



# education

Department of  
Education  
FREE STATE PROVINCE

**CONTROL TEST**

**GRADE 10**

**TECHNICAL SCIENCES**

**MARCH 2019**

**MARKS: 100**

**TIME: 2 HOURS**

**This paper consists of 10 pages and one data sheet.**

## **INSTRUCTIONS AND INFORMATION**

1. Write your name and other information in the appropriate spaces on the ANSWER BOOK.
2. This question paper consists of SIX 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 pocket 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 where applicable.
11. Give brief motivations, discussions, et cetera where required.
12. Write neatly and legibly.

## QUESTION 1: MULTIPLE-CHOICE QUESTIONS

Four options are provided as possible answers to the following questions. Each question has only ONE correct answer. Choose the answer and write down only the letter A, B, C or D next to the question number (1.1–1.10) in the ANSWER BOOK.

1.1 Which one of the following is NOT a unit for temperature?

- A K
- B °C
- C °F
- D °K (2)

1.2 Which one of the following combinations are the correct corresponding values in SI units and CGS units respectively?

|   | SI unit                     | CGS unit                 |
|---|-----------------------------|--------------------------|
| A | 10 cm; 5 kg; 2 hours        | 0,1 m; 5 000 g; 7 200 s  |
| B | 0,1 m; 5 kg; 7 200 s        | 10 cm; 5 000 g; 7 200 s  |
| C | 10 cm; 5 000 g; 120 minutes | 0,1 m; 5 kg; 2 hours     |
| D | 0,1 m; 5 kg; 7 200 s        | 10 cm; 5 kg; 120 minutes |

(2)

1.3 Which physical quantity is represented by the symbol  $R$  in the formula  $R = \frac{V}{I}$ ?

- A Rate
- B Resistor
- C Resistance
- D Potential difference (2)

1.4 What is the basic SI unit of electric current?

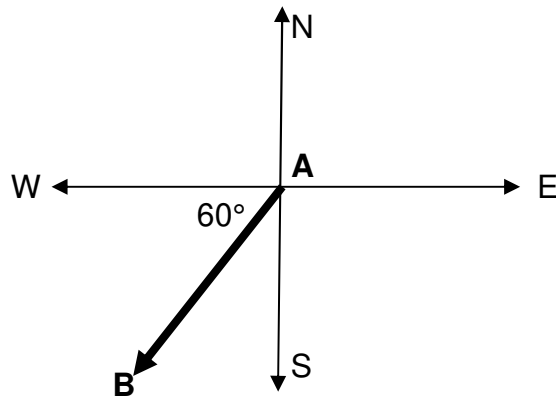
- A N
- B A
- C kg
- D m<sup>3</sup> (2)

1.5 Which one of the following physical quantities can be classified as a scalar?

- A Speed
- B Velocity
- C Acceleration
- D Displacement

(2)

1.6 Study the diagram below.



What is the direction of vector **AB** in terms of its BEARING?

- A 240°
- B 210°
- C 120°
- D 060°

(2)

1.7 What is the resultant of 20 mm north and 12 mm south?

- A 32 mm north
- B 20 mm north
- C 32 mm south
- D 8 mm north

(2)

