education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

PROVINCIAL ASSESSMENT

GRADE 11

TECHNICAL SCIENCES P1

NOVEMBER 2024

MARKS: 150

TIME: 3 hours

This question paper consists of 16 pages and 2 data sheets.

INSTRUCTIONS AND INFORMATION

1. This question paper consists of NINE questions. Answer ALL 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 subquestions, 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 SHEETS.

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

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

10. Write neatly and legibly.

QUESTION 1: MULTIPLE-CHOICE

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 numbers (1.1 to 1.10) in the ANSWER BOOK, e.g. 1.11 D.

1.1 In the Cartesian coordinates system, the horizontal axis presents the …

A y values.

B x values.

C vertical values.

D origin. (2)

1.2 Newton (N) is equivalent to …

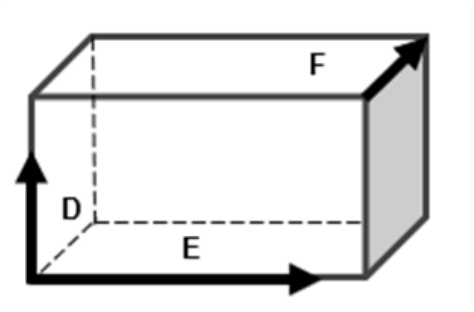
A $kg.m.s^{-2}$

B kg.m.s

C $kg.m.s^{-1}$

D $kg.m.s^{2}$ (2)

1.3 Which vectors are coplanar in the diagram below?



A D and F

B D, E and F

C E and F

D D and E (2)

1.4 Equilibrant is known to be …

A unequal and act in the opposite direction to the resultant.

B equal and act in the opposite direction to the resultant.

C equal and act in same direction as the resultant.

D unequal and act in the same direction as the resultant. (2)

1.5 … is the ratio of the frictional force to normal force.

A Kinetic friction

B Force of friction

C Angle of friction

D Coefficient of friction (2)

1.6 Which ONE of the following is NOT an example of a non-magnetic material?

A Copper

B Gold

C Cobalt

D Silver (2)

1.7 According to the formula $v = f\lambda$, which ONE of the following best describes the relationship between frequency and wavelength?

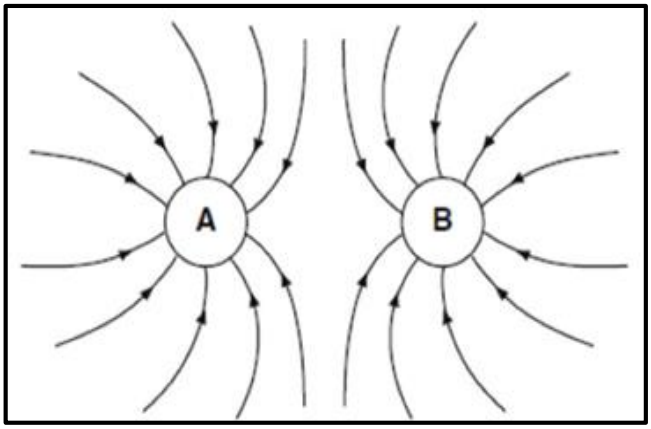
A $\lambda \propto f$

B $v \propto \frac{1}{f}$

C $f \propto \frac{1}{\lambda}$

D $v \propto \frac{1}{\lambda}$ (2)

1.8 Electric field pattern of charged sphere **A** and **B** are given in the diagram below.



Which ONE of the statements is CORRECT about the charges of spheres of **A** and **B**?

A Sphere **A** is negatively charged and sphere **B** is positively charged.

B Both sphere **A** and **B** are negatively charged.

C Sphere **A** is positively charged and sphere **B** is negatively charged.

