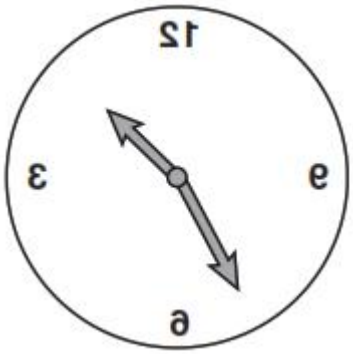
B frequency

C speed

D wavelength

Question 11

The image of a clock face as seen in a plane mirror is shown.

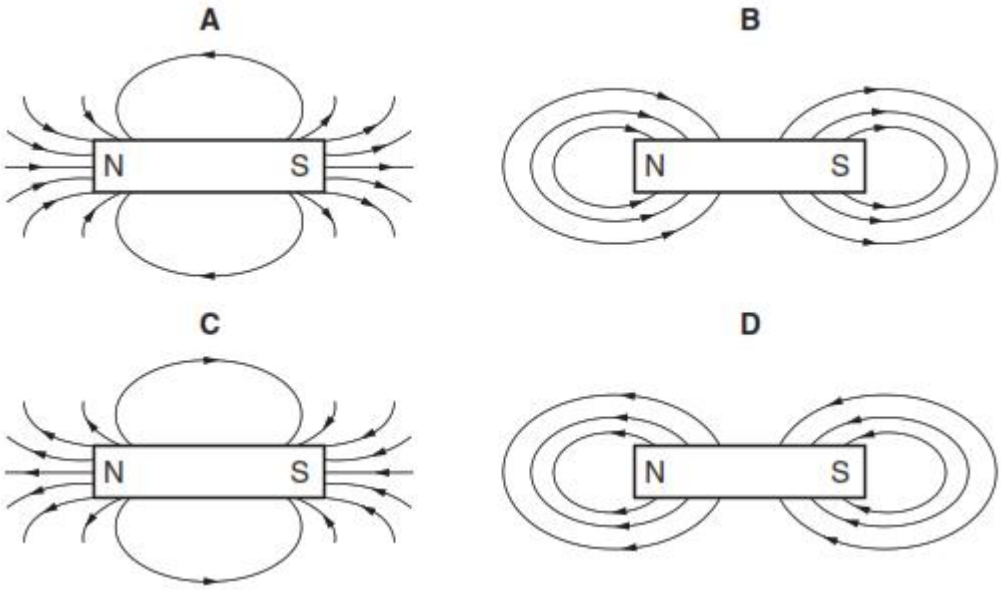


What is the actual time on the clock?

A 1.25 **B** 1.35 **C** 10.25 **D** 10.35

Question 12

Which diagram best shows the pattern of field lines around a bar magnet?



Question 13

Which materials are suitable to make a permanent magnet and the core of an electromagnet?

	permanent magnet	core of an electromagnet
A	iron	iron
B	iron	steel
C	steel	iron
D	steel	steel

Question 14

Which two electrical quantities are measured in volts?

A current and e.m.f.

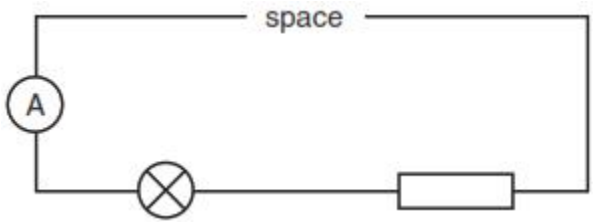
B current and resistance

C e.m.f. and potential difference

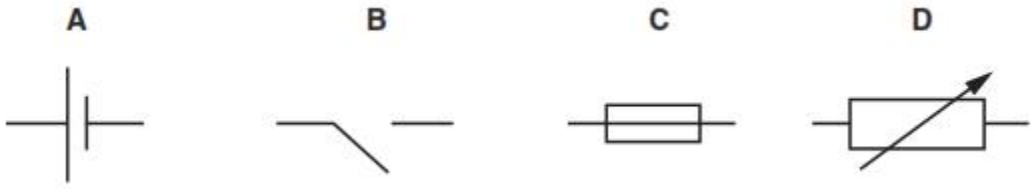
D potential difference and resistance

Question 15

The diagram shows an incomplete circuit.



Which component should be connected in the space to make the lamp light?



Question 16

Why are the electric lamps in a house lighting circuit normally connected in parallel?

A The current in every circuit must be the same.

B The lamps are always switched on and off at the same time.

C The voltage across each lamp must be the mains voltage.

D When one of the lamps blows, all the others go out.

Question 17

When electricity is transmitted over long distances, energy is wasted. How can the wasted energy be kept as small as possible?

A Keep the current in the transmission lines as large as possible.

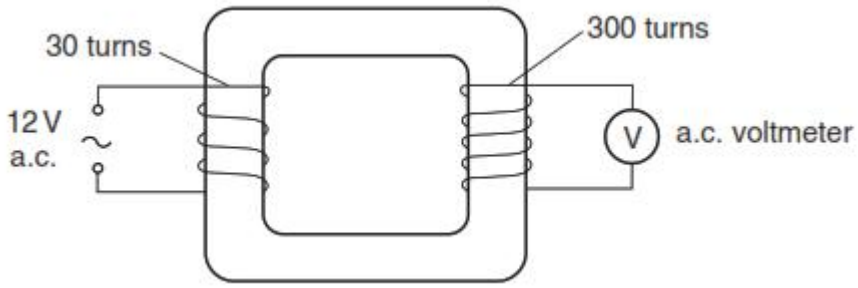
B Keep the power supplied to the transmission lines as large as possible.

C Keep the resistance of the transmission lines as large as possible.

D Keep the voltage supplied to the transmission lines as large as possible.

Question 18

The diagram shows a transformer.



What is the voltmeter reading?

A 1.2 V

B 12 V

C 120 V

D 1200 V

Question 19

What is a beta-particle?

A a helium nucleus

B a high-energy electron

C four protons

D two neutrons

Question 20

In the Sun, energy is transferred from an energy store.

