

Candidate Name \_\_\_\_\_

Centre Number	Candidate Number

## EXAMINATIONS COUNCIL OF ZAMBIA

Joint Examination for the School Certificate  
and General Certificate of Education Ordinary Level

# SCIENCE

**5124/2**

**PAPER 2  
(PHYSICS)**

**Wednesday**

**4 NOVEMBER 2009**

**1 hour 15 minutes**

Additional materials:

Mathematical tables

Graph paper

Writing paper

**(Do not allow calculators)**

**Time: 1 hour 15 minutes**

### INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number at the top of this page and on any separate answer paper used.

There are **twelve (12)** questions in this paper.

#### Section A

Answer **all** the questions.

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

#### Section B

Answer any **two** questions.

Write your answers on the answer paper provided.

At the end of the examination

1. Fasten answer paper used securely to the question paper.

2. Enter the numbers of the **Section B** questions you have answered in the grid below.

### INFORMATION FOR CANDIDATES

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

**Cell phones are not allowed in the Examination room.**

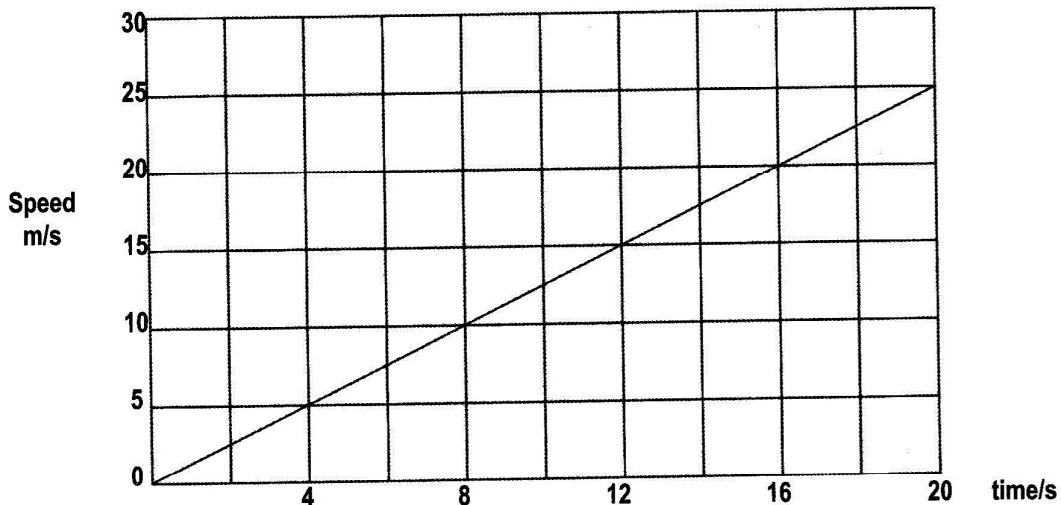
Candidate's use	Examiner's use
Section A	
Section B	
Total	

## Section A

[45 marks]

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

- 1 Figure 1.1 shows a graph of how the speed of a car changed over 20 seconds as the car accelerated along a straight road.



**Figure 1.1**

- (a) Calculate the acceleration of the car.

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

- (b) The mass of the car was 1200kg. Calculate the force which produced the acceleration in (a).

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

- (c) Calculate the distance travelled by the car during the 20 seconds.

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

**Total: [6]**

- 2** A girl who has a mass of 50kg runs up some stairs in 7.0 seconds. The stairs are 8.0m high. Take the gravitational field strength as 10N/kg. What is:-

**(a)** The girl's weight?

---

[1]

**(b)** The girl's potential energy when she is at the top of the stairs?

---

[2]

