

**SIR ARTHUR LEWIS COMMUNITY COLLEGE**  
**ENGINEERING AND THE CIRCULAR ECONOMY**  
**ACADEMIC YEAR (2024/2025) - SEMESTER ONE**  
**END OF SEMESTER EXAMINATION**

**TUTOR (S)** : **Mr. Kwame Frederick**

**PROGRAMME TITLE** : **Electrical Installation  
Motor Vehicle Mechanics**

**COURSE TITLE** : **Engineering Science IA**

**COURSE CODE** : **ENS101**

**LEVEL** : **Certificate/Year one**

**PAPER** : **One**

**DATE** : **Tuesday, 10<sup>th</sup> December 2024**

**COMMENCEMENT TIME** : **1:00p.m**

**DURATION** : **2 hours**

**INVIGILATOR(S)** : **C. Charles (Chief), B. Scott & S. Herelle**

**ROOM(S)** : **TRB-02-03**

**STUDENT ID** :

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**GENERAL INFORMATION AND INSTRUCTIONS**

- This paper consists of Three (3) Sections (A, B, & C). **You are required to attempt all questions** in the spaces provided on the question paper. **Marks are awarded accordingly.**
- You may request additional sheets to complete your responses. **ENSURE** the additional sheet are properly stapled to your answer booklet and your answers are visible.
- **Section A** consists of four (4) questions.
- **Section B** consist of five (5) questions.
- **Section C** consist of three (3) questions.
- Ensure your student ID number is clearly written on the paper
- Where you are required to draw to scale **FREE HAND SKETCHES** will not be accepted.
- **Note: Bags, Books as well as writing paper not given by the invigilator should be deposited at the front of the examination room or as otherwise indicated.**
- **All cell phones must be turned off during the exam**

**DO NOT TURN THIS COVER SHEET UNTIL  
YOU ARE TOLD TO DO SO!!!**

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**SECTION A**

Answer **all** questions within this section in the spaces provided on this question paper.

**Question One– Fundamental Quantities****[10 Marks]**

In the table below shows a list of the seven fundamental quantities that exist. Fill in the blank where necessary.

Fundamental Quantity	SI Unit	
Name	Name	Symbol
Length		m
	Kilogram	
		A
Luminous Intensity		Ca
	Mole	
Time		s
Temperature	Kelvin	

**Question Two – Scientific Notation**

(A) Convert the following ordinary numbers to scientific notation.

**[2 marks]**

1) 32400

2) 0.00138

(B) Convert the following from scientific notation to ordinary numbers.

**[2 marks]**

1)  $1.23 \times 10^{-3} \text{A}$

2)  $6.78 \times 10^5 \text{V}$

**Question Three– Metric Prefixes & Conversions**

1) An electrical circuit has a resistor with a value of 4.7 k $\Omega$ . What is this resistance in ohms?

**[1 mark]**

2) A small electronic component draws 10.003 A of current. Convert this current to mA **[1 mark]**

3) A bridge is 120 meters tall. Convert this height into feet.

**[2 marks]**

**Question Four – Derived Quantities**

- 1) Given that the equation for density ( $\rho = \frac{\text{Mass}}{\text{Volume}}$ ), use the **SI units** for mass and volume to determine the SI unit for density. Show your working steps. **[4 marks]**

**[TOTAL 22 MARKS]**

**SECTION B**

Answer **all** questions within this section in the spaces provided on this question paper.

**Question Five – Differentiating Vectors and Scalars**

- 1) What is the major difference between vectors and scalars? **[2 marks]**

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\_\_\_\_\_

\_\_\_\_\_

- 2) On the lines provided, state whether a vector or scalar quantity is described below. **[5 marks]**

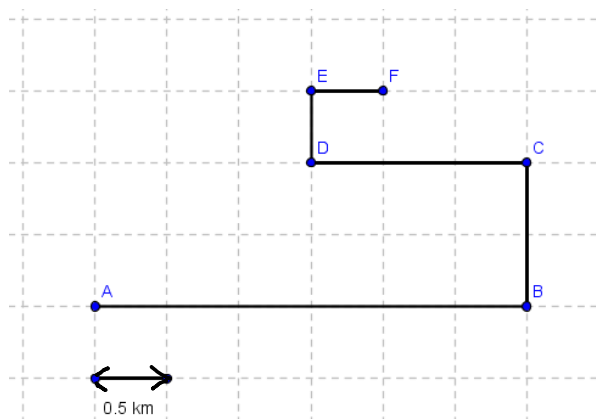
- A car is traveling at 80 km/h on a straight highway. \_\_\_\_\_
- A person pushes a box with a force of 50 N to the right. \_\_\_\_\_
- The temperature of the water in a beaker is measured as 75°C. \_\_\_\_\_
- A hiker walks 5 km north from the starting point. \_\_\_\_\_
- A runner completes one lap around a 400 m track in 60 seconds. \_\_\_\_\_