Which energy is being released and what is the name of the reaction that releases this energy inside the Sun?

	energy	reaction
A	chemical	burning
B	chemical	radiation
C	nuclear	fission
D	nuclear	fusion

Section B (55 marks)
Theoretical Questions (30 marks)

1 Fig. 1.1 shows the speed–time graph for a car.

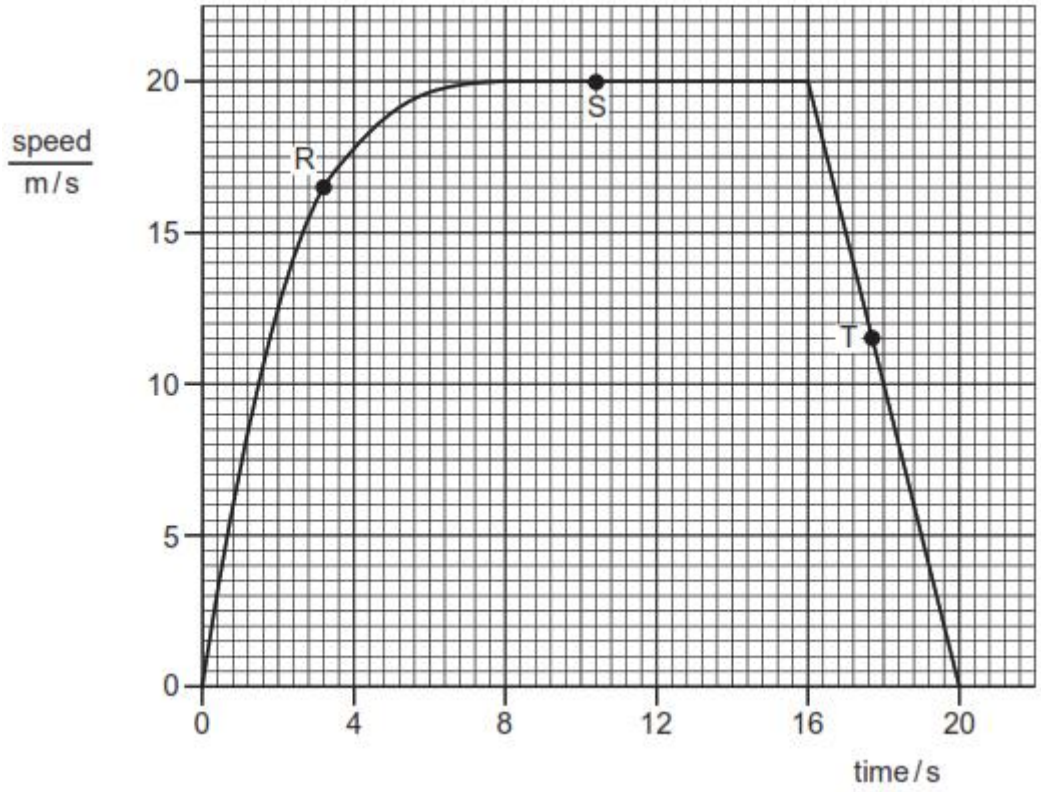


Fig. 1.1

(a) (i) For the graph in Fig. 1.1, match each letter, R, S and T, with the motion at that point.

Draw **one** line from each letter to the correct description. One has been done for you.

letter on the graph	**description of motion**
	▪ at rest
R ▪	
	▪ moving with constant speed
S ▪	
	▪ decelerating (negative acceleration)
T ▪	
	▪ accelerating (positive acceleration)

[2]

(ii) Determine the speed of the car at time = 4.0 s.

speed = ... m / s [1]

(b) Define the term velocity.

..... [1]

2 Fig. 2.1 shows the horizontal forces acting on a boat.

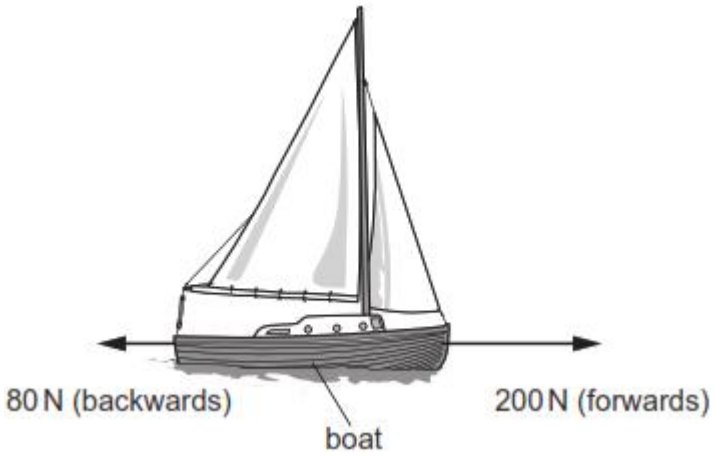


Fig. 2.1

(a) (i) Calculate the resultant horizontal force on the boat in Fig.2.1.

size of resultant force = ... N

direction of resultant force .....

[2]

(ii) Suggest what causes the 80 N force on the boat in Fig. 2.1.

.....

..... [1]

(iii) Another boat is travelling and the horizontal forces on this boat are balanced.

Describe the horizontal motion of this boat.

..... [1]

(b) Fig. 2.2 shows the wheel used to steer a boat.

