



education

Department of
Education
FREE STATE PROVINCE

CONTROL TEST

GRADE 10

TECHNICAL SCIENCES

MARCH 2018

MARKS: 100

TIME: 2 HOURS

This paper consists of 10 pages and two data sheets.

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 SHEETS.
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.

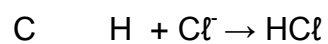
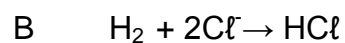
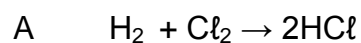
QUESTION 1: MULTIPLE-CHOICE QUESTIONS

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

- 1.1 If the resultant of two forces acting at a point is zero, the forces have ...
- A different magnitudes and act in the same direction.
 - B different magnitudes and act in opposite directions.
 - C equal magnitudes and act in the same direction.
 - D equal magnitudes and act in opposite directions. (2)
- 1.2 Two forces of magnitudes 3 N and 4 N act on a body. The maximum magnitude of the resultant of these forces is ...
- A 12 N.
 - B 7 N.
 - C 5 N.
 - D 1 N. (2)
- 1.3 What is the basic SI-unit of mass?
- A N
 - B g
 - C kg
 - D m^3 (2)
- 1.4 Which one of the following represents a scalar quantity?
- A 12 km covered in 2 hours.
 - B 1 m; south
 - C 2 m.s^{-1} ; 45° with the horizontal
 - D 100 km.h^{-1} ; 0° (2)

- 1.5 The strength of a material refers to how ...
- A well a material conducts heat.
 - B closely packed the particles are in the material.
 - C easily a material can float on another material without sinking.
 - D much force a material can withstand before it changes shape. (2)
- 1.6 Non-metals can be distinguished from metals because they ...
- A have high melting points.
 - B are dull and do not have a shiny appearance.
 - C are ductile and can be stretched into thin wires.
 - D can conduct electricity and are used in electrical wires. (2)
- 1.7 Which ions do you find in hydrogen sulphite?
- A H^+ and SO_3^{2-}
 - B H^+ and SO_4^{2-}
 - C H_2 and SO_4^{2-}
 - D H_2 and SO_3^{2-} (2)
- 1.8 Which one of the following is NOT an example of a metalloid?
- A Germanium
 - B Antimony
 - C Carbon
 - D Boron (2)

1.9 Which one of the reactions below is balanced?



1.10 Which one of the following is the name of KOH?

A Potassium oxygen hydrogen

B Calcium oxygen hydrogen

C Potassium hydroxide

D Calcium hydroxide (2)
[20]

QUESTION 2

2.1 Consider the following list of units:

mm	V	A	g	$\text{m}\cdot\text{s}^{-1}$
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Which unit from the list would be suitable to measure the following?

- 2.1.1 Electrical current (1)
- 2.1.2 Distance between two poles in a devil fork fence (1)
- 2.2 Convert 11,5 kilometre (km) to metre (m). (2)
- 2.3 The volume of a swimming pool is $2\,500\,000\text{ m}^3$. Write down this number in scientific notation. (1)
- 2.4 The average diameter of glass particles used in sandpaper is $1,26 \times 10^{-5}\text{ m}$. Write down this number as an ordinary number. (1)
- [6]**

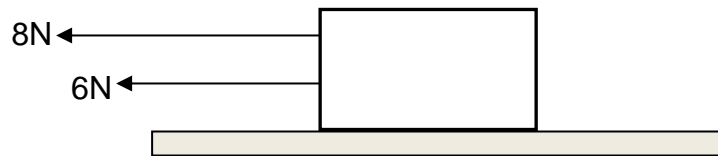
QUESTION 3

- 3.1 Ibrahim pulls a crate with a horizontal force of 20 N to the RIGHT. Rafat sees that his friend is struggling and helps him by pulling with a horizontal force of 50 N to the RIGHT.
- 3.1.1 Define the term *resultant vector*. (2)
- 3.1.2 Calculate the magnitude of the resultant force on the crate. (2)
- 3.2 Two forces simultaneously act in OPPOSITE directions on an object as shown below.