**Question Six – Distance Vs Displacement**

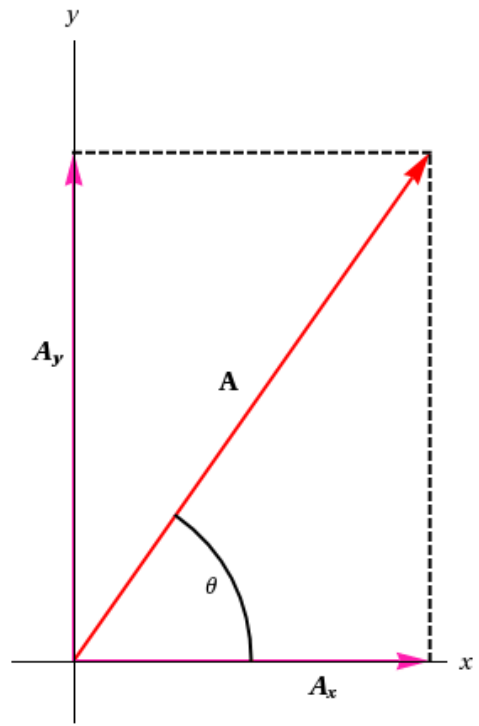
- 1) A man walked from point A to F, traveling from his workplace in the city center to his home on the outskirts of town.

(A) Using the scale provided determine the total distance he walked using the scale provided. **[2 marks]**

(B) On the drawing provided show using a dotted line his total displacement. **[1 mark]**



**Question Seven – Measuring the Resultant Vector**



The diagram below shows two perpendicular vectors drawn to a scale of 1cm :10 miles. Measure

- a) The Magnitude of the  $A_y$  vector. **[2 marks]**
- b) The magnitude of the  $A_x$  vector. **[2 marks]**
- c) The magnitude and angle of the resultant vector A. **[3 marks]**

**Question Eight – Drawing and Solving Resultant Vectors**

Michael is heading to his aunt’s house. His first stop was 8 km East to his brother’s house then finally drove 4 km to the south to arrive at his aunt’s house.

- (A) Using the scale 1cm: 1km, show your resultant vector (R) for this trip. Use the “+” as your start point. Label all vectors. **[6 Marks]**

+

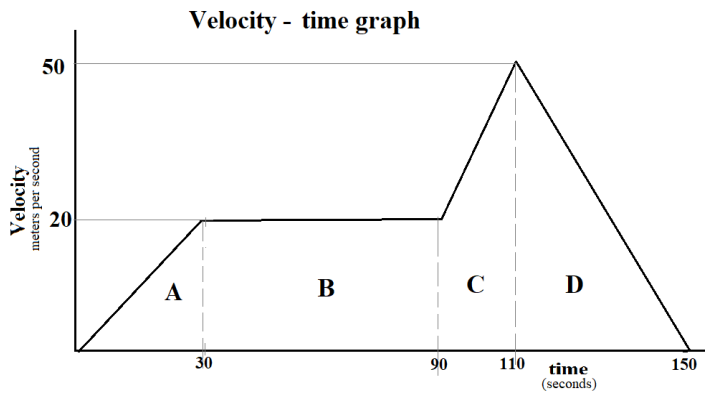
- (B) Calculate the Magnitude and angle of your resultant vector. Solve in the boxes provided

**[6 Marks]**

Magnitude	Angle

**Question Nine - Velocity – Time Graph**

The velocity-time graph below shows the motion of a vehicle over a time period. Examine the graph and answer the questions below.



(A) Describe the velocity seen in the following sections on the lines provided. **[4 marks]**

Section A \_\_\_\_\_

Section B \_\_\_\_\_

Section C \_\_\_\_\_

Section D \_\_\_\_\_

(B) Calculate the acceleration in section A & C and the deceleration in section D on the graph.

Formula:  $a = \frac{v-u}{t}$

**[6 Marks]**

Section A	Section B	Section C

(C) Calculate the total displacement the vehicle traveled from A to B.

**[6 Marks]**

Section A	Section B	Total A + B

**[TOTAL 45 MARKS]**

**SECTION C**

Answer all questions within this section in the spaces provided on this question paper.

**Question Ten**

(A) What is the difference between mass and weight? **[2 marks]**

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(B) Match the word to the correct definition. **[5 marks]**

Friction	A force that moves an object away from the source of the force.
Gravitational Force	A force that acts on an object moving in a circular path, directed toward the
Centripetal Force:	The attractive force exerted by any mass on another mass, pulling them toward each other.
Push:	A force that draws an object closer to the source of the force.
Pull:	A force that opposes the relative motion between two surfaces in contact.

**Question Eleven - Calculating Weight & Mass**

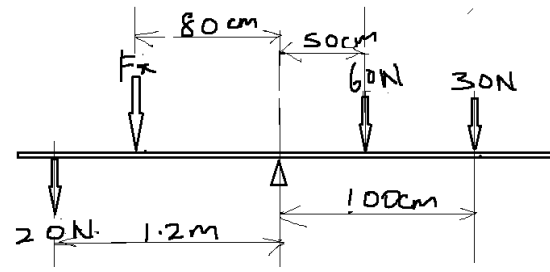
(A) A physical science test book has a mass of 2.2 kg What is the weight on the Earth? **[2 marks]**

(B) An object accelerates  $30 \text{ m/s}^2$  when a force of 6.0 newtons is applied to it. What is the mass of the object? **[3 marks]**

**Question Twelve – Moments**

- (A) The diagram shows four forces acting on a light rod. Determine the force  $F_x$  that would keep the system in equilibrium. **[6 marks]**

**[12 Marks]**



**[TOTAL 24 MARKS]**