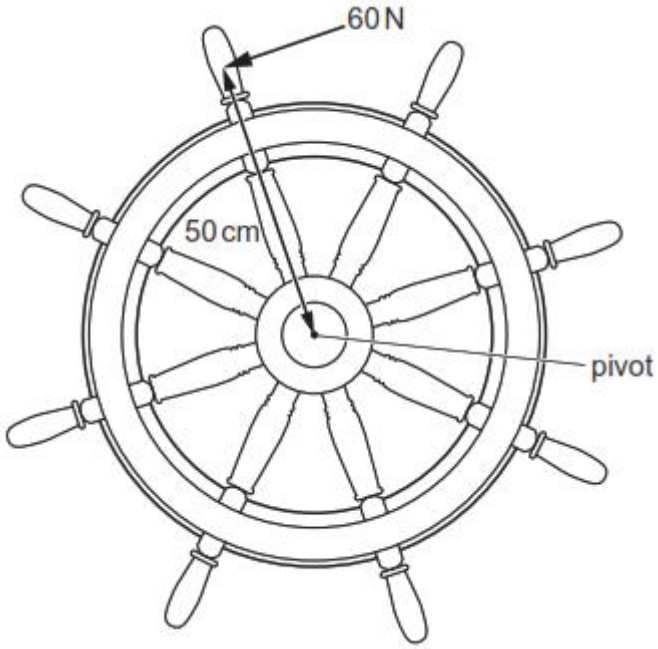


Fig. 2.2

A force of 60 N acts at a perpendicular distance of 50 cm from the wheel's pivot.

Calculate the moment of the 60 N force about the pivot. Include the unit.

moment = ...

unit .....

[4]

3 A student wants to compare the conduction of thermal energy through rods made of iron, copper, glass and aluminium. Each rod is coated with wax.

Fig. 3.1 shows the equipment that the student uses.

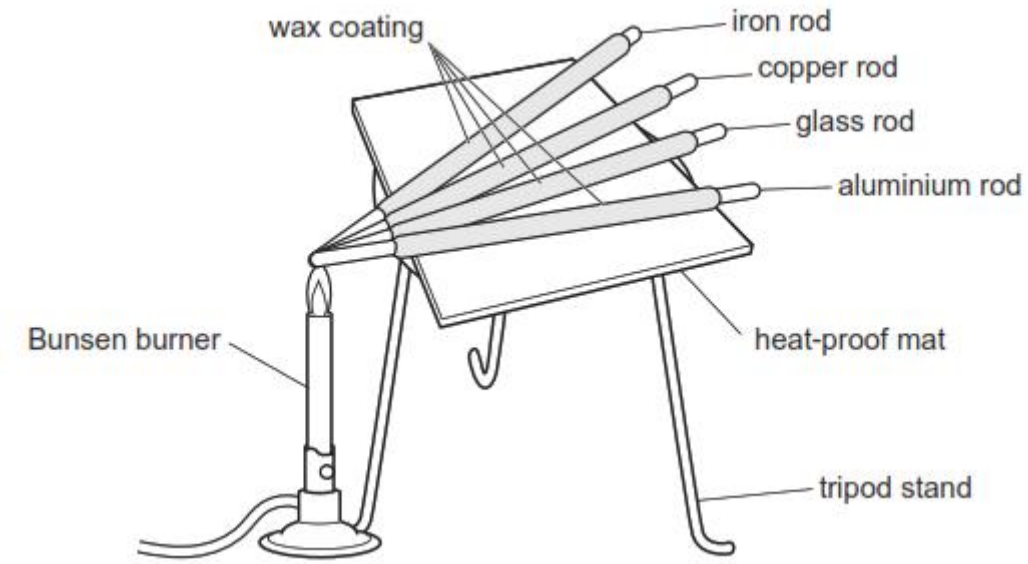


Fig. 3.1

(a) Describe how the student can compare the conduction of thermal energy through the rods in Fig. 3.1.

.....

.....

..... [2]

(b) The Bunsen burner emits infrared waves.

The infrared waves have a wavelength of 2.0×10^{-6} m.

The velocity of the infrared waves is 3.0×10^{8} m / s.

Calculate the frequency of the infrared waves.

frequency = ... Hz [3]

4 (a) Fig. 4.1 shows a ray of light striking a plane mirror. The ray is reflected as shown.

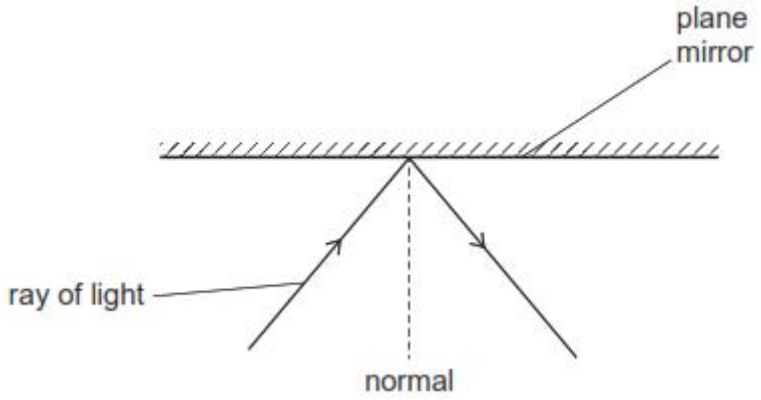


Fig. 4.1

The angle of incidence for the ray of light is 40°.

(i) Indicate the angle of reflection by drawing a letter R on Fig. 4.1. [1]

(ii) State the size of the angle of reflection in Fig. 4.1.

angle of reflection = ...° [1]

(b) An object O is placed to the left of a thin converging lens. F_1 is the principal focus on one side of the lens and F_2 is the principal focus on the other side of the lens.

Two rays from the top of the object are incident on the lens, as shown in Fig. 4.2.

On Fig. 4.2, locate the image of O by continuing the path of each ray. [2]

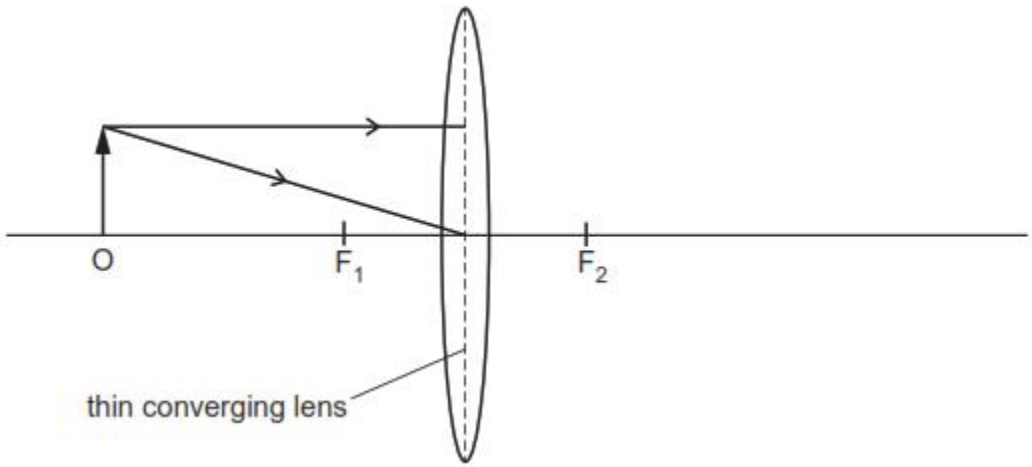


Fig. 4.2

(c) Fig. 4.3 shows a prism producing a spectrum of colours from a narrow beam of white light.

