education

MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA

FURTHER EDUCATION

AND TRAINING

GRADE 12

PHYSICAL SCIENCES TOPIC TEST

TOPIC: WORK, ENERGY AND POWER

06 MAY 2025 (Proposed date)

MARKS: 27

TIME: 33 minutes

This question paper consists of 4 pages and 1 data sheet
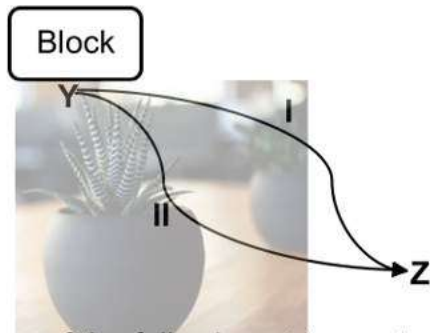
INSTRUCTIONS AND INFORMATION

1. Write your name in the appropriate space on the ANSWER BOOK.

2. This question paper consists of THREE questions. Answer ALL the questions in the ANSWER BOOK.

3. Start EACH Question on a NEW page in the ANSWER BOOK.

4. Number the answers correctly according to the numbering system used in this question paper.

5. Leave one line between two sub questions, for example between QUESTION 2.1 and QUESTION 2.2.

6. You may use a non-programmable calculator.

7. You may use appropriate mathematical instruments.

8. You are advised to use the attached DATA SHEET.

9. Show ALL formulae and substitutions in ALL calculations.

10. Round off your final numerical answers to a minimum of TWO decimal places.

11. Give brief motivations, discussions, etc, where required.

12. Write neatly and legibly.

QUESTION 1: MULTIPLE—CHOICE QUESTIONS

Various options are provided as possible answers to the following questions. Each question has only ONE correct answer. Choose the answer and write only the letter (A–D) next to the question number (1.1 to 1.2) in the ANSWER BOOK, eg. 1.3E

1.1   A block is moved from point **Y** to **Z** along two different paths **I** and **II**, as shown in the diagram below.

Which one of the following statements is CORRECT regarding the work done by the gravitational force in moving the block from point **Y** to **Z**? The work done is….

A   greater for path **I** than **II**.

B   lower for path **I** than **II**.

C   the same for both paths.

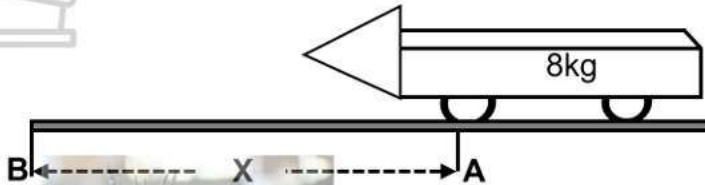D   zero for both paths.   (2)

1.2   The work done by a constant force **F** applied to an object to increase the object's speed from **v** to **2v** is **W**.
The work done by the same force to increase the speed of the object from **0** to **v** will be….

A $\frac{1}{2}$ W

B $\frac{1}{3}$ W

C   3W

D   2W   (2)
                                                                                            [4]
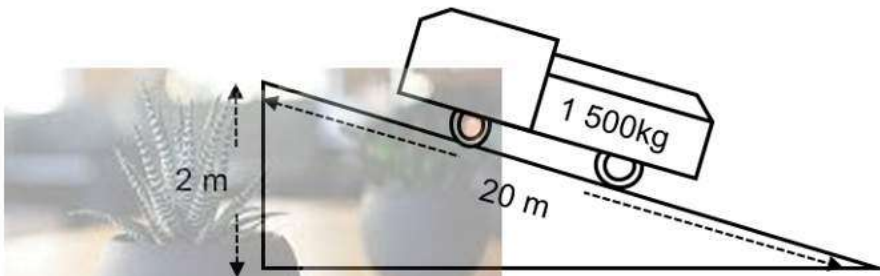
QUESTION 2

A child's electric car of mass 8kg is driven by a constant engine force of 40N from rest at point **A**. The car moves under the influence of a constant frictional force of 10N and reaches point **B** at a velocity of 5 m.s^{-1}, as shown in the diagram below. Point **B** is **X** meters long from point **A**.