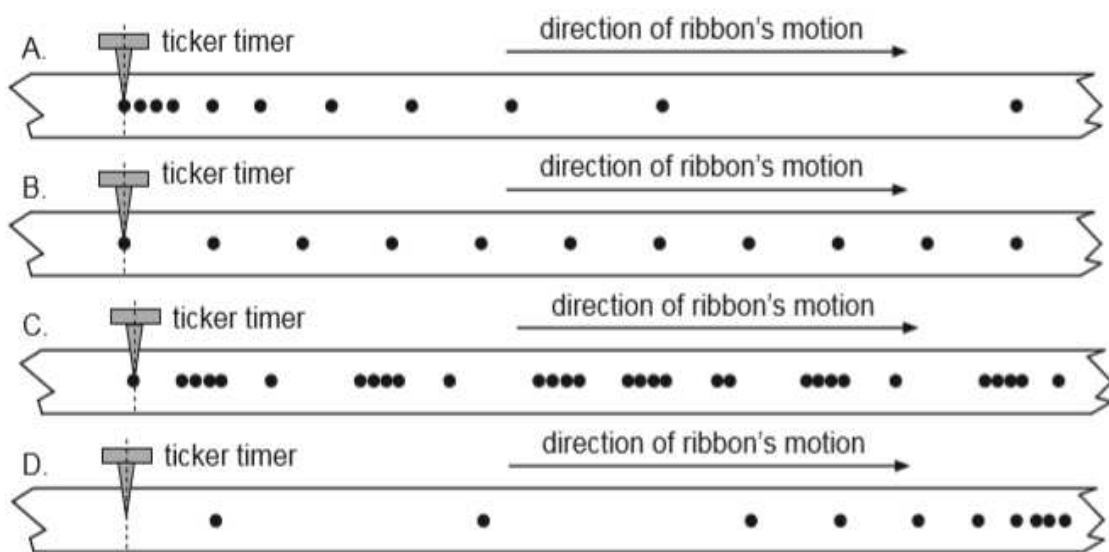
1.8 Velocity can be calculated as the change in ...

- A speed divided by the change in time.
- B distance divided by the change in time.
- C acceleration divided by the change in time.
- D displacement divided by the change in time. (2)

1.9 An object has an acceleration of  $3 \text{ m} \cdot \text{s}^{-2}$ . What does it mean?

- A The velocity increases with  $3 \text{ m} \cdot \text{s}^{-2}$  every second.
- B The velocity increases with  $3 \text{ m} \cdot \text{s}^{-1}$  every second.
- C The acceleration increases with  $3 \text{ m} \cdot \text{s}^{-2}$  every second.
- D The acceleration increases with  $3 \text{ m} \cdot \text{s}^{-1}$  every second. (2)

1.10 Which one of the following ticker-timer ribbons represents motion at INCREASING speed?



(2)  
[20]

**QUESTION 2 (Start on a new page.)**

- 2.1 Consider the information in the block below and choose your answers to question 2.1.1 to 2.1.4 from it.

|   |    |   |    |   |   |   |
|---|----|---|----|---|---|---|
| m | kg | A | cd | K | $\text{kg}\cdot\text{m}^{-1}\cdot\text{s}^{-2}$ | V |
|---|----|---|----|---|---|---|

What UNIT would you use to answer the following questions?

- 2.1.1 What is the temperature of a given solution? (1)
- 2.1.2 What is the mass of your teacher's table? (1)
- 2.1.3 What is the intensity of the light? (1)
- 2.1.4 What is the potential difference Eskom supplies to your house? (1)
- 2.2 A dam contains a volume of 1 000 000 ℓ of water.
- 2.2.1 Complete the missing information:  
1 000 000 ℓ is the same volume as 1 ...ℓ. (1)
- 2.2.2 What number should be in the block?  $1\,000\,000 = 1 \times 10^{\square}$  (1)
- 2.3 Convert 0,003 km to cm. (2)
- 2.4 Convert  $155 \text{ m}\cdot\text{s}^{-1}$  to  $\text{km}\cdot\text{h}^{-1}$  and give the answer in SCIENTIFIC NOTATION. (4)
- 2.5 Consider the following three numbers:
- $2,9 \times 10^4$
  - $0,5 \times 10^5$
  - $2,6 \times 10^4$
- 2.5.1 Which one is the smallest number? (1)
- 2.5.2 Which one is the largest number? (1)