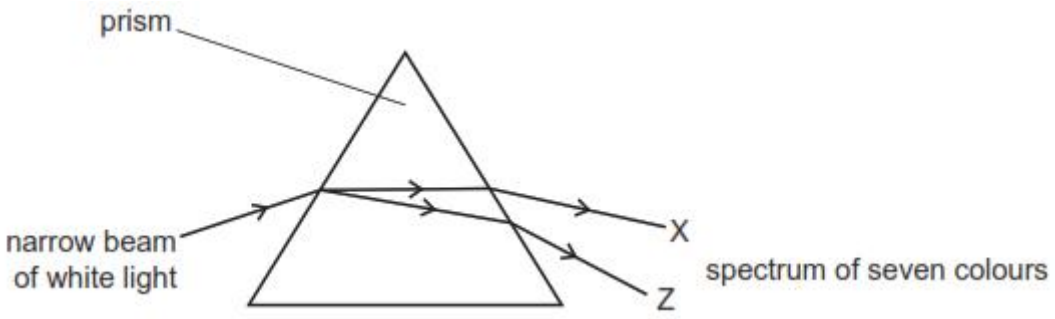


Fig. 4.3

(i) The prism refracts the white light.

State the name of the effect that produces a spectrum.

..... [1]

(ii) In the spectrum shown in Fig. 4.3, there are seven colours.

List the seven colours in the order they appear between X and Z.

X .....

.....

.....

.....

.....

.....

Z .....

[2]

5 A nucleus of strontium-90 is represented using nuclide notation as shown.

$$^{90}_{38}\mathrm{Sr}$$

(a) (i) Calculate the number of neutrons in one nucleus of strontium-90.

number of neutrons = ... [2]

(ii) Determine the number of electrons in one atom of strontium-90.

number of electrons = ... [1]

(b) Strontium-90 decays by emitting ß-particles (beta-particles).

Describe the nature of ß-particles.

.... [1]

(c) Strontium-90 decays with a half-life of 29 years.

A sample contains 16 mg of strontium-90.

Calculate the time taken for the strontium-90 to decay until only 2.0 mg of strontium-90 remains in the sample.

time = ... years [2]

Practical Component (25 marks)
Question 1

Light from an extended source **XY** is allowed to pass through a circular hole in a piece of card and to illuminate part of a screen. The apparatus is shown in Fig. 1.1.

