education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

PROVINCIAL ASSESSMENT

GRADE 10

TECHNICAL SCIENCES P1

NOVEMBER 2024

MARKS: 150

TIME: 3 hours

This question paper consists of 15 pages and 1 data sheet.

INSTRUCTIONS AND INFORMATION.

1. This question paper consists of TEN (10) questions. Answer ALL the questions in the ANSWER BOOK.

2. Start EACH question on a NEW page in the ANSWER BOOK.

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

4. Leave ONE line between two sub questions, e.g. between QUESTION 2.1 and QUESTION 2.2.

5. You may use a non-programmable calculator.

6. You may use appropriate mathematical instruments.

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

8. Show ALL formulae and substitutions in ALL calculations.

9. Round off your FINAL numerical answers to a minimum of TWO decimal places.

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

11. Write neatly and legibly.

QUESTION 1: MULTIPLE-CHOICE QUESTIONS

Various options are provided as possible answers to the following questions. Choose the answer and write only the letter (A–D) next to the question number (1.1 to 1.10) in the ANSWER BOOK, e.g. 1.11 D.

1.1 Which ONE of the following is the SI unit for velocity?

A $m \cdot s^{1}$

B $m \cdot s^{2}$

C $m \cdot s^{-1}$

D $m \cdot s^{-2}$ (2)

1.2 Which ONE of the following is CORRECT according to physical quantities?

	Current	Energy	Force
A	Vector	Vector	Vector
B	Scalar	Scalar	Vector
C	Vector	Vector	Scalar
D	Scalar	Scalar	Scalar

(2)

1.3 Which ONE of the following statements is the correct description of a moving object if the rate of change in displacement is CONSTANT. The object moves with a …

A increasing acceleration.

B constant acceleration.

C no acceleration.

D the velocity changes, but the speed stays the same. (2)

1.4 Which ONE of the following is a NON-contact force?

A Gravitational force

B Normal force

C Tension force

D Frictional force (2)

1.5 Which ONE of the following statements is CORRECT according to normal force? The normal force must always be …
.

A horizontal to the ground.

B parallel to the surface of the object.

C vertical to the ground.

D perpendicular to the surface of the object. (2)

1.6 Which ONE of the following is the CORRECT symbol and unit of moment of force?

A τ and N·m

B F and N·m

C m and N·m

D τ and $N \cdot m^{-1}$ (2)

1.7 An object with mass m, moves at a speed v and has kinetic energy E_k. The mass of the object is now HALVED, the speed stays the same. What is the kinetic energy now?

A E_K

B $2E_K$

C ¼ E_k

D ½ E_k (2)

1.8 Which ONE of the following statements is CORRECT?

A Conductors are only non-metals.

B A charge can be destroyed.

C A charge can be created.

D Unlike charges will attract each other. (2)

1.9 1 Volt is equal to …

A $\frac{1\ Joule}{1\ second}$

B $\frac{1\ Joule}{1\ Coulomb}$

C $\frac{1\ Coulomb}{1\ second}$

D $\frac{1\ Coulomb}{1\ Joule}$ (2)

1.10 Which ONE of the following statements is CORRECT regarding the voltmeter reading across the battery in a series circuit?

A $V_T = V_S – V_1 + V_2$

B $V_T = V_1 + V_2 + V_3$

C $V_T = V_1 + V_2 - V_3$

D $V_T = V_1 = V_2 = V_3$ (2)
[20]

QUESTION 2 (Start on a new page.)

2.1 Convert the following physical quantities and show ALL the calculations:

2.1.1 580 grams to kilogram (2)

2.1.2 3 hours to seconds (2)

2.1.3 8 kilometres to metre (2)

2.1.4 80 $km.h^{-1}$ to $m \cdot s^{-1}$ (2)

2.1.5 The standard notation of 0,000 006 m to scientific notation. (2)

2.2 Make (I) the subject of the formulae in the following equation:

$$R = \frac{V}{I}$$

(2)
[12]

QUESTION 3 (Start on a new page.)

3.1 Differentiate between a *vector quantity* and *scalar quantity*. (4)

3.2 Classify the following as a *vector* or *scalar* quantity.
Write down VECTOR or SCALAR.

3.2.1 Ashley walks for 5 minutes. (1)

3.2.2 Sipho drives 120 $km \cdot h^{-1}$ West. (1)

3.2.3 The astronaut weight is 90 N. (1)

3.2.4 The current of 5 A move through an electric circuit. (1)

3.3 Mark is shopping at a Game store. He walks 3 m east to the first cashier; the cashier is closed, and he turns around to walk 2 m west to a new cashier.

