Candidate Name	Centre Number	Candidate Number

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

PHYSICS **4023/2**

PAPER 2 Theory 2 hours 15 minutes

JUNE 2024 SESSION

Additional materials:
Electronic calculator
Answer booklet

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top.

At the end of the examination fasten the answer booklet used securely to the question paper.

INFORMATION FOR CANDIDATES

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

This question paper consists of two compulsory sections, **A** and **B.**

FOR EXAMINER'S USE

Section A	
Section B	**9**
	10
	11
	12
Total	

This question paper consists of 14 printed pages and 2 blank pages.

Section A

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

1 **(a)** State which of the following are vector quantities:

acceleration, *distance*, *current*, *speed*

_____

_____ [2]

(b) **(i)** Describe how it is possible to obtain a resultant force of zero from two forces of 10.0 N each.

_____

_____ [1]

(ii) **Fig.1.1** shows two equal forces acting at 120° to each other.

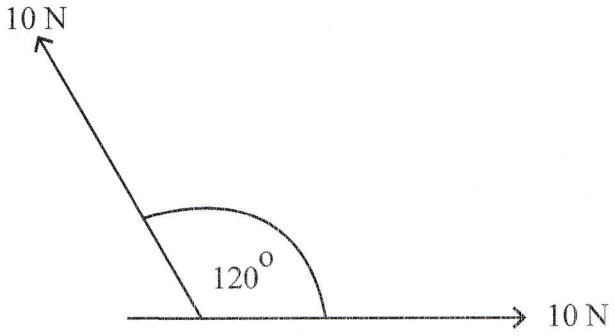

Fig.1.1

Calculate the resultant force.

[2]

2 **(a)** Define *mechanical advantage.*

_____

_____ [1]

(b) **Fig.2.1** shows a pulley system of effort 300 N.

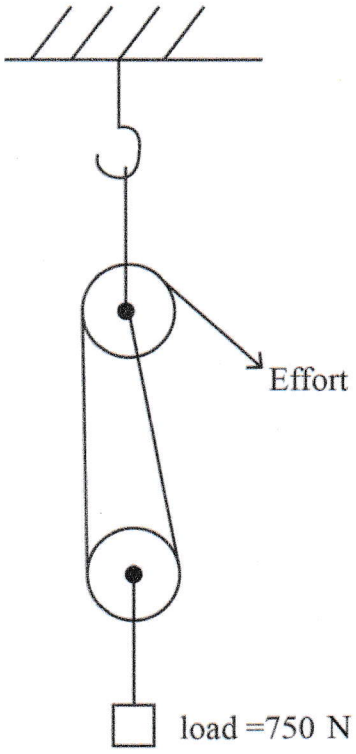

Fig.2.1

(i) Find the velocity ratio of the above system.

[1]

(ii) Calculate the vertical distance moved by the effort in order to lift the load through 30.0 cm.

[3]

3 **(a)** State the type of energy in the following:

(i) *torch cell*

[1]

(ii) *compressed spring*

[1]

(b) **(i)** State what is meant by *renewable energy source.*

[1]

(ii) Explain why it is important to use renewable energy source.

[2]

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

_____

_____ [1]

(b) **Fig.4.1** shows a heating curve for a substance, which was a solid before heating.

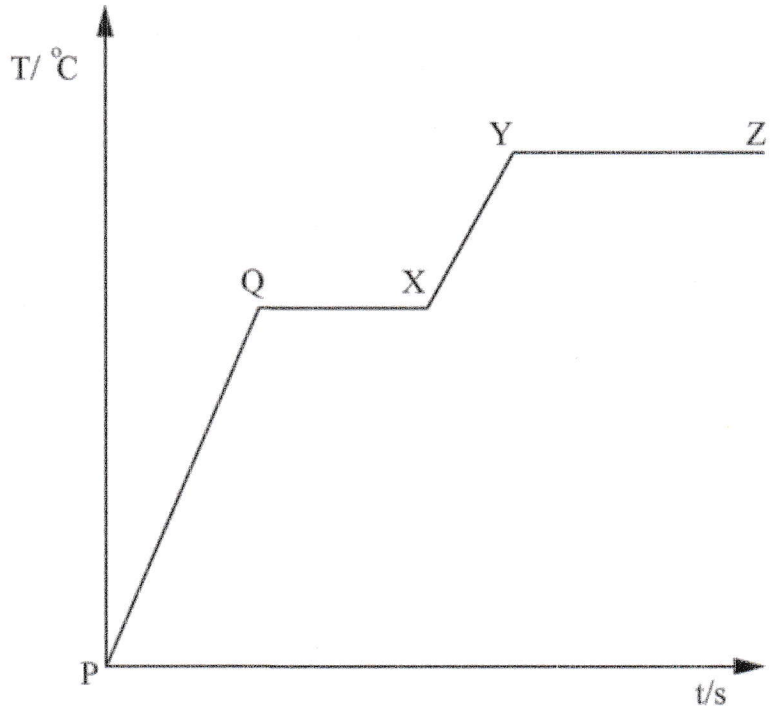

Fig.4.1

Name the process that occurs at QX and YZ.