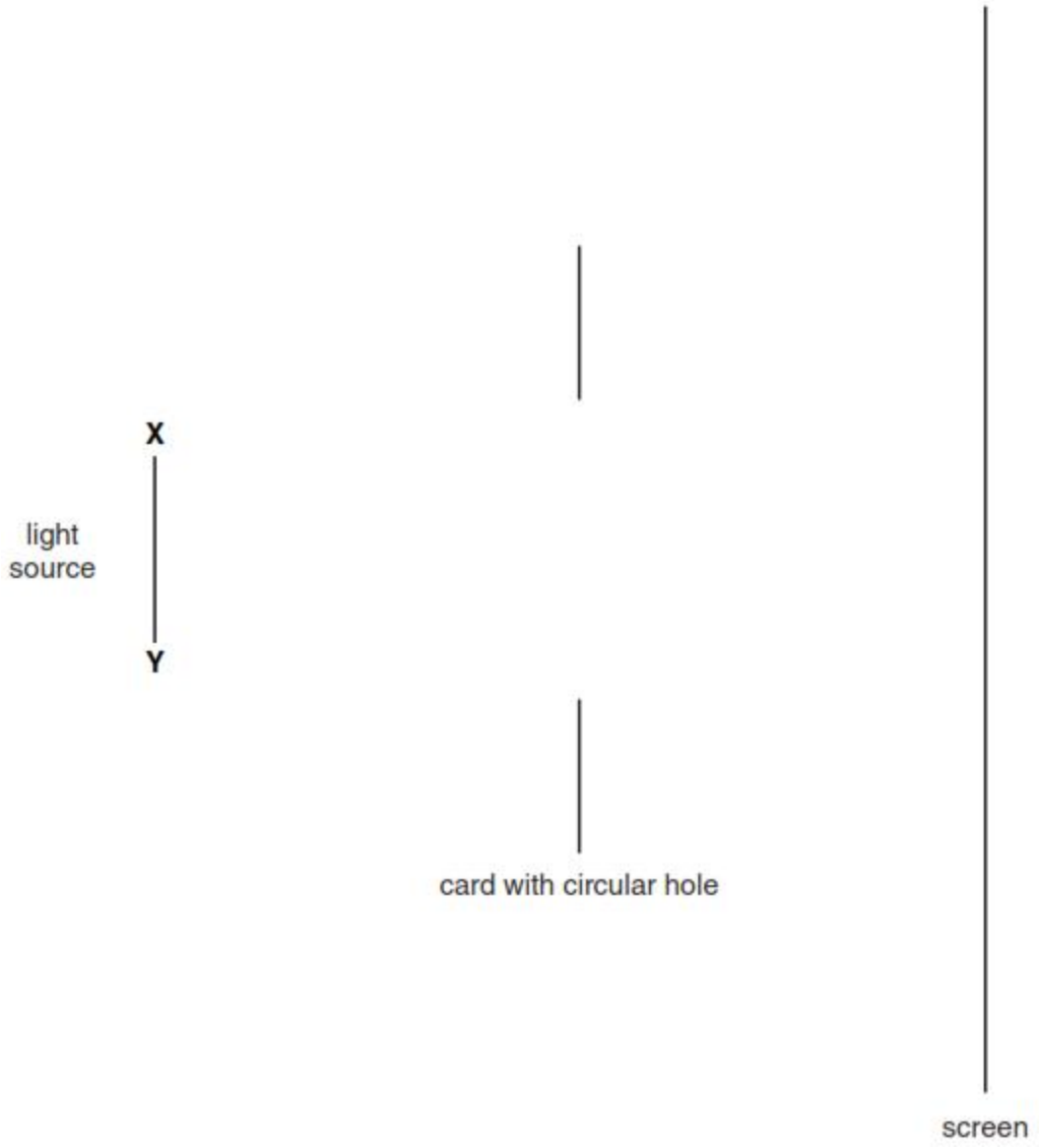


Fig. 1.1

(a) (i) Carefully draw the paths of the rays to show the part of the screen illuminated by point **X**. Use the labels $\mathbf{X_1}$ and $\mathbf{X_2}$ to show this part of the screen.

(ii) Carefully draw the paths of the rays to show the part of the screen illuminated by point **Y**. Use the labels $\mathbf{Y_1}$ and $\mathbf{Y_2}$ to show this part of the screen.

[4]

(b) Measure and record the diameter of the area of that part of the screen illuminated by all of the source **XY**.

diameter = ...[1]

Question 2

A diode is an electrical device that lets current pass through it in one direction only. The circuit symbol for a diode is shown in Fig. 2.1.

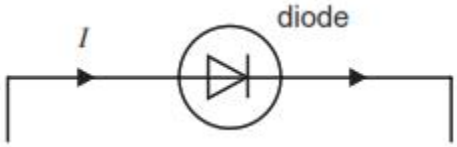


Fig. 2.1

The arrow shows the direction of the conventional current *I* when the diode is conducting.

(a) Complete Fig. 2.1 to show a series circuit that includes

(i) a 1.5 V power supply of fixed voltage, connected so that the diode is conducting,

(ii) an ammeter to measure the diode current *I* and a switch,

(iii) a lamp, rated at 1.25 V, 0.25 A, in series with the diode and the power supply. [3]

(b) On Fig. 2.1, mark with a '+' sign the positive terminals of the power supply and the ammeter. [1]

(c) What would happen if the diode is connected the other way round?

....

....[1]

(d) Why is it necessary to include a lamp in this circuit?

....

.....[1]

Question 3

In Fig. 3.1, the length *l* of a mercury thread in a mercury thermometer is plotted against the temperature θ recorded on the thermometer.

