DUNMAN SECONDARY SCHOOL

CANDIDATE NAME			
CLASS		**INDEX NUMBER**	

PRELIMINARY EXAMINATION 2024
SECONDARY 4 NORMAL (ACADEMIC)

SCIENCE **5105/02**

Paper 2 Physics **5 August 2024**

Paper 1 and 2: 1 hour 15 minutes

Candidates answer on the Question Paper.
No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number on all the work you hand in.
Write in dark blue or black pen
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Section A
Answer **all** questions in the spaces provided.

Section B
Answer **one** question in the spaces provided.

The use of an approved scientific calculator is expected, where appropriate.
In calculations, you should show all the steps in your working, giving your answer at each stage.
You are advised to spend no longer than 30 minutes on Paper 1.
You may proceed to answer Paper 2 as soon as you have completed Paper 1.

At the end of the examination hand in your answers to Paper 1 and Paper 2 separately.
The number of marks is given in brackets [ ] at the end of each question or part question.

Section A

Answer **all** the questions in this section.

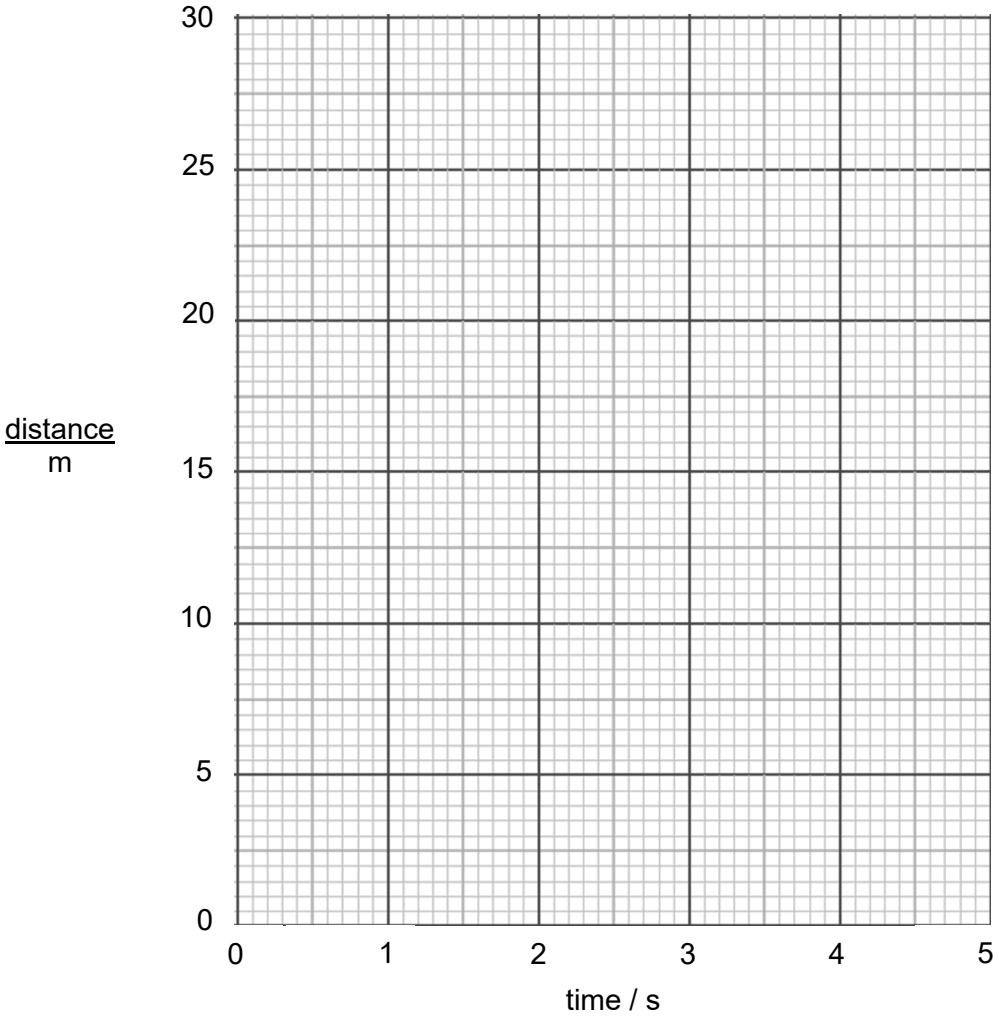
1 The total distance a cyclist travels from the starting point is measured every second.