3.3.1 Define the term *resultant* in words. (2)

3.3.2 Draw a vector diagram by using the tail-to-head method, determine Marks' resultant displacement.

Scale 1 cm: 1 m (3)

3.3.3 Prove the answer in QUESTION 3.3.2 by making use of calculations. (3)
[16]

QUESTION 4 (Start on a new page.)

4.1 Naledi is at a nature reserve for the weekend, she is allowed to ride a Quad bike. She wants to go for a trail ride through the reserve, she drives 2 000 m in the direction of 0°, then she drives 1 500 m in the direction of 180°. The whole journey takes her 30 minutes to complete.

4.1.1 Define the term *speed* in words. (2)

4.1.2 Calculate her distance for the journey. (2)

4.1.3 Determine her speed for the journey. (3)

4.2 Tshepo is playing with a toy monster truck in the street. He starts the toy monster truck from rest and reaches a velocity of 5 $m \cdot s^{-1}$ within 5 seconds, in the NORTH direction.

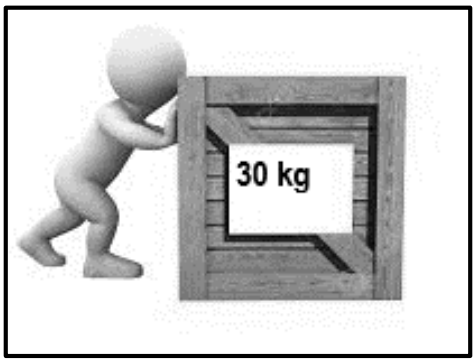
4.2.1 Define the term *acceleration* in words. (2)

4.2.2 Calculate the magnitude and direction of the toy monster truck's acceleration. (4)

[13]

QUESTION 5 (Start on a new page.)

5.1 A crate with a mass of 30 kg is pushed with a force of 40 N to the right. The crate is experiencing a frictional force of 10 N, as shown in the diagram below.



5.1.1 Define the term *frictional force* in words. (2)

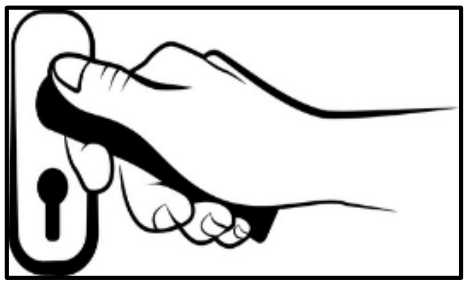
5.1.2 Draw a labelled free-body diagram indicating ALL the forces acting on the crate. (4)

5.1.3 Calculate the weight of the crate. (3)

5.1.4 Name TWO ways in which friction can be reduce. (2)
[11]

QUESTION 6 (Start on a new page.)

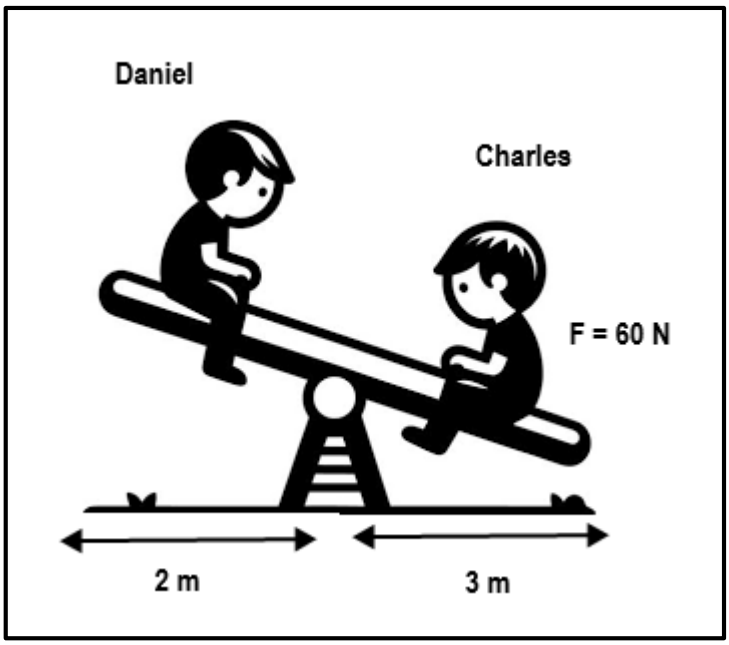
6.1 A force of 20 N is applied downwards on a door handle, 15 cm from the hinges of the door, as shown in the diagram below.