Use a scale of 10 mm to represent 1N and determine the resultant of the two forces graphically (by means of a construction). (4)

- 3.3 The two forces now act simultaneously in the SAME direction as shown below.



Use a scale of 10 mm to represent 1 N and determine the resultant of the two forces graphically (by means of a construction).

(4)
[12]

QUESTION 4

- 4.1 Study the table below and answer questions 4.1.1 to 4.1.4.

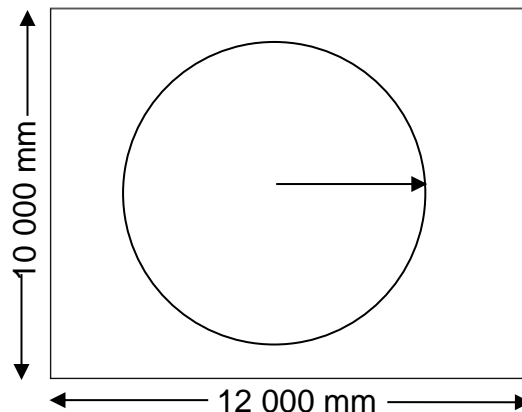
Formula in words	Formula in symbols	Units
Work = force x displacement	$W = F \times \Delta x$	Work (W) in joule (J) Force (F) in newton (N) Displacement (Δx) in metre (m)
Average power = $\frac{\text{work}}{\text{time}}$	$P = \frac{W}{t}$	Power (P) in watt (W) Work (W) in joule (J) Time (t) in seconds (s)
Weight = mass x g, where g stands for gravitational acceleration	$w = m \times g$	Weight (w) in newton (N) Mass (m) in kilogram (kg) g in $\text{m} \cdot \text{s}^{-2}$

A hiker carries a rucksack of 8 kg. After 10 minutes, his vertical displacement is 50 m above his starting point. Calculate each of the following by using a suitable formula from the table above:

- 4.1.1 Weight of the rucksack (3)
- 4.1.2 Work done on the RUCKSACK only (3)
- 4.1.3 Total amount of work done on both the hiker and the rucksack if the mass of the hiker is 80 kg. (3)
- 4.1.4 The hiker's average power during the 10 minute walk. (4)

- 4.2 The diagram below shows the top view of a round swimming pool with a rectangular piece of paving around it. The following specifications are applicable:

- The radius of the swimming pool is 2 500 mm.
- 50 bricks per square metre are used for the paving.



Calculate the following and keep in mind that 1 000 mm is the same as 1 m.

- 4.2.1 Area of the swimming pool in m^2 . (3)
- 4.2.2 Area of the paving in m^2 . (4)
- 4.2.3 Minimum number of paving bricks required to pave the area around the swimming pool (2)

- 4.3 On a particular day, the water temperature in the swimming pool in the previous question is 24°C , but somebody wants to know how much it is in $^\circ\text{F}$. No thermometer is available, but the following formula is:

$$T_1 = \frac{9T_2}{5} + 32, \text{ where } T_1 \text{ is temperature in } ^\circ\text{F} \text{ and } T_2 \text{ is temperature in } ^\circ\text{C}.$$

- 4.3.1 Calculate the temperature in $^\circ\text{F}$. (3)

- 4.3.2 Without showing any calculation, how much is 0°C expressed as $^\circ\text{F}$? (1)

[26]

QUESTION 5

- 5.1 Consider the following formulae of anions and cations and use them to answer the questions that follow.

SO_4^{2-}	CO_3^{2-}	SO_3^{2-}	OH^-	Mg^{2+}	NH_4^+	Na^+
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- 5.1.1 Differentiate between a cation and an anion by referring to their charges. (2)
- 5.1.2 Write down a formula from this list that represents a cation. (1)
- 5.1.3 Write down the formula of the sulphate ion in this list. (1)
- 5.1.4 Write down the formula of the carbonate ion in this list. (1)
- 5.1.5 Write down the formula of sodium hydroxide. (2)
- 5.1.6 Write down the formula of magnesium carbonate. (2)
- 5.2 Write down the formula of copper(II) sulphate. (2)
- 5.3 Rewrite the following UNBALANCED equations in your answer book and balance them.
- 5.3.1 $\text{H}_2 + \text{O}_2 \rightarrow \text{H}_2\text{O}$ (2)
- 5.3.2 $\text{SO}_2 + \text{O}_2 \rightarrow \text{SO}_3$ (2)
- 5.3.3 $\text{Na}_2\text{CO}_3 + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O} + \text{CO}_2$ (2)
- 5.3.4 $\text{C}_2\text{H}_{10} + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$ (4)
- [21]**

QUESTION 6

The table below shows some physical properties of materials we use in our everyday lives.