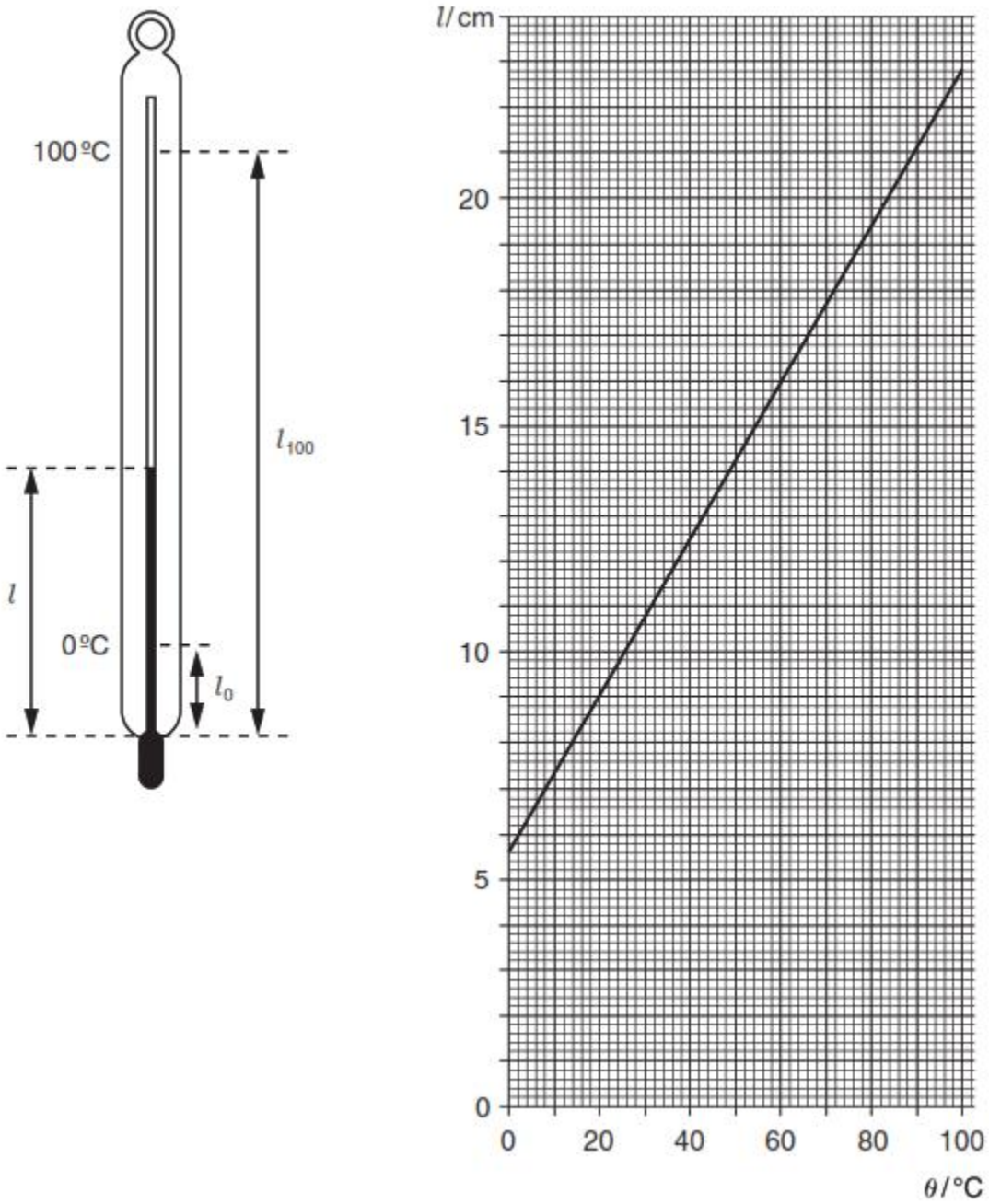


Fig. 3.1

(a) Describe how you would measure the length *l* of the mercury thread on a day when the laboratory temperature is 25 °C. You should use a 300 mm rule with a dead space at each end, as shown in Fig. 3.2. In your answer, state what readings you would take and how you would make your readings accurate. You may draw a diagram if you wish.

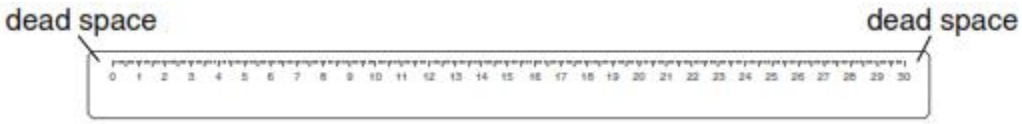


Fig. 3.2

.....

.....

.....

.....

.....[3]

(b) (i) Using the graph in Fig. 3.1, determine l_0 (the value for *l* when θ is 0°C) and l_{100} (the value for *l* when θ is 100 °C).

l_0 = ...

l_{100}= .....

(ii) Hence calculate the increase in *l* when the temperature is raised by 1 °C.

(iii) Describe how *l* varies with θ.

.....

.....

[4]

Question 4

A student investigates the effect of varying the amount of light reaching a light-dependent resistor (LDR). She sets up the apparatus as shown in Fig. 4.1.

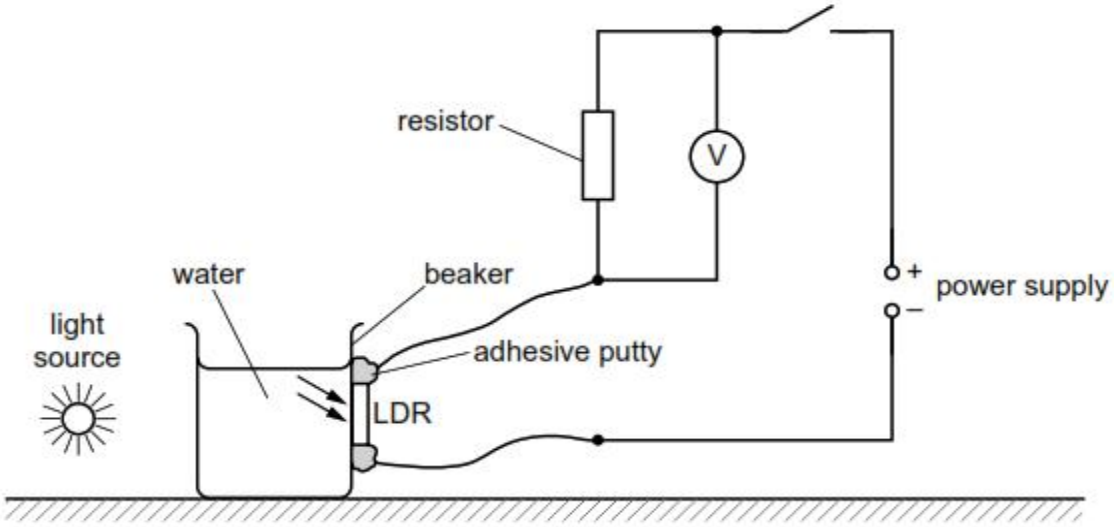


Fig. 4.1

(a) (i) Fig. 4.2 shows the reading on the voltmeter when the light source is turned on and the switch is closed.

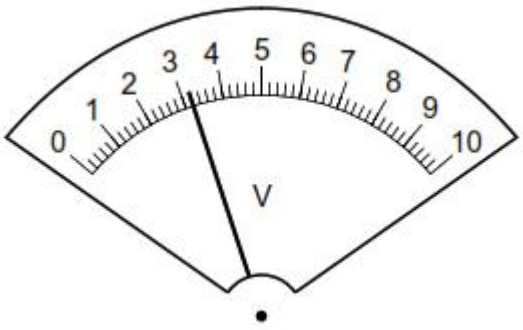


Fig. 4.2

Record the reading on the voltmeter on the answer line and in the first row of Table 4.1.

voltmeter reading = ... V [1]

(ii) The student uses a syringe to add 2 cm^3 of a coloured liquid to the water in the beaker and stirs the mixture.

Explain why the student must stir the two liquids together.

....

..... [1]

(b) The student continues to add 2 cm^3 of coloured liquid to the water at a time, recording each new voltmeter reading in Table 4.1.

Table 4.1

volume of coloured liquid / cm^3	voltmeter reading / V
0	
2	2.4
4	2.2
6	1.8
8	1.6
10	1.5
12	1.4

On Fig. 4.3, plot a graph of the voltmeter reading against the volume of coloured liquid.
Draw the best-fit curve.