**[14]**

**QUESTION 3 (Start on a new page.)**

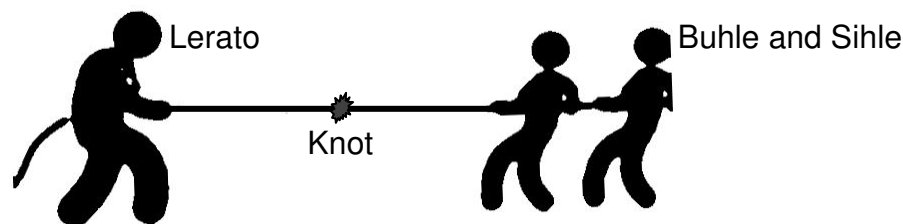
- 3.1 A rugby player is displaced FORWARD when two players from his team are pushing him forward. AFTER THAT, two players from the opposing team are pushing him BACKWARDS (in the opposite direction). When the players of his team push him, he is displaced a distance of 20 m due to the first player and then 30 m due to the second one. When the players from the opposing team push him, he experiences a displacement of 25 m.

3.1.1 Explain the difference between a *vector* and a *scalar*. (2)

3.1.2 Define the term *resultant vector* in words (2)

3.1.3 Determine the resultant displacement of the rugby player by means of an accurate construction. Use a scale where 2 cm represents 10 m. (5)

- 3.2 Lerato, Buhle and Sihle are participating in a tug-of-war competition. They tie a knot in the middle of the rope and the judges measure the movement of the knot.



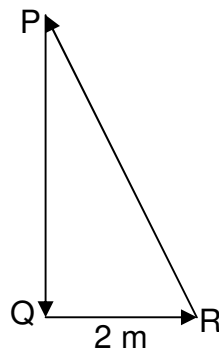
During the competition, the knot first undergoes a displacement  $x_1$  of 25 cm in the direction of Lerato. Buhle and Sihle then pulls harder and the knot undergoes a displacement  $x_2$  of 20 cm in their direction before it stops.

3.2.1 Calculate the resultant displacement of the knot. Start your calculation with an applicable formula. (4)

3.2.2 When the knot stops, Buhle and Sihle pulls with a total force of 1 200 N to the right. What is the magnitude and direction of the force exerted by Lerato at that stage? (2)  
**[15]**

**QUESTION 4 (Start on a new page.)**

Bongani walks from **P** to **Q** to **R** and back to **P**. His complete journey forms a right-angled triangle whose area is  $4 \text{ m}^2$ . The distance between **Q** and **R** is 2 m.



4.1 Define the term *distance* in words. (2)

4.2 Calculate the distance from:

4.2.1 **P** to **Q** (3)

4.2.2 **R** to **P** (3)

4.2.3 **P** via **Q** and **R** back to **P** (1)

4.3 What is Bongani's DISPLACEMENT with respect to **P** when he is at **R**? (2)

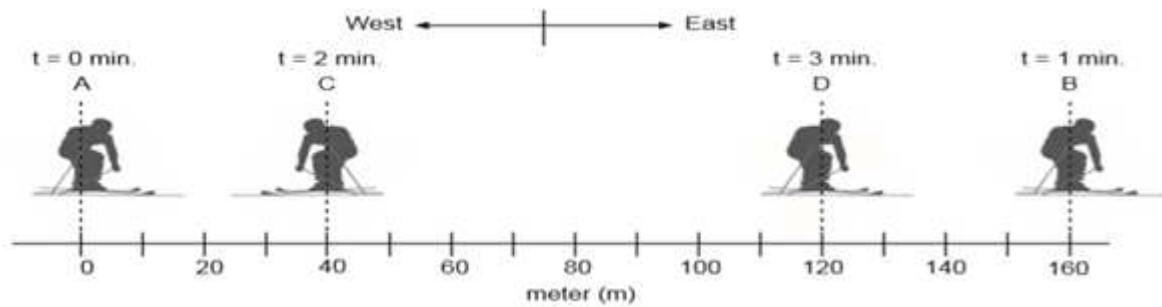
4.4 During Bongani's walk the temperature was  $32^\circ\text{C}$ . Convert this temperature to  $^\circ\text{F}$ . (3)

**[14]**



**QUESTION 5 (Start on a new page.)**

A skier moves from position **A** to **B** to **C** and to **D** in three minutes.