6.1.1 Define the term *Moment of force* in words. (2)

6.1.2 Calculate the moment of force on the door handle. (4)

6.2 Two boys, Charles and Daniel, are playing on a seesaw in the town park. Charles exerts a 60 N force 3 m away from the fulcrum, while Daniel is sitting 2 m from the fulcrum, as shown in the diagram below.



6.2.1 State the *Law of Moments* in words. (2)

6.2.2 Determine the force that Daniel needs to exert on the seesaw to balance the beam. (4)

6.3 Give the type of lever for the following objects:

6.3.1 Scissors (1)

6.3.2 Fishing road (1)

6.3.3 Nutcracker (1)

6.4 A builder wants to move a wheelbarrow with a weight of 780 N. The builder applied a force of 820 N to pick the wheelbarrow up.

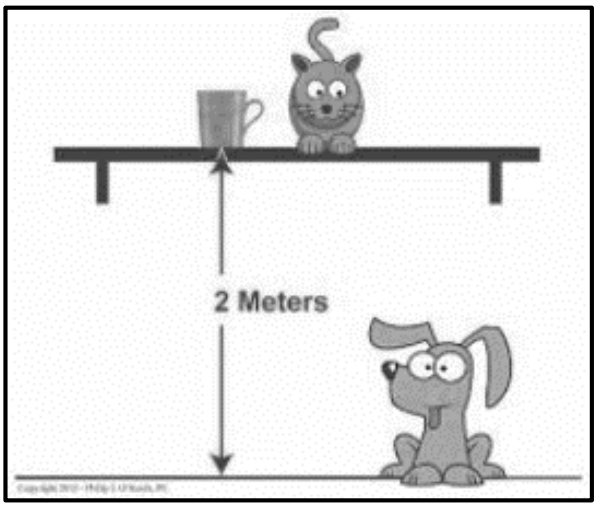
6.4.1 Define the term *mechanical advantage* in words. (2)

6.4.2 Explain why mechanical advantage have no unit. (2)

6.4.3 Calculate the mechanical advantage on the wheelbarrow. (3)
[22]

QUESTION 7 (Start on a new page.)

7.1 The diagram below represents a cat that is walking on top of a shelf, he knocks a mug with a mass of 2 kg off the shelf, the shelf is 2 m above the ground.



7.1.1 Differentiate between *kinetic energy* and *gravitational potential energy*. (4)

7.1.2 Calculate the kinetic energy of the mug when it is still on the shelf. (3)

7.1.3 Determine the gravitational potential energy of mug at the maximum height. (3)

7.1.4 Discuss how the kinetic energy, gravitational potential energy and mechanical energy changes as the mug falls to the ground. (3)

7.1.5 If the velocity of the mug is DOUBLED, what will happen to the kinetic energy of the mug? Write only INCREASE, DECREASE or STAY THE SAME (1)

7.1.6 Justify your answer in QUESTION 7.1.5 (2)
[16]

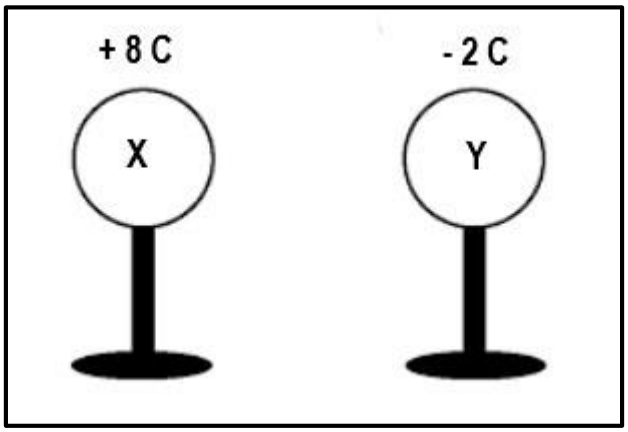
QUESTION 8 (Start on a new page.)

8.1 A plastic ruler is rubbed with a cloth, the ruler becomes positively charged.

8.1.1 Identify the charge on the cloth. (1)

8.1.2 Give the method of charging the ruler. (1)

8.2 Two identical charges spheres, sphere **X** and sphere **Y** are on insulated stands. The electric charge of sphere **X** is + 8 C and sphere **Y** is - 2 C, as indicated in the diagram below.