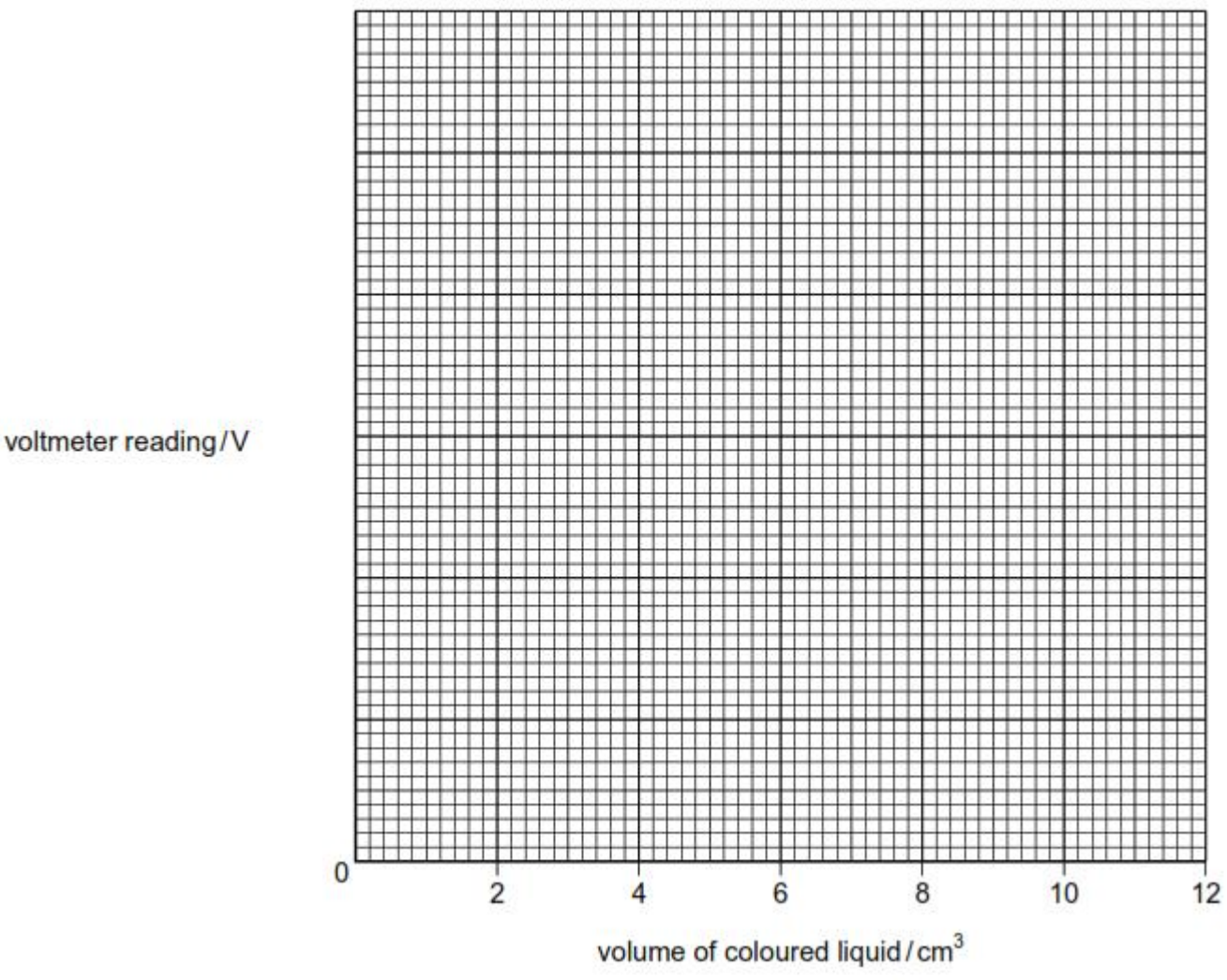


Fig. 4.3 [2]

(c) Describe **one** precaution taken to ensure that the reading from a voltmeter is accurate.

.....

..... [1]

(d) Another student performs the same experiment. He calculates a gradient which is slightly different to the value you obtained in **(c)(ii)**.

Suggest **two** variables that are difficult to control that may result in different gradients.

1 .....

.....

2 .....

.....[2]

Formula Sheet

$V = U + at$	$p=mv$	$W = mg$
$F = kx$	$W = Fd$	$\Delta E = mc\Delta T$
$\Delta E = mL$	$v = \frac{s}{t}$	$average\ speed = \frac{total\ distance\ travelled}{total\ time\ taken}$
$a = \frac{\Delta v}{\Delta t}$	$s = ut + \frac{1}{2}at^2$	$Average\ Acceleration = \frac{Change\ in\ Velocity}{Time\ Taken}$
$s = \frac{u+v}{2}t$	$v^2 = u^2 + 2as$	$average\ velocity = \frac{u+v}{2}$
$m = \frac{F}{a}$	*Pressure* $P = \frac{F}{A}$	$Efficiency = \frac{Useful\ Energy}{Total\ Energy}$ x 100
$\rho = \frac{m}{V}$	*Power* $P = \frac{W}{t}$	$n_1 sin\theta_1 = n_2 sin\theta_2$
$n = \frac{1}{\sin c}$	$v = f\lambda$	$E_{P.E} = \frac{1}{2}kx^2$
$E_P = mgh$	$I = \frac{Q}{t}$	$E_k = \frac{1}{2}mv^2$
$V = \frac{W}{Q}$	$R = V/I$	$\frac{Vp}{Vs} = \frac{Np}{Ns}$
$R_T = R_1 + R_2$	$I_p V_p = I_s V_s$	$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2}$

Model Paper Marking Scheme: Physics

Paper 1: Physics **Model Paper 2025** **(Time: 2 hours)**

Marking Scheme

INFORMATION:

- This paper has a total of 75 marks.
- In objective section there are 20 questions, each carries one mark. There is no negative marking for incorrect responses.
- In subjective section, 30 marks are for extended theoretical questions and 25 marks for practical component.