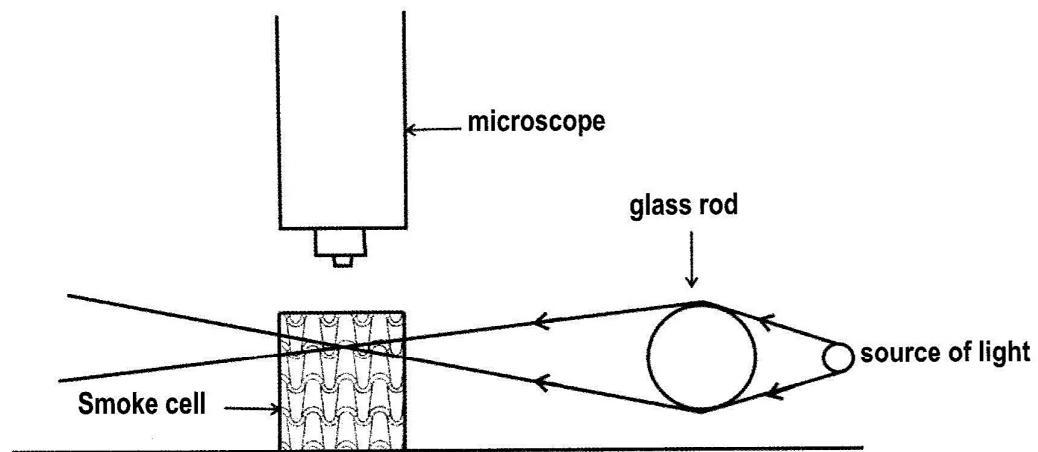
**(c)** Her power output?

---

[2]

**Total:** [5]

- 3 **Figure 3.1** shows one form of an apparatus used to observe Brownian motion of smoke particles in air. A pupil looking through the microscope sees tiny bright specks which he described as “dancing about”



**Figure 3.1**

- (a) What are the bright specks?

---

---

[1]

- (b) Why are the specks “dancing about”?

---

---

[1]

- (c) State the conclusion that can be drawn from Brownian motion.

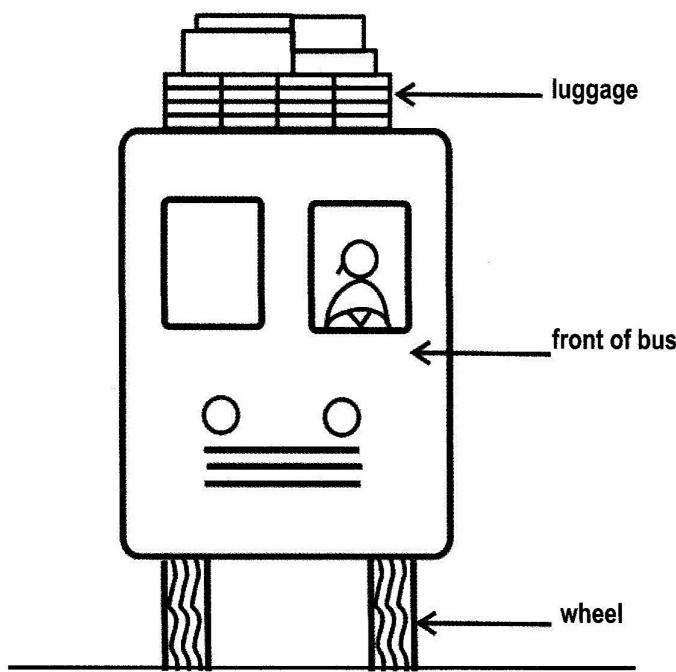
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[1]

**Total: [3]**

- 4 (a) Figure 4.1 shows a bus.



**Figure 4.1**

State 3 modifications that should be made in the design of the bus to make it more stable.

(i) \_\_\_\_\_

\_\_\_\_\_

(ii) \_\_\_\_\_

\_\_\_\_\_

(iii) \_\_\_\_\_

\_\_\_\_\_

[3]

- (b) An astronaut with a mass 75kg on Earth travels to the moon whose gravitational field strength is 1.6N/Kg.

- (i) What is meant by mass?