8.2.1 State the *Principle of conservation of charge* in words. (2)

8.2.2 Explain the difference between a *positive charged object* and a *negatively charges object*. (4)

8.2.3 The two charges are brought into contact with each other and then are separated. Calculate the new charge of each sphere. (3)
[11]

QUESTION 9 (Start on a new page.)

9.1 An electric circuit consist of the following components:

- 9 V-battery in series
- Ammeter
- Two resistors in parallel, R_1 = 2 Ω and R_2 = 4 Ω
- 1 Light bulb in series
- A closed switch
- A voltmeter across the light bulb

9.1.1 Draw an electric circuit diagram of the components above. (7)

9.1.2 Define the term *current* in words. (2)

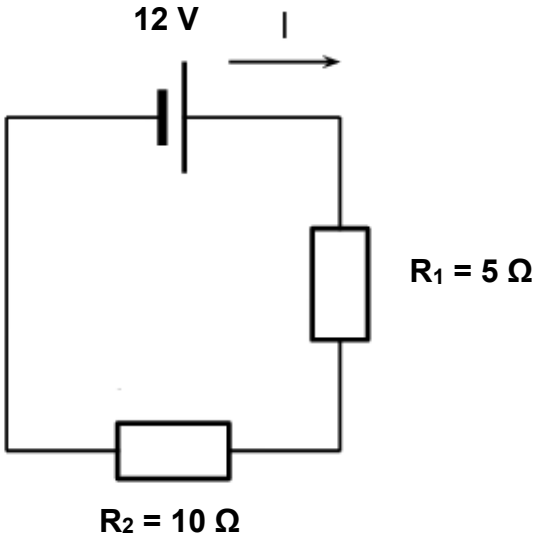
9.1.3 Calculate the current strength in the circuit, if 30 C of charge passes through a conductor in 15 seconds. (3)

9.1.4 State the term *potential difference* in words. (2)

9.1.5 Determine the potential difference if 40 C of charge flow through a resistor and 160 J of work is done. (3)
[17]

QUESTION 10 (Start on a new page.)

10.1 A 12-volt battery is connected to an electric circuit with two resistors in series, R_1 = 5 Ω and R_2 = 10 Ω, as indicated in the diagram below.



10.1.1 Define the term *resistance* in words. (2)

10.1.2 Identify if the circuit is a series or parallel connection. (1)

10.1.3 Calculate the total resistance of circuit. (3)

10.1.4 If resistors **R_1** is removed from the circuit and replaced by another 10 Ω resistor, what will happen to the total current of the circuit?

Write down INCREASE, DECREASE or STAY THE SAME. Explain the answer.

(3)

10.1.5 Give THREE factors that will influence the resistance of a conductor. (3)

[12]

TOTAL: 150

TABLE 1: PHYSICAL CONTENT

NAME	SYMBOL	VALUE
Acceleration due to gravity	g	9.8 $m.s^{-2}$
Change on electrons	e^-	$-1,6 \times 10^{-19}$ C

TABLE 2: FORMULAE

MOTION	ENERGY
Speed = distance / time OR $v_{ave} = \frac{D}{\Delta t}$ Velocity = displacement / time OR $v_{ave} = \frac{\Delta x}{\Delta t}$ Acceleration = change in velocity / time $a = \frac{vf - vi}{\Delta t}$	$E_p = mgh$ OR $U = mgh$ $E_k = \frac{1}{2} mv^2$ $M_E = E_p + E_k$
FORCE	**MOMENTS**
$F_g = mg$ $F_{res} = F_1 + F_2$	$\tau = F \times r\perp$ $\sum \tau_{cw} = \sum \tau_{aw}$
SIMPLE MACHINE	**ELECTROSTATICS**
Mechanical advantage = $\frac{Load}{Effort}$ or MA = $\frac{L}{E}$ OR Mechanical advantage = $\frac{effort\ arm}{load\ arm}$ or MA = $\frac{e}{\ell}$	$Q_{new} = \frac{Q1+Q2}{2}$

ELECTRICAL CIRCUITS

$R = \frac{V}{I}$	$I = \frac{Q}{\Delta t}$
$R_s = R_1 + R_2 + \ldots$	$\frac{1}{Rp} = \frac{1}{R1} + \frac{1}{R2} + \ldots.$
$V_T = V_1 + V_2 + V_3$	$I_T = I_1 + I_2 + I_3$
$V = \frac{W}{Q}$	$R_p = \frac{R_1 X R_2}{R_{1+} R_2}$