D Both sphere **A** and **B** are positively charged. (2)

1.9 Which ONE of the statement below is CORRECT for resistors connected in a series circuit?

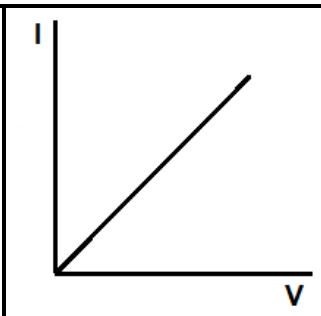
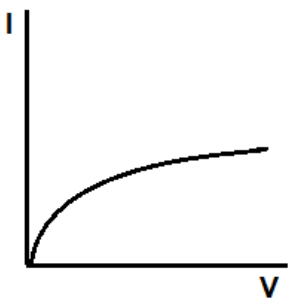
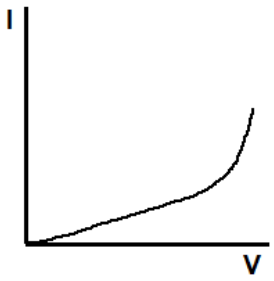
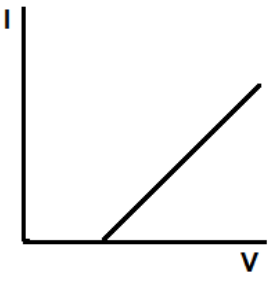
A The potential difference across the resistors is divided and the current in all the resistors is the same.

B The potential difference across the resistors is the same and the current in all the resistors is divided.

C The potential difference across the resistors is divided and the current in all the resistors is divided.

D The potential difference across the resistors is the same and the current in all the resistors is the same. (2)

1.10 Which ONE of the following slopes is NOT correct for a non-Ohmic conductor?

A		B	
C		D	

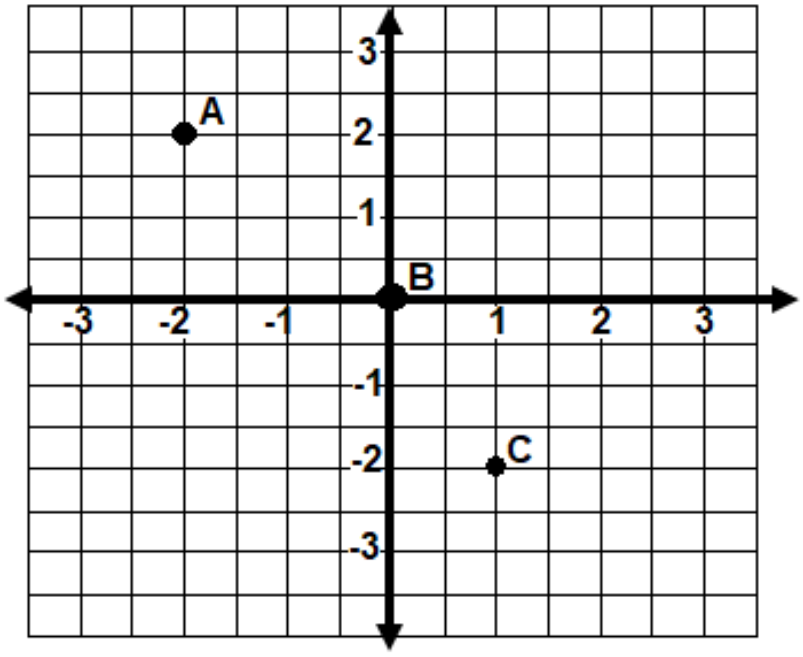
(2)
[20]

QUESTION 2

2.1 Draw a vector of 25 N at a bearing of 235°.

Use a scale of**: 5N = 10 mm** (3)

2.2 Study the graph below with the x-axis and y-axis showing three points **A, B** and **C**.



2.2.1 What is the NAME of point **B**? (1)

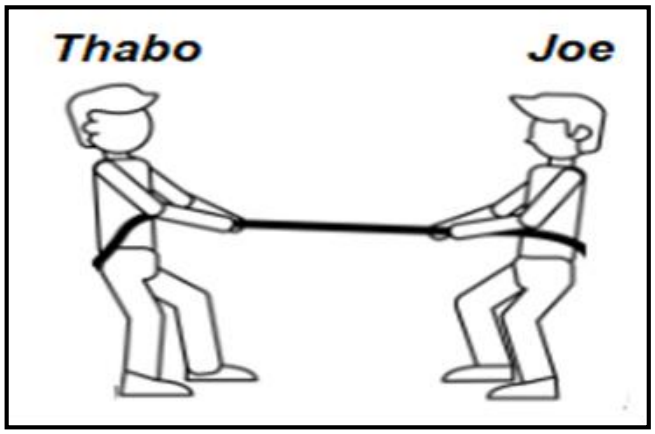
Write down the coordinates of:

2.2.2 **A** (2)

2.2.3 **C** (2)
[8]

QUESTION 3

3.1 Two learners Thabo and Joe are pulling against each other using a rope. Thabo pulls with a force of 80 N to the left and Joe with a force of 50 N to the right.