\_\_\_\_\_

\_\_\_\_\_

[1]

- (ii) What is the mass of an astronaut on the moon?

\_\_\_\_\_

[1]

- (iii) What is his weight on the moon?

\_\_\_\_\_

[1]

**Total: [6]**

- 5 Figure 5.1 shows the diagram of rotating gear wheels. The driving wheel has 36 teeth and the driven wheel has 12 teeth.

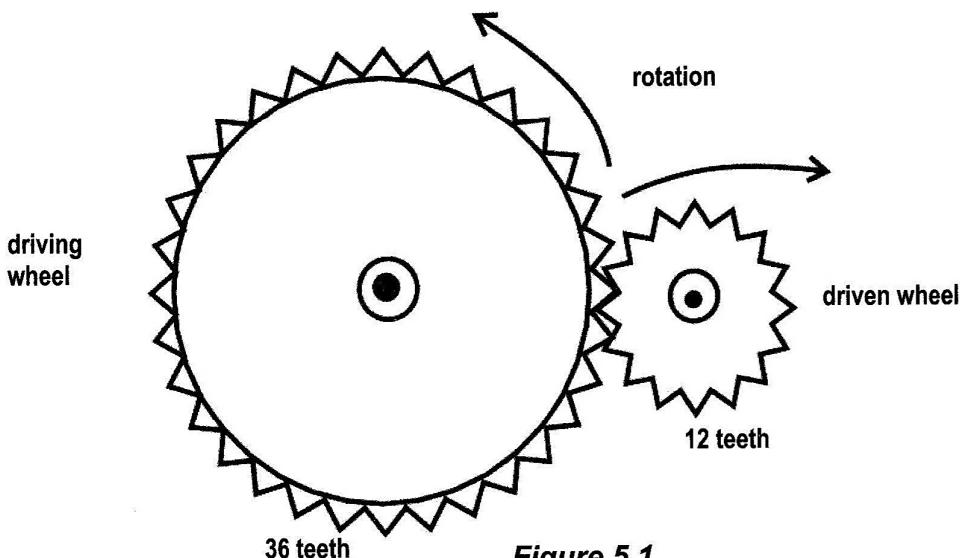


Figure 5.1

- (a) Find the velocity ratio.

[2]

- (b) If the driven wheel makes 15 rotations, how many rotations would the driving wheel make?

[2]

Total: [4]

- 6 (a) Figure 6.1 shows a ray of light incident on a rectangular glass block. Complete the path taken by the ray of light through and out of the block. The angle of refraction is  $18.2^\circ$ .

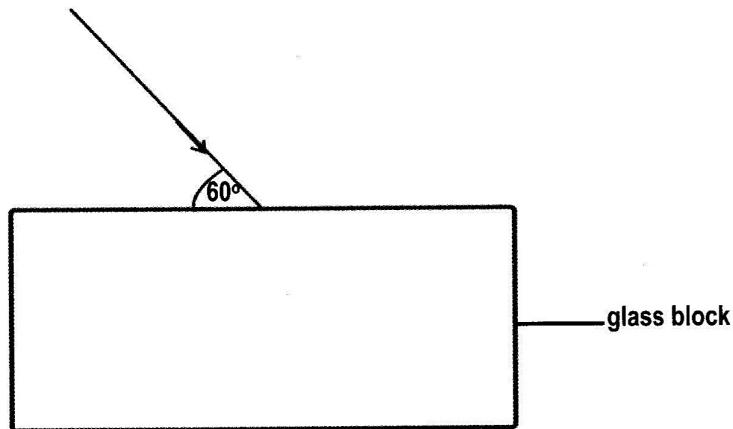


Figure 6.1

(b) If the ray strikes the glass block at an angle of  $60^\circ$  as shown in Figure 6.1. Find ...