5.1 Define the following terms in words:

5.1.1 Position (2)

5.1.2 Displacement (2)

5.1.3 Speed (2)

5.2 Consider the movement of the skier for the ENTIRE three minutes.  
Calculate the:

5.2.1 Total distance travelled (3)

5.2.2 Displacement (2)

5.2.3 Magnitude of the average velocity in  $\text{m} \cdot \text{s}^{-1}$  (4)

**[15]**

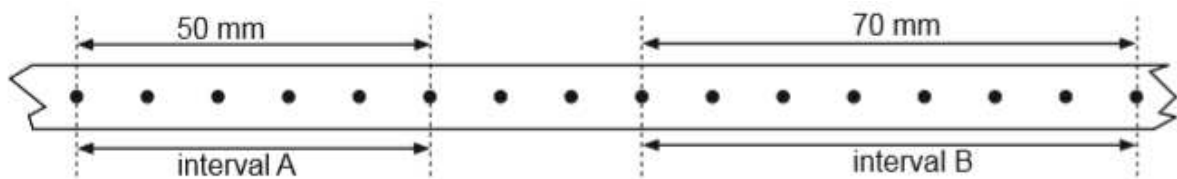
**QUESTION 6 (Start on a new page.)**

- 6.1 A car travelling at a velocity of  $13 \text{ m}\cdot\text{s}^{-1}$  accelerates uniformly to a velocity of  $25 \text{ m}\cdot\text{s}^{-1}$  in 5 s.

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

6.1.2 Calculate the magnitude of the acceleration of the car during this 5 s time interval. (4)

- 6.2 A ticker-timer makes a mark every 0,02 seconds on a ticker-tape. The length of interval **A** is 50 mm and that of interval **B** is 70 mm.



6.2.1 Calculate the time, in seconds, for interval **A**. (2)

6.2.2 Calculate the magnitude of the average velocity, in  $\text{m}\cdot\text{s}^{-1}$ , during interval **A**. (4)

6.2.3 Calculate the magnitude of the average velocity, in  $\text{m}\cdot\text{s}^{-1}$ , during interval **B**. (3)

6.2.4 What conclusion can you draw about the VELOCITY and ACCELERATION represented by this ticker-tape? (2)

- 6.3 A car travels at an average speed of  $6 \text{ m}\cdot\text{s}^{-1}$  due north for 8 s and then it travels 36 m due south for 12 s. Calculate:

6.3.1 The distance covered by the car in the first 8 s. (2)

6.3.2 The resultant displacement of the car. (3)

**[22]**

**GRAND TOTAL: 100**

**DATA FOR TECHNICAL SCIENCES GRADE 10**  
**GEGEWENS VIR TEGNIESE WETENSKAPPE GRAAD 10**

**TABLE 1: FORMULAE / TABEL 1: FORMULES**

|  |   |
|--|---|
| $T_{\circ C} = \frac{5}{9} (T_{\circ F} - 32)$                 | $T_{\circ F} = \frac{9T_{\circ C}}{5} + 32$                       |
| Area of a triangle = $\frac{1}{2}bh$                           | Oppervlakte van 'n driehoek = $\frac{1}{2}bh$                     |
| For a right-angled triangle:                                   | Vir 'n reghoekige driehoek:                                       |
| Length of the hypotenuse = $\sqrt{a^2 + b^2}$                  | Lengte van die skuinssy = $\sqrt{a^2 + b^2}$                      |
| speed = $\frac{\text{distance}}{\text{time}}$                  | spoed = $\frac{\text{afstand}}{\text{tyd}}$                       |
| velocity = $\frac{\text{displacement}}{\text{time}}$           | snelheid = $\frac{\text{verplasing}}{\text{tyd}}$                 |
| acceleration = $\frac{\text{change in velocity}}{\text{time}}$ | versnelling = $\frac{\text{verandering in snelheid}}{\text{tyd}}$ |