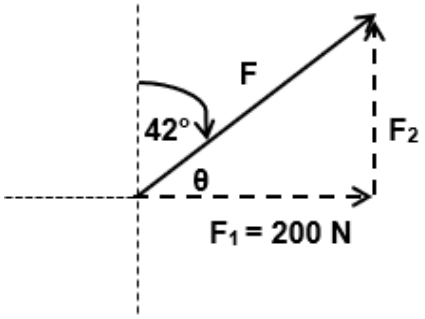


3.1.1 What is the NAME of the force acting on the rope? (1)

3.1.2 To which side will the two learners move? Write only LEFT or RIGHT. (1)

3.1.3 Support your answer in QUESTION 3.1.2, by means of calculations. (4)

3.2 Force **F** is exerted on an object at a bearing of 42°, as shown in the diagram below. The magnitude of the horizontal component $\mathbf{F_1}$ is 200 N, and vertical component $\mathbf{F_2}$ is unknown.



3.2.1 Define the term *resultant vector* in words. (2)

Calculate the:

3.2.2 value of **θ** (2)

3.2.3 magnitude of **F** (4)

3.2.4 vertical component $\mathbf{F_2}$ (3)
[17]

QUESTION 4

A truck filled with sand is at REST, weighing 60 800 N at the construction site after it broke down, because of mechanical failure.

4.1 Define the term *weight*. (2)

4.2 Name ONE contact force acting on the truck at rest. (1)

4.3 What is the magnitude of the frictional force when the truck is at rest? (1)

4.4 Calculate the mass of the truck if the sand has 800 kg of mass. (6)

A mechanic fixed the truck and the sand was off loaded. The driver applies a force of 1 738 N to move the truck to the LEFT.

4.5 Draw a labelled force diagram indicating ALL the forces acting on the truck. (4)

4.6 Calculate the normal force acting on the truck. (3)

4.7 If the resultant force acting on the truck is 2 638 N to the left, determine the kinetic frictional force acting on the wheels of the truck. (4)

4.8 Calculate the coefficient of kinetic friction. (3)

4.9 Name TWO ways in which frictional force can be reduced. (2)
[26]

QUESTION 5

Grade 11 learners were given a permanent bar magnet with two opposite poles as shown below.

5.1 Define the term *magnetic field*. (2)

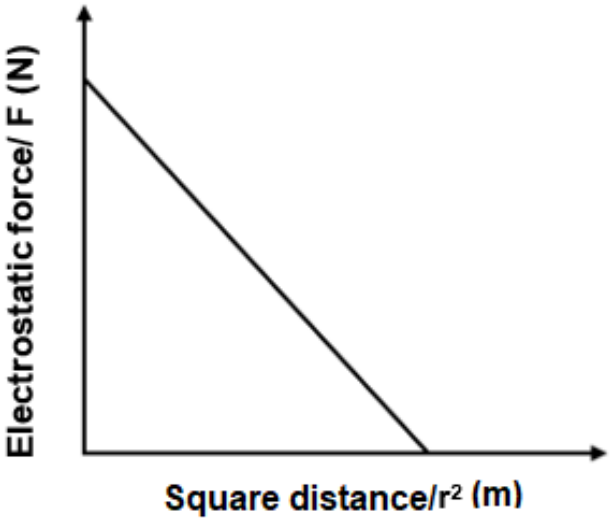
5.2 Redraw the bar magnet in your answer book and draw the magnetic field lines around the bar magnet. (2)

5.3 List THREE properties of magnetic field lines. (3)
[7]

QUESTION 6

Technical Sciences learners are investigating the relationship between electrostatic force and square of the distance between two charges to study Coulomb's law.