(i) the angle of incidence. [1]

(ii) the refractive index of the glass block. Use the data below.

$$\sin 18.2^\circ = 0.3125$$

$$\sin 30^\circ = 0.500$$

$$\sin 45^\circ = 0.707$$

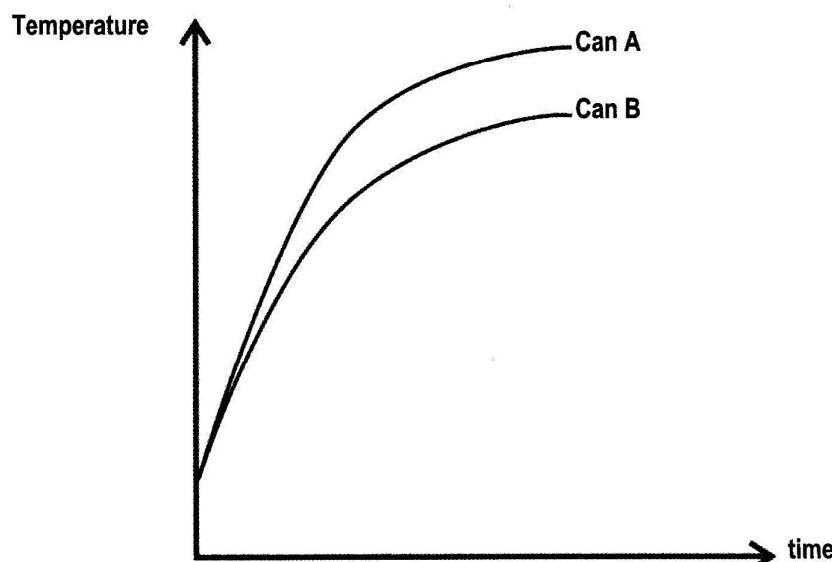
$$\sin 60^\circ = 0.866.$$

---

[2]

**Total: [5]**

- 7 **Figure 7.1** shows how the temperature of two identical cans, one with polished surface and the other one with black painted surface, varied over a short period of time after they were placed into strong sunlight.



**Figure 7.1**

(a) State the name of the process that transfers energy to the cans.

---

[1]

(b) Which Can A or B is with the polished surface?

---

[1]

(c) Give a reason for your answer.

---

[1]