QX_____

YZ_____[2]

(c) Explain why the heating element is placed at the bottom in an electric kettle.

_____

_____

_____ [2]

5 **(a)** Describe how an *echo* is produced.

_____

_____ [1]

(b) A bat flying towards a wall produces a sound wave directed towards the wall. The bat hears the echo of the sound it had produced 25 ms later.

Given that the speed of sound produced by the bat is 330 m/s, determine the distance of the wall from the bat.

[3]

(c) State one application of *echoes*.

_____ [1]

6 **(a)** State **two** advantages of a diesel engine over a petrol engine.

_____

_____ [2]

(b) Describe social implications of using fuels.

_____

_____

_____

_____

_____ [3]

7 **(a)** Explain what is meant by

(i) *electromotive force,*

_____

_____ [1]

(ii) *current.*

_____

_____ [1]

(b) **Fig 7.1** shows a circuit diagram used to determine the resistance of a load R.

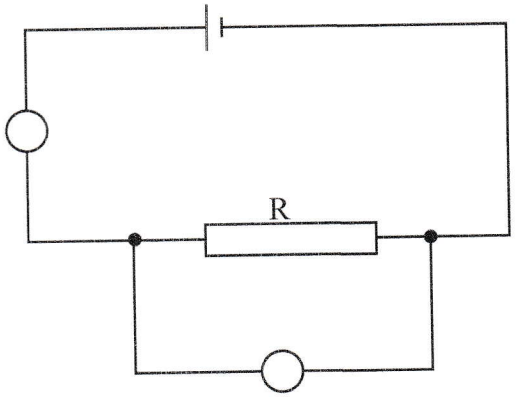

Fig 7.1

(i) On the diagram, indicate in the circles provided, the voltmeter, V, and the ammeter, A.

_____

_____ [1]

(ii) Explain how this set up can be used to determine resistance.

_____

_____

_____

_____ [2]

8. **(a)** Explain what is meant by the following terms as used in radioactivity:

(i) *half-life*

_____

_____ [1]

(ii) *radioactive decay*

_____ [1]

(b) The initial mass of radioactive isotope of half life 6 minutes is 20 g.
Find the mass of the isotope remaining after 18 minutes.

[3]

Section B

*Answer **any three** questions from this section.*
Write your answers on the separate answer booklet provided.

9. **(a)** Define *displacement*. [1]

(b) **Fig.9.1** shows a velocity time graph for a motorcycle.

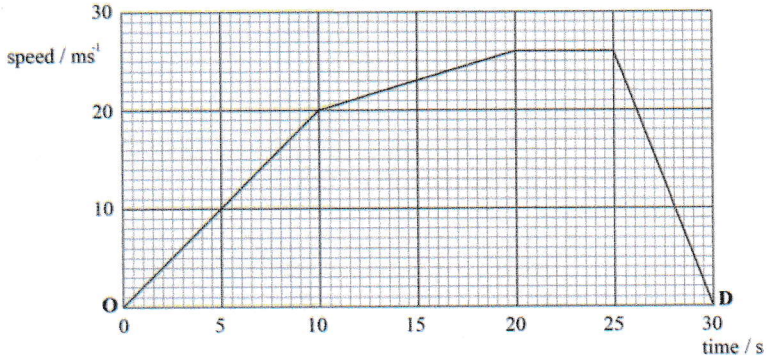

Fig.9.1

(i) From the graph describe qualitatively the motion of the motor cycle from **O** to **D**. [4]

(ii) Calculate the average speed of the motor cycle. [3]

(c) A feather is plucked off an eagle at a height of 200 m above the ground. **Fig.9.2** shows how the speed of the feather varies with time as it falls to the ground.

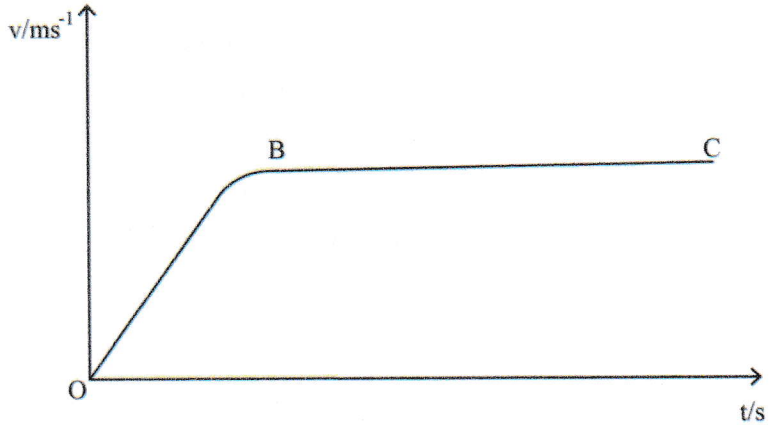

Fig.9.2

(i) Name the downward force acting on the feather. [1]