The graph below represents their results obtained from the investigation. Study the graph and answer the questions that follow.



6.1 State *Coulomb's law* in words. (2)

6.2 Give a suitable title for the graph above. (2)

6.3 Write down the investigative question for this investigation. (2)

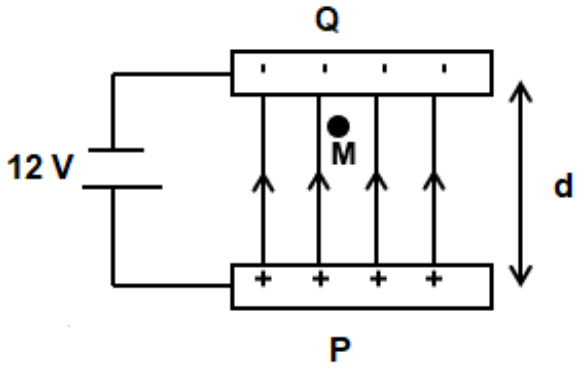
6.4 What conclusion can be made from this experiment? (2)

6.5 Give the:

6.5.1 dependent variable (1)

6.5.2 independent variable (1)

6.6 The potential difference of 12 V and a uniform electric field strength between parallel plates **P** and **Q** is 60 V. m^{-1}, in a vacuum. The distance **d** between the plates is unknown. Particle **M** is placed between the plates and experience the same electric strength.



6.6.1 Define the term *electric field*. (2)

6.6.2 Determine the distance **d** between the two plates. (4)

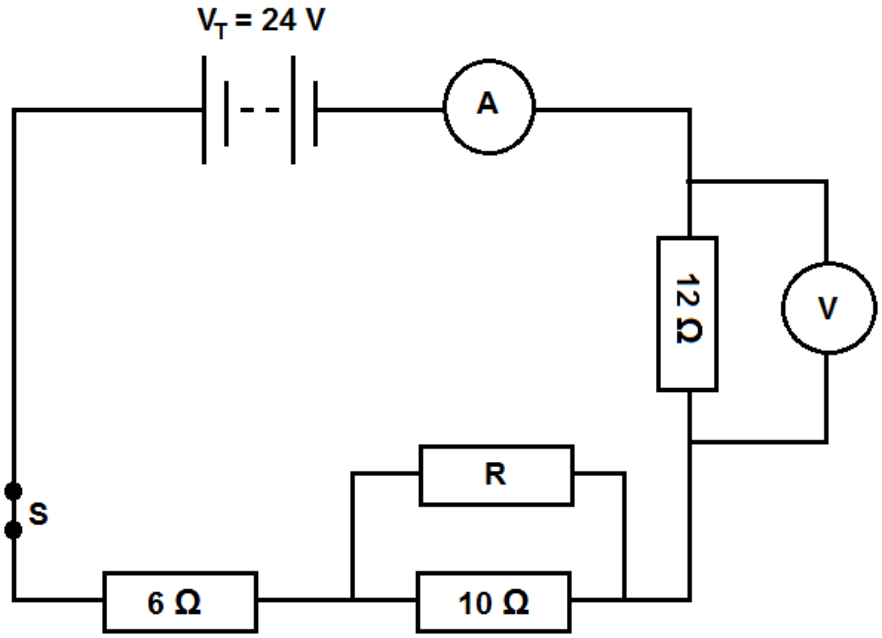
6.6.3 Calculate the magnitude of the electrical force experienced by particle **M**, if it has a charge of 12 µC. (3)

6.6.4 Determine, by means of calculations, the value of electrical force if the charge of particle **M** is halved. (2)
[21]

QUESTION 7

7.1 State *Ohm's law* in words. (2)

7.2 The resistor **R** is unknown, in the circuit shown below. The potential difference of the battery is 24 V. Ignore the resistance of connecting wires and the ammeter.



If switch **S** is closed, ammeter **A** has a reading of 0,9 A.