**Total: [3]**

8 Figure 8.1 shows the diagram of a simple a.c generator.

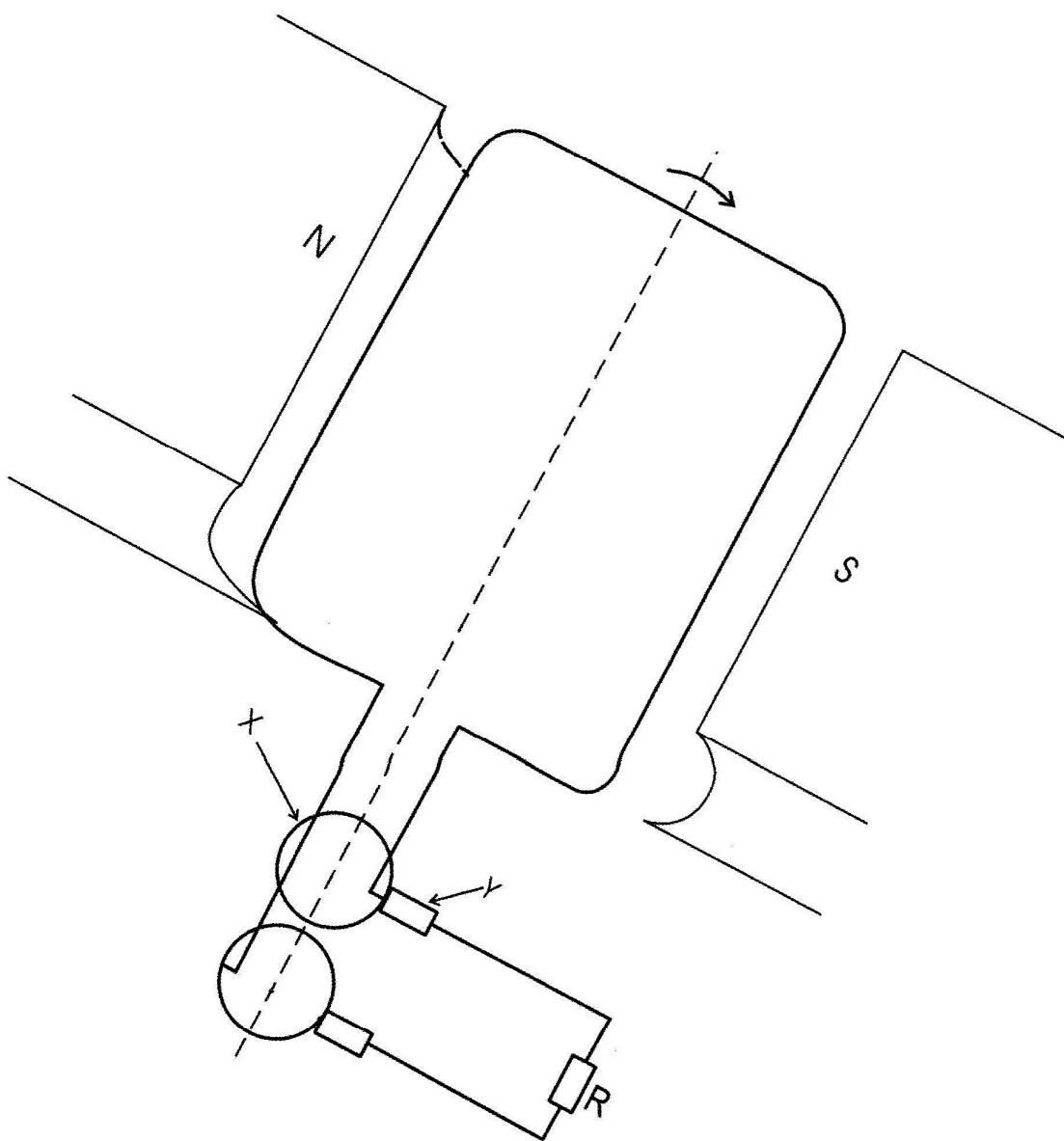


Figure 8.1

(a) Name the parts labelled X and Y.

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

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

(b) Name three ways in which the generator would be made to produce more voltage.

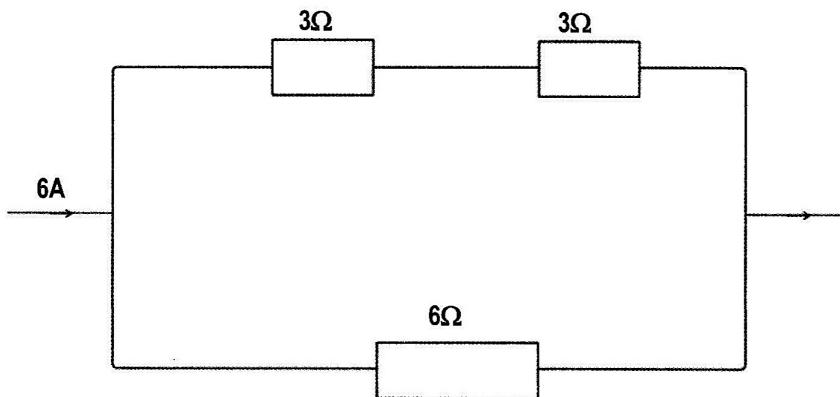
(i) \_\_\_\_\_

(ii) \_\_\_\_\_

(iii) \_\_\_\_\_ [3]

Total: [5]

- 9 (a) Figure 9.1 shows a network of resistors.



**Figure 9.1**

- (i) What current flows in the 6Ω resistor?

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

- (ii) What charge passes through the 6Ω resistor for 3 seconds.

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

- (iii) What is the potential difference across the 6Ω resistor.