The results for the first 5s are shown in the table.

time / s	distance from the starting point / m
0	0
1	6
2	10
3	20
4	24
5	30

(a) On the grid provided, plot these results, marking each point with a cross (x). [1]

(b) Draw a best fit straight line through these points. [1]



(c) Use the graph to find the time when the cyclist is 15m away from the starting point.

time = …….. s [1]

(d) Calculate the cyclist's average speed during the first 5s.

average speed = …….. m/s [1]

2 **(a)** Gamma radiation and infrared radiation are examples of electromagnetic waves.

List **two** properties which are common to both gamma radiation and infrared radiation.

1 ……..…….

……..……

2 ……..…….

……..……..…..…….. [2]

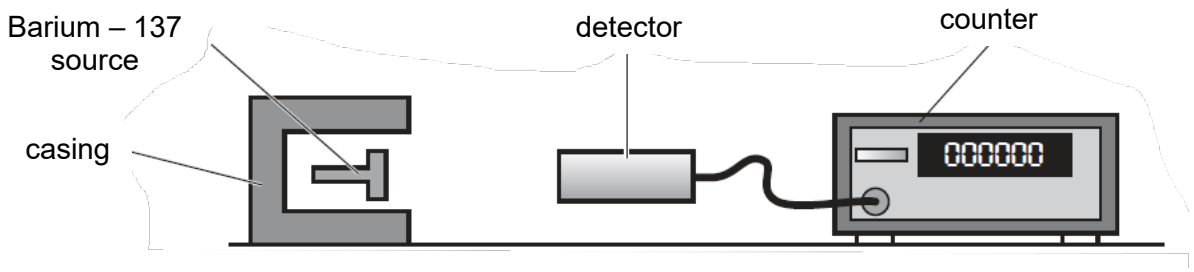
(b) Gamma radiation has a wavelength of 1.0×10^{-11}m and travels at a speed of 3.0×10^{8}m/s in vacuum.

Calculate its frequency.

frequency = …….. Hz [1]

(c) Gamma radiation is emitted when Barium – 137 undergoes radioactive decay.

The diagram shows a setup to detect the radioactive decay of Barium – 137.



(i) State the change, if any, to the charge and mass of a Barium – 137 nuclide after it has emitted gamma radiation.

charge: ……..…… [1]

mass: ……..…….. [1]

(ii) The Barium – 137 source is enclosed with a casing.

Suggest a suitable material for the casing around the Barium-137 source.
Give a reason for your answer.

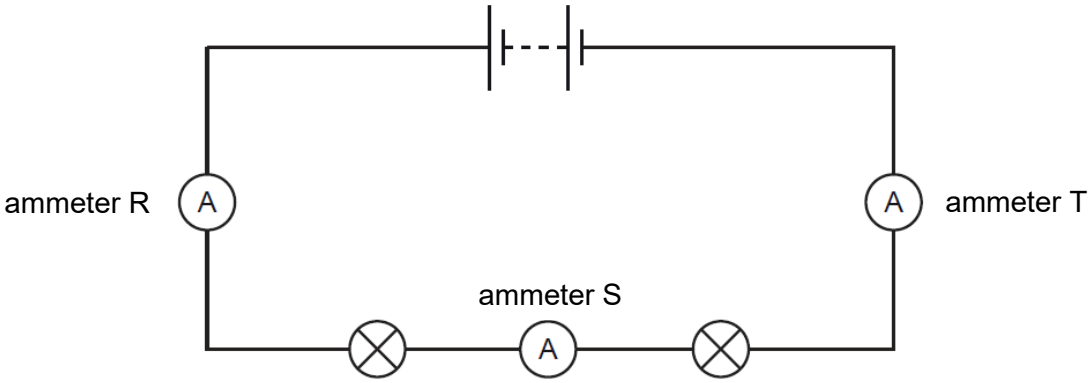
……..……

……..……

……..……

……..…….. [2]

3 The diagram shows a circuit containing two identical lamps and three ammeters.



(a) An experiment is carried out to collect the current readings in the circuit.