Determine the:

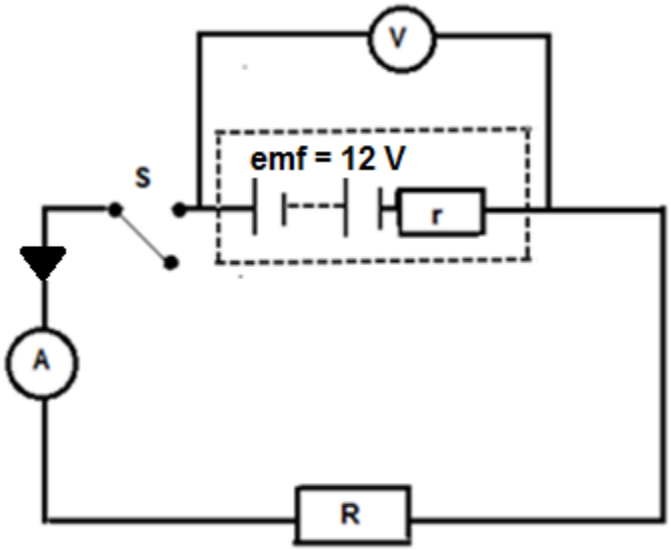
7.2.1 total resistance of the circuit (4)

7.2.2 resistance of **R** (7)

7.2.3 current passing through the 12 Ω resistor (2)

7.2.4 potential difference of **V** (2)

7.3 Learners study the difference between emf and potential difference. The battery has internal resistance **r** and an emf of **12 V**, as shown in the figure below.



7.3.1 Define the term *internal resistance*. (2)

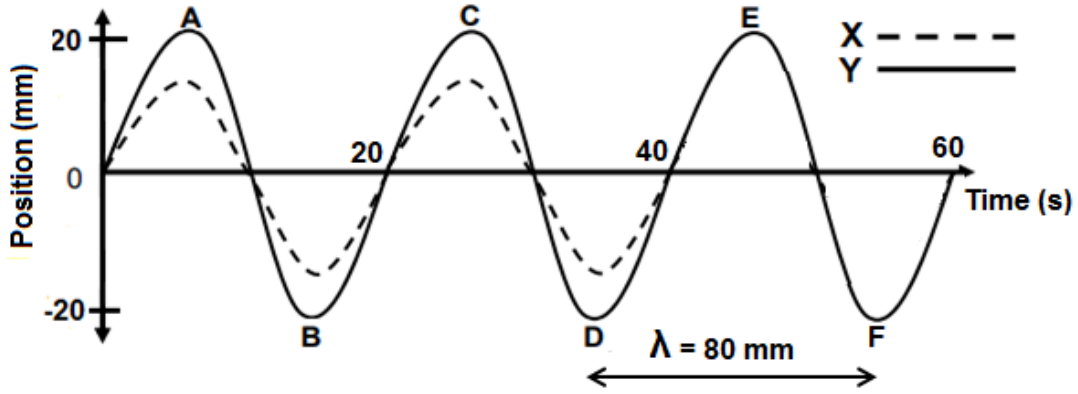
Learners observed that when switch **S** is closed, the value at the voltmeter changes to 11,88 V.

7.3.2 Give the NAME to the value of 11,88 V. (1)

7.3.3 What conclusion can be made from this observation? (2)
[22]

QUESTION 8

Two different transverse waves **X** and **Y** are given in the diagram below. Each wave has a wavelength of 80 mm.



8.1 Define the following terms:

8.1.1 *Wave* (2)

8.1.2 *Wavelength* (2)

8.1.3 *Transverse wave* (2)

8.2 Write down the letter(s) that represents the following in wave **Y**:

8.2.1 Crest (1)

8.2.2 Trough (1)

8.2.3 Two points in phase (2)

8.3 Determine the:

8.3.1 number of wave length in wave **X** (2)

8.3.2 value of the amplitude of wave **Y** in meters (2)

8.4 Calculate the:

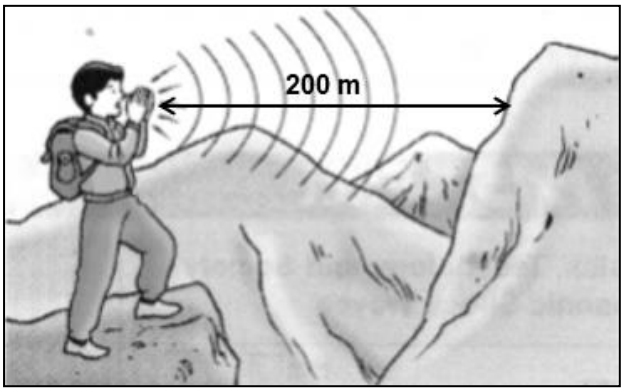
8.4.1 speed of wave **Y**.
Write your final answer in scientific notation. (4)