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

- (b) A 2kW, 250V electric fire is connected to 250V mains.

- (i) How much current does the electric fire take?

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

- (ii) What is the cost of running the electric fire for 5 hours if the cost of a unit (kWh) of electrical energy is K900?

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

**Total: [8]**

**Section B**

[20 marks]

Answer any **two (2)** questions from this section.

Use the answer paper provided.

- 10** In an experiment to determine the half-life of radon-220 ( $\frac{220}{86}\text{Rn}$ ) the following results were obtained, after allowing for the background count:

Time/s	0	10	20	30	40	50	60	70
Count rate/ $5^{-1}$	30	26	23	21	18	16	14	12

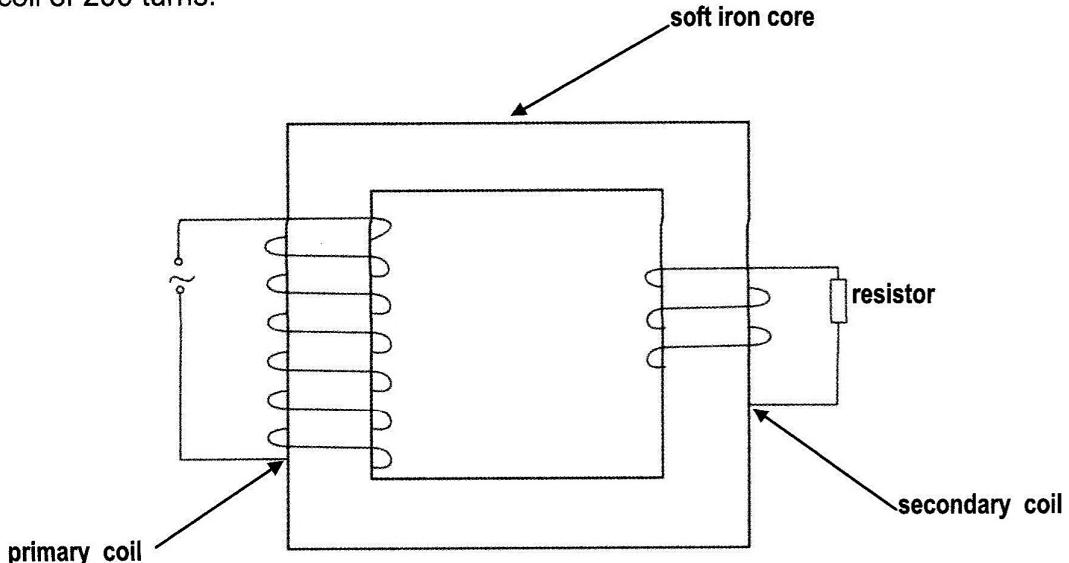
- (a) By plotting the graph of the count rate (vertically) against time (horizontally), determine the half-life of  $\frac{220}{86}\text{Rn}$ . Show clearly on the graph how you obtained the answer. [6]
- (b) What is the origin of the background count? [2]
- (c)  $\frac{220}{86}\text{Rn}$  emits alpha particle. When it does so, it becomes an isotope of an element polonium (Po). Write an equation to represent this change. [2]

**Total: [10]**

- 11** (a) Describe an experiment you would perform to determine the focal length of a converging lens using a distant object. [5]
- (b) An object 2cm high is placed 30cm from a converging lens of focal length 10cm. Find by scale drawing the position and size of the image. [5]

**Total: [10]**

- 12** Figure 12.1 represents a transformer with a primary coil of 400 turns and a secondary coil of 200 turns.



**Figure 12.1**

- (a) The primary coil is connected to the 240V a.c mains. Calculate the secondary voltage. [2]

(b) Explain carefully how the transformer works. [4]

(c) Why is soft iron used for the core instead of steel? [2]

(d) If the current in the primary coil is 3A, calculate the current in the secondary coil of the transformer, assuming the transformer is 100% efficient. [2]

Total: [10]

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