Section A: MCQ (20 marks)

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

Section B (55 marks)
Theoretical Questions (30 marks)

1 (a) (i)	line from S to moving with constant speed	1
	line from T to decelerating	1
1 (a) (ii)	17.8 (m / s)	1
1 (b)	(velocity is defined as) speed in a stated / given direction OR change in displacement per unit time	1
2 (a) (i)	(200-80) = 120 (N)	1
	forwards OR to the right OR in same direction as 200 (N force)	1
2 (a) (ii)	friction OR air / water / wind resistance OR drag (from water)	1
2 (a)(iii)	constant / steady / uniform velocity	1
2 (b)	3000 OR 30	1
	60 ⏐ 50 OR 60 ⏐ 0.5(0)	1
	moment = force ⏐ distance from pivot	1
	N cm OR N m	1
3 (a)	idea of measure / read / note / compare how much wax melts (along each rod) OR how quickly the wax melts	1
	idea of: the better the conductor the shorter the length of unmelted wax (remaining) OR the better the conductor the further the wax melts (along rod) OR the better the conductor the shorter the time for the wax to melt	1
3 (b)	(frequency =) 1.5 ⏐ 1014 (Hz)	1
	(frequency =) 3(.0) ⏐ 108 ÷ 2(.0) ⏐ 10–6	1
	velocity = frequency ⏐ wavelength	1
4 (a) (i)	angle of reflection identified	1
4 (a) (ii)	40 (°)	1
4 (b)	horizontal ray drawn to continue through F2	1
	ray to centre drawn to continue undeviated	1
4 (c) (i)	dispersion	1
4 (c) (ii)	all 7 colours AND in correct order	1
	6 of the seven colours given	1
5 (a) (i)	(number of neutrons =) 52	1
	nucleon number – proton number = number of neutrons OR 90 – 38	1
5 (a) (ii)	38	1
5 (b)	(beta-particles are fast-moving / negatively charged) electrons	1
5 (c)	(29 ⏐ 3 =) 87 years	1
	idea of 3 half-lives OR 16 ÷ 23 (= 2)	1

Practical Component (25 marks)

1 (a)	Uses two rays from X and Y (clear intention to touch hole edges) One X and one Y ray "touch" an edge of the hole and meet screen Any one X and one Y are neat lines (rule and sharp "pencil") allow apparent "refraction" or "diffraction" at hole One correct X and the corresponding Y labeled on screen Arrows on rays; no broken lines.	4
1 (b)	XY in range 54 to 56 mm (unit required), accept in cm	1
2 (a)	4 items correct, 3mks; 3 items = 2mks; 2 items = 1mk. Accept historical symbols Accept any other component provided that the function of the circuit is not compromised. Penalise -1 (max) :- short circuit (e.g. line behind component, unless signs of use of rubber) or any compromised circuit function.	3
2 (b)	Correct polarities, +ve signs for correct terminals of cell and ammeter (re diode)	1
2 (c)	No current / I = 0, (do not accept "nothing"), accept very small "reverse" current / lamp does not light.	1
2 (d)	One from: limit current / prevent overheating / current indicator / provides resistance	1
3 (a)	Any method based on rule reading at 25°C – rule reading at top of thermometer bulb. NB / required. Mark text or diagram or Fig 3.1 Rule as close as possible to thermometer (on diagram < 1 cm) / uses fiducial aid With the eye/line of sight perpendicular to the rule/end of mercury th	3
3 (b) (i)	I0 = 5.6 – 5.8 (cm), I100 = 22.6 – 22.8 (cm) ignore unit	4
3 (b) (ii)	ΔI / 100, clear, correct arithmetic ecf, 2 or 3 dcp, ignore unit, accept any correct Δθ from graph.	
3 (b) (iii)	linearly, or (I – I0) ∝ θ accept/line has a constant/uniform m, note that… "directly proportional" automatically looses the mark	
4 (a) (i)	3.2	1
4 (a) (ii)	any one from: so that the colour is evenly distributed ; so that the reading on the voltmeter is repeatable ;	1
4 (b)	all values in table plotted correctly to within 12 small square ; smooth curved line of best fit with even distribution of points either side and gradient remains negative ;	2
4 (c)	any one from: check for zero error ; tap the meter in case the needle sticks ;	1
4 (d)	any two from: level of background light ; the type / mix / consistency of the coloured liquid ; distance between light source and LDR ; how much water the coloured liquid is mixed with ;	2

Question-wise Breakdown			
Section	**Question**	**Related Chapter**	**AO**
MCQS	1	1	2
	2	1	2
	3	1	1
	4	3	2
	5	3	2
	6	4	1
	7	2	2
	8	2	2
	9	3	2
	10	3	2
	11	5	1
	12	5	1
	13	5	3
	14	7	1
	15	7	2
	16	6	1
	17	6	2
	18	6	2
	19	6	3
	20	6	2
	21	6	3
	22	9	2
	23	9	2
	24	10	2
	25	10	2
Theory	1	2	1, 2
	2	3	1.2
	3	4	1,2
	4	5.8	1,2
	5	5	1,2
	6	9	1,2
ATP	1	5	3
	2	6	1,2
	3	8	3
	4	6	1,2,3

Chapter-wise Breakdown

No.	Chapter Title	MCQs (1 mark)	AO	Theory	AO	ATP	AO
1	Physical Quantities and measuring techniques	3	AO1 (1) AO2 (2)	0	-	0	-
2	Kinematics	2	AO2 (2)	7	AO2 (7)	0	-
3	Dynamics	4	AO2 (4)	8	AO1 (2) AO2(6)	0	-
4	Work, Power & Energy	1	AO1 (1)	8	AO1 (4) AO2(4)	0	-
5	Waves	3	AO1 (2) AO3(1)	8	AO1 (5) AO2(1) AO3 (2)	5	AO3 (5)
6	Electricity	6	AO1 (1) AO2 (3) AO3 (2)	0	-	18	AO1 (6) AO2 (4) AO3 (8)
7	Magnetism and Electromagnetic Induction	2	AO1 (1) AO2 (1)	0	-	0	-
8	Thermal Physics	-	-	7	AO1 (4) AO2(1) AO3 (2)	7	AO3 (7)
9	Atomic Structure and Nuclear Physics	2	AO2 (2)	7	AO1 (3) AO2 (1) AO3 (3)	0	-
10	The Universe and Cosmology	2	AO2 (2)	0	-	0	-

Marks for AO1		Percentage
MCQ	6	30%
Theory	24	
TOTAL	30	

Marks for AO2		percentage
MCQ	16	40%
Theory	24	
TOTAL	40	

Marks for AO3		percentage
MCQ	3	30%
Theory	27	
TOTAL	30	