8.4.2 frequency of wave **Y** (3)

[21]

QUESTION 9

9.1 A learner is standing 200 m away from a mountain. He shouts and simultaneously start a stopwatch to determine how long until he will hear the sound of the echo. Assume that the speed of sound in air is 343 $m.s^{-1}$. Ignore the effect of wind.



9.1.1 What type of waves are soundwaves?
Write only LONGITUDINAL or TRANSVERSE. (1)

9.1.2 Calculate how long did it take for the learner to hear the echo. (5)

9.2 Write down TWO uses of infrasound. (2)
[8]

TOTAL: 150

DATA FOR TECHNICAL SCIENCES GRADE 11

PAPER 1 (PHYSICS)

GEGEWENS VIR TEGNIESE WETENSKAPPE GRAAD 11

VRAESTEL 1 (FISIKA)

TABLE 1: PHYSICAL CONSTANTS/ TABEL 1: FISIESE KONSTANTES

NAME/NAAM	SYMBOL/SIMBOOL	VALUE/WAARDE
Acceleration due to gravity Swaartekragversnelling	g	9,8 $m \cdot s^{-2}$
Charge on electron Lading op elektron	-e	$-1,6 \times 10^{-19} C$
Coulomb's constant *Coulomb se konstante*	k	$9,0 \times 10^{9} N \cdot m^{2} \cdot C^{-2}$

TABLE 2: FORMULAE/TABEL 2: FORMULES

MOTION/*BEWEGING*	VECTORS *VEKTORE*	FORCES/*KRAGTE*
speed = $\frac{distance}{time}$	$\vec{F}_R = \vec{F}_1 + \vec{F}_2$	$F_{net} = ma$
$\vec{V} = \frac{\Delta \vec{x}}{\Delta t}$	$\vec{F}_R^{\,2} = \vec{F}_1^{\,2} + \vec{F}_2^{\,2}$	$\vec{F}_s = \mu_s N$
$\vec{a} = \frac{\Delta \vec{v}}{\Delta t}$	$\vec{f}_x = \vec{F}\cos\theta$	$\vec{F}_s^{\,max} = \mu_s N$
	$\vec{f}_y = \vec{F}\sin\theta$	$\vec{F}_k = \mu_k N$
ENERGY/*ENERGIE*		
$E_p = mgh$	$E_K = \frac{1}{2} m V^2$	

ELECTRICITY AND ELECTROSTATICS/*ELEKTRIESE EN ELEKTROSTATIKA*			
$I = \frac{Q}{\Delta t}$	$V = \frac{W}{\Delta t}$	$F = \frac{kQ_1 \cdot Q_2}{r^2}$	$I = \frac{V}{R}$
$E = \frac{V}{d}$	$C = \frac{Q}{V}$	$Q = \frac{Q1 + Q2}{2}$	$E = \frac{F}{Q}$

PARALLEL CIRCUIT / *PARALLEL STROOMBANE*	**SERIES CIRCUIT / *SERIE STROOMBANE***
$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots$	$R_T = R_1 + R_2 + R_3 + \ldots$
$Rp = \frac{R_1 \cdot R_2}{R_1 + R_2}$	$V_T = R_1 + R_2 + R_3 + \ldots$
$V_T = V_1 = V_2 = V_3 = \ldots$	$I_T = I_1 = I_2 = I_3 = \ldots$
$I_T = I_1 + I_2 + I_3 + \ldots$	

WAVES, SOUND AND LIGHT/*GOLWE, KLANK EN LIG*	
$f = \frac{1}{T}$	$V = \frac{\lambda}{T}$
$T = \frac{1}{f}$	$V = f\lambda$
	$V = \frac{\Delta \vec{x}}{\Delta t}$