(ii) State any upward force acting on the feather. [1]

(iii) Describe qualitatively the motion of the feather up to a time it reaches the ground. [4]

(d) (i) Define a *vector quantity*. [1]

(ii) Forces of 15.0 N and 7.0 N both act at the same point but their direction can be varied. Calculate their

1. greatest possible resultant,
2. smallest possible resultant. [2]

(iii) If the two forces in **(ii)** are at right angles, find their resultant. [3]

10. **(a)** (i) Explain *Hooke's law*. [1]

(ii) **Fig.10.1** shows a spring mass system with an original length of 10.0 cm and an extension of 0.5 cm.

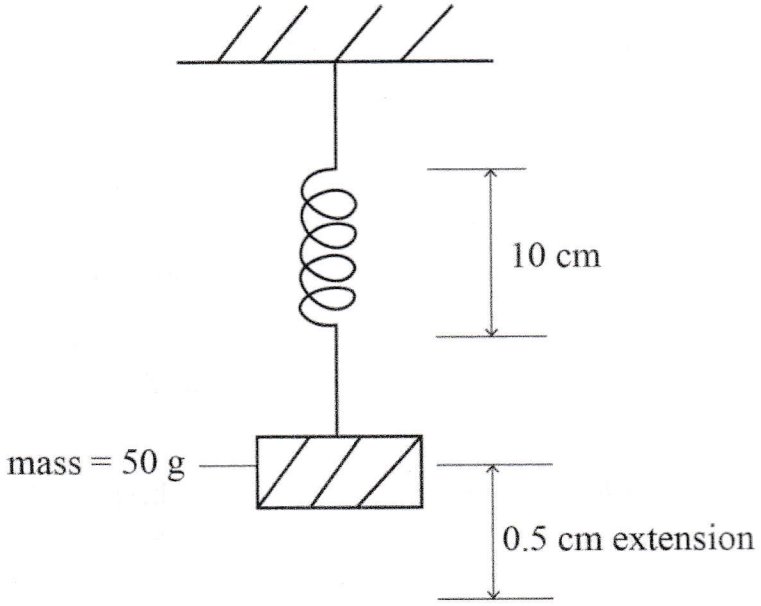

Fig.10.1

1. Calculate the spring constant.
2. State any assumption made in **(ii)1**.
3. Name any additional apparatus not shown in **Fig.10.1** that would be used to take readings that will help to find the spring constant. [4]

(b) **(i)** Define *inertia* and *momentum*. [2]

(ii) Describe and explain what would happen to a rock if it is launched with a speed of 10 m/s in a vacuum. [2]

(iii) **Fig.10.2** shows a 300 g bird on a building 100 m tall.

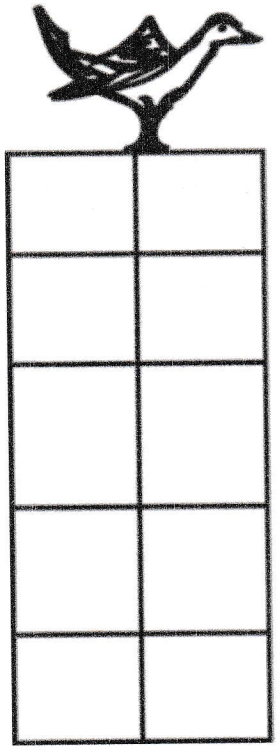

Fig.10.2

If the bird is shot dead and falls down,

calculate the

1. force it exerts on the ground,
2. velocity the dead bird attains when it reaches the ground. [4]

(c) **Fig.10.3** shows a car moving round a bend.

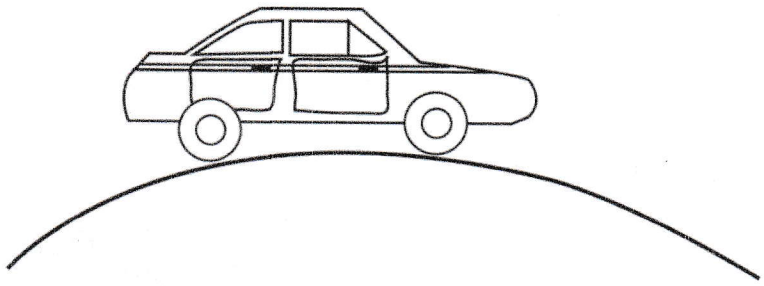

Fig.10.3

(i) State what provides the centripetal force. [1]