Four different sets of ammeter readings are recorded in the table below.

Put **one** tick in the last column to indicate which set of readings is correct for the circuit.

ammeter R / A	ammeter S / A	ammeter T / A	correct readings
0.5	0.5	0.8	
0.5	0.5	1.0	
0.6	0.6	0.6	
0.6	0.4	1.0	

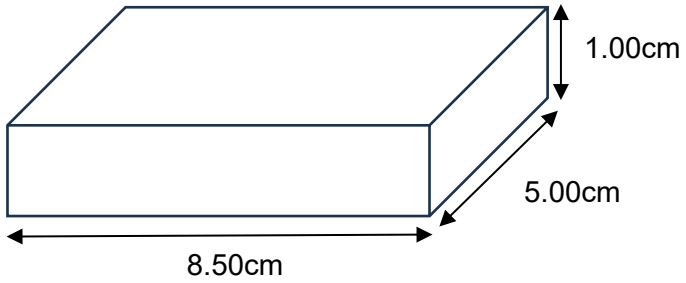
[1]

(b) The student uses a voltmeter to measure the potential difference across **one** of the lamps. The voltmeter reading is 2.0V.

Determine the e.m.f. of the battery.

e.m.f. = ... V [2]

4 The diagram shows the dimensions of a wooden block. The mass of the wooden block is found to be 4.8g.



(a) State a suitable apparatus which can be used to measure the respective quantities in the table below.

quantity	suitable apparatus
length of 8.50cm	
mass of 4.8g	

[2]

(b) Calculate

(i) the volume of the wooden block,

volume = ... cm^3 [1]

(ii) the density of the wooden block.

density = ... g/cm^3 [1]

(c) **(i)** Initially, the wooden block is at rest on a rough surface as shown in the diagram below.

On the diagram, draw and label the forces acting on the wooden block as it rests on the rough surface. [2]

(ii) A force of 5.0N to the right is applied on the wooden block. The wooden block moves with a constant speed of 0.2m/s to the right.

State the friction acting on the wooden block as it moves along the rough surface. Explain your answer.