2.1 State the *work-energy theorem* in words. (2)

2.2 Use energy principles to calculate the length **X**, between points **A** and **B**. (4)

2.3 Calculate the power delivered by the engine to move the car to point **B** in 2 minutes. (5)

[11]

QUESTION 3

A truck of mass 1500 kg, moves at a constant velocity of 2 m.s^{-1} up an incline by the driving force, **F** of the engine. The incline is 20 m long and has a vertical height of 2 m, as shown in the diagram below. The truck experiences a frictional force of 1000N.

3.1 Write down ONE name of a non-conservative force acting on the truck. (1)

3.2 Draw a labelled free body diagram showing all the forces acting on the truck during its motion. (4)

3.3 Calculate the magnitude of the driving force, **F** of the engine. (4)

3.4 Calculate the work done by the gravitational force on the truck.

(3)

[12]

TOTAL:27

DATA FOR PHYSICAL SCIENCES P1 GRADE 12

TABLE 1: PHYSICAL CONSTANTS

NAME	SYMBOL	VALUE
Acceleration due to gravity	g	$9{,}8 \text{ m·s}^{-2}$

TABLE 2: FORCE

$F_{net} = ma$	$p = mv$
$f_{s(max)} = \mu_s N$	$f_k = \mu_k N$
$F_{net}\Delta t = \Delta p$ $\Delta p = mv_f - mv_i$	$w = mg$

TABLE 3: WORK, ENERGY AND POWER

$W = F\Delta x \cos\theta$	$U = mgh$ or/of $E_P = mgh$	
$K = \dfrac{1}{2}mv^2$ or $E_k = \dfrac{1}{2}mv^2$	$W_{net} = \Delta K$ or $W_{net} = \Delta E_k$ $\Delta K = K_f - K_i$ or $\Delta E_k = E_{kf} - E_{ki}$	
$W_{nc} = \Delta K + \Delta U$ or $W_{nc} = \Delta E_k + \Delta E_p$	$P = \dfrac{W}{\Delta t}$	$P_{ave} = F \cdot v_{ave}$

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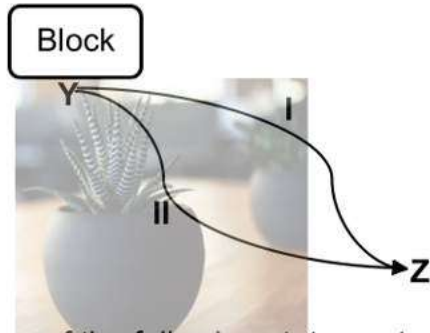This question paper consists of 4 pages and 1 data sheet

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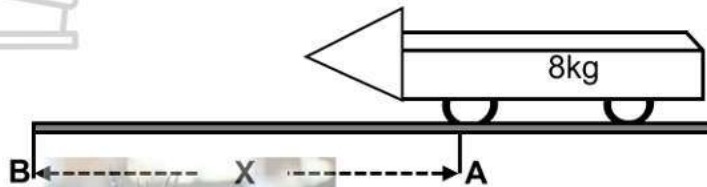

Which one of the following statements is CORRECT regarding the work done by the gravitational force in moving the block from point **Y** to **Z**? The work done is….

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C   the same for both paths.

D   zero for both paths.   (2)

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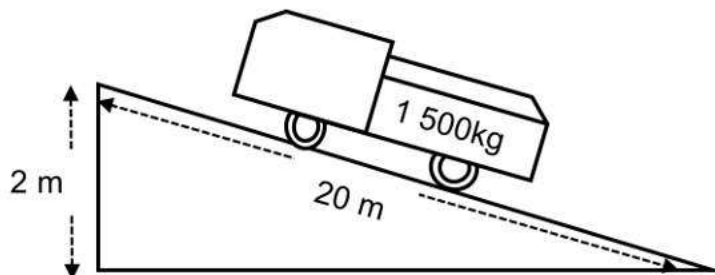
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                                                                                                  (3)
                                                                                              [12]

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please turn over

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$W_{nc} = \Delta K + \Delta U$ or $W_{nc} = \Delta E_k + \Delta E_p$	$P = \dfrac{W}{\Delta t}$	$P_{ave} = F \cdot v_{ave}$