(ii) If the car is travelling at constant speed round the bend, explain how the centripetal acceleration is produced. [2]

(iii) If oil is spilt on the road in **Fig.10.3,** describe the motion of the car. [2]

(iv) State **one** advantage and one disadvantage of friction. [2]

11. **(a)** **(i)** Name any **three** regions of the *electromagnetic spectrum.* [3]

(ii) Calculate the frequency of the radiation with a wavelength of 1.0×10^{-11}m. [3]

(iii) Explain how and why microwaves can cause damage to living cells or even kill living cells. [2]

(b) **(i)** Explain what is meant by *induced magnetism.* [2]

(ii) Describe, with the aid of a diagram, how a magnetic material can be magnetised by using a solenoid. [4]

(c) Mr Zulu records details of electricity consumption in a week of some appliances in his home. The details are shown in the table.

Appliance	Power rating/kW	Time switched on/hour	Energy used/kWh
stove	3.50	12.0	
TV and light	0.86	36.0	

(i) Copy and complete the table by calculating the energy used by each appliance. [2]

(ii) Mr Zulu uses prepaid electricity token. At the beginning of the week the meter reading showing the remaining electrical energy in his last prepaid token was 843.2 kWh.

Calculate the meter reading at the end of the week. [2]

(iii) The cost per unit of energy used is \$0.25. Calculate the energy cost of the appliance that consumed the most energy that week. [2]

12. (a) (i) Explain why transformers use alternating voltage. [1]

(ii) With the aid of a diagram, describe the structure of a step-up transformer. [3]

(iii) Describe and explain the advantages of high voltage transmission. [2]

(b) **Fig.12.1** shows a combination of logic gates.

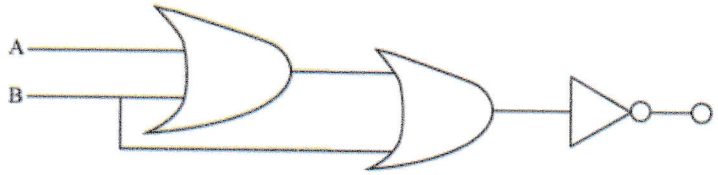

Fig.12.1

(i) Name the **two** types of logic gates shown in **Fig.12.1.** [2]

(ii) Draw a truth table for the circuit diagram in **Fig.12.1.** [3]

(iii) Give a single gate that could be used to perform the same function as the circuit diagram in **Fig.12.1.** [1]

(c) **Fig.12.2** shows radiation emitted by a radioactive isotope.

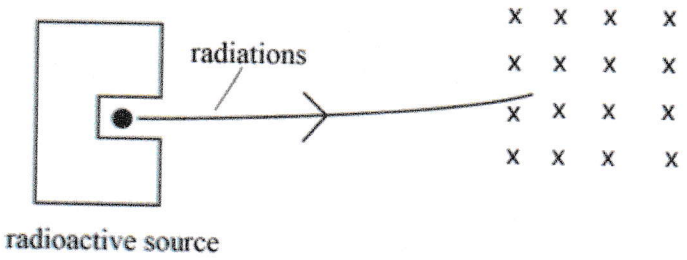

Fig.12.2

(i) Name **one** type of radiation emitted by radioactive isotopes. [1]

(ii) Copy **Fig.12.2** and show how radiations are deflected when they pass through a magnetic field as shown in **Fig.12.2.** [3]

(iii) Give **two** particles that are found in the nucleus of an atom. [2]

(iv) **Fig.12.3.** shows a cathode ray tube.

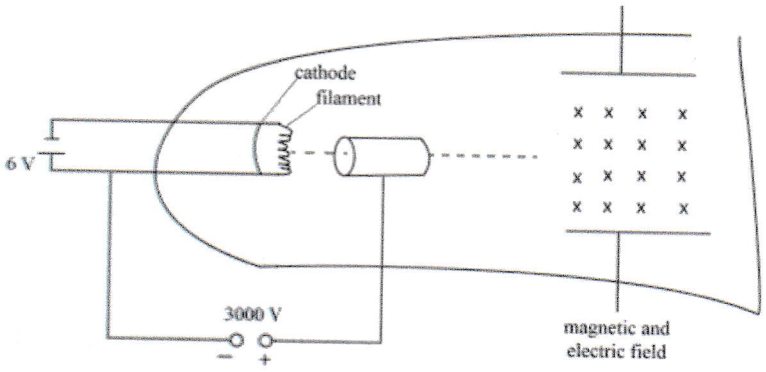

Fig.12.3.

1. Name the process by which electrons are emitted from the cathode.
2. Describe how electrons are accelerated inside the tube. [2]