……

……

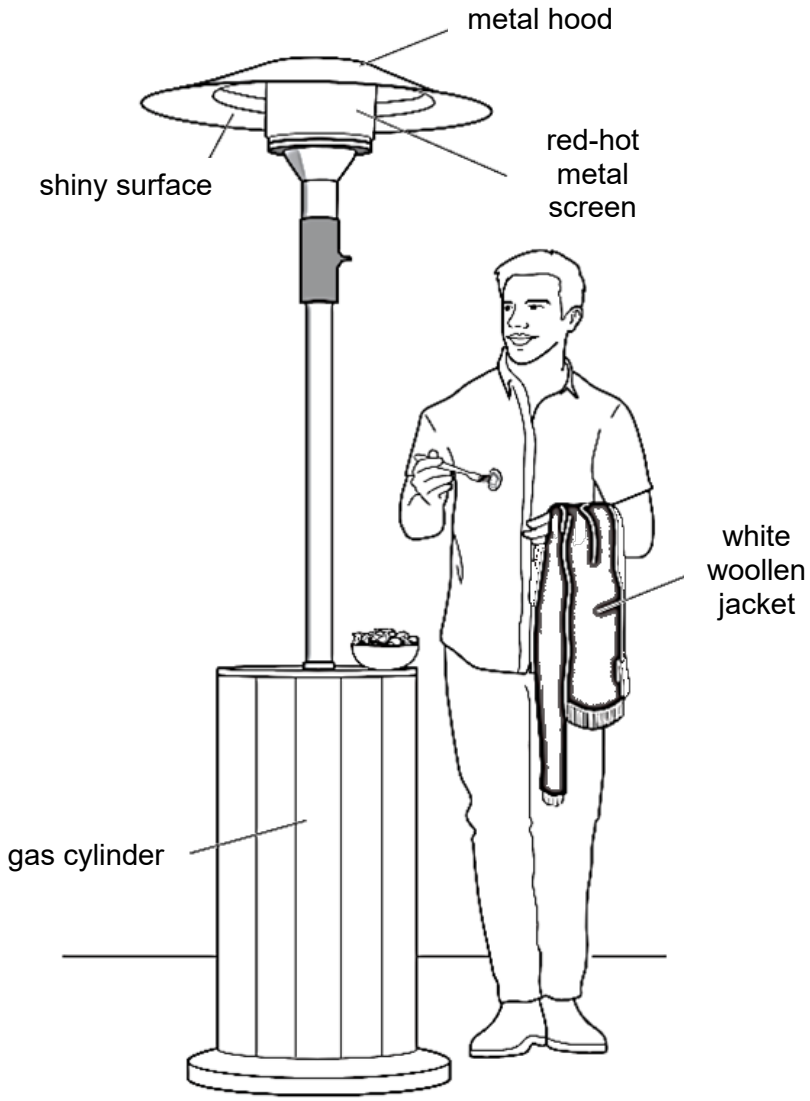
……

…… [2]

Section B

Answer **one** question from this section.

5 The diagram shows a man standing under an outdoor heater on a cold evening.



Gas in the cylinder at the base of the heater is the source of fuel for the heater. When the heater is operating, the gas travels to the top of the heater where it burns.

(a) State the form of energy stored in the gas.

……..…….. [1]

(b) State and explain what happens to the internal energy of the gas as it burns in the heater.

……

……

……

…… [2]

(c) A metal screen surrounding the burning gas is heated by the burning gas until it is red-hot. The hot metal screen warms the man who is standing under it.

(i) State how thermal energy in the red-hot metal screen is transferred to the man.

……

…… [1]

(ii) At the top of the heater is a metal hood which has a shiny lower surface.

Describe how this impacts the energy transfer from the metal screen.

……

……

……

…… [2]

(iii) The air temperature decreases, and the man puts on a white woollen jacket.

Explain **two** ways by which wearing the white woollen jacket helps to keep the man warm in cold weather.

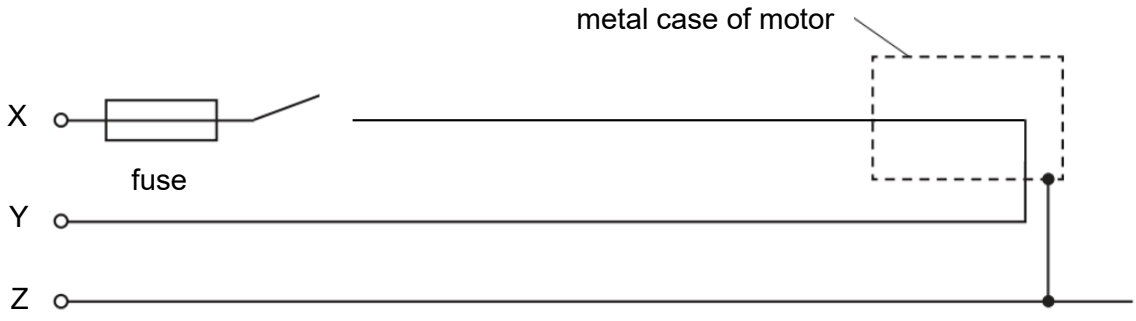
1 ……

……

2 ……

…… [2]

6 The diagram shows a motor connected to an electrical circuit in a house.



X, Y and Z are wires in the circuit.

(a) Name wire X and explain why the switch is connected on wire X.

name of wire X ..... [1]

explanation for connection to switch .....

..... [1]

(b) Name wire Z and explain why it is connected to the metal case of the motor.

name of wire Z ..... [1]

explanation for connection to metal case.....

..... [1]

(c) The motor produces a power of 300W at a voltage of 24V.

(i) Calculate the current flowing in the motor.

current = ... A [1]

(ii) Suggest a suitable rating of a fuse to be used for the motor.

……..…….. [1]

(iii) Calculate the electrical energy generated by the motor in five hours.

energy = ……. kWh [2]