Substance	Melting point (°C)	Boiling point (°C)	Density (g·cm ⁻³)	Electrical conductivity	Hardness
Ethene	-169	-104	0,61	Poor	-
Water	0	100	1,00	Poor	-
Aluminium	660	4 473	2,7	36,9	Hard
Copper	1 084	4 667	8,9	58,5	Hard
Iron	1 127	5 198	7,9	10,1	Hard

6.1 Which one of the substances:

6.1.1 Is a liquid at 25°C (2)

6.1.2 Is a gas at 25°C (2)

6.1.3 Needs the most energy to melt (2)

6.2 Aluminium is used to make body parts of aeroplanes. Explain by referring to the PROPERTIES LISTED in the table why aluminium is used for this purpose. (2)

6.3 Which one of the materials is the most suitable for use in electrical cables? Give a reason for your answer. (2)

6.4 Mercury is a metal in liquid phase at 25°C and it has a density of 13,69 g·cm⁻³. A cube of aluminium, with dimensions of 1 cm x 1 cm x 1 cm, is put into a bowl of mercury. Will the aluminium sink or float? Give a reason for your answer. (3)

6.5 Looking at the densities of iron and water, it does not seem as if an iron ship can float on water, but we know it does? Give a brief explanation why this is possible. (2)

[15]

GRAND TOTAL: 100

**DATA FOR TECHNICALSCIENCES GRADE 10
CONTROL TEST 1**

**GEGEWENS VIR TEGNIESE WETENSKAPPE GRAAD 10
KONTROLTOETS 1**

TABLE 1: FORMULAE / TABEL 1: FORMULES

Perimeter of a rectangle <i>Omtrek van 'n reghoek</i>	Perimeter = $2l + 2w$ <i>Omtrek = $2l + 2b$</i>
Area of a circle <i>Oppervlakte van 'n sirkel</i>	Area = πr^2 <i>Oppervlakte = πr^2</i>
Area of a rectangle <i>Oppervlakte van 'n reghoek</i>	Area = $l \times w$ <i>Oppervlakte = $l \times b$</i>
Volume of an object <i>Volume van 'n voorwerp</i>	Volume = area of base x height <i>Volume = oppervlakte van basis x hoogte</i>
Average speed of an object <i>Gemiddelde spoed van 'n voorwerp</i>	Average speed = $\frac{\text{Distance}}{\text{Time}}$ <i>Gemiddelde spoed = $\frac{\text{Afstand}}{\text{Tyd}}$</i>
Average velocity of an object <i>Gemiddelde snelheid van 'n voorwerp</i>	Average velocity = $\frac{\text{Displacement}}{\text{Time}}$ <i>Gemiddelde snelheid = $\frac{\text{Verplasing}}{\text{Tyd}}$</i>

TABLE 2: THE PERIODIC TABLE OF ELEMENTS
TABEL 2: DIE PERIODIEKE TABEL VAN ELEMENTE

1 (I)	2 (II)	3	4	5	6	7	8	9	10	11	12	13 (III)	14 (IV)	15 (V)	16 (VI)	17 (VII)	18 (VIII)
<p>KEY/SLEUTEL</p> <p>Atomic number <i>Atoomgetal</i></p> <p>Electronegativity <i>Elektronegatiwiteit</i></p> <p>Symbol <i>Simbool</i></p> <p>Approximate relative atomic mass <i>Benaderde relatiewe atoommassa</i></p>																	
2,1 1 H							29 1,9 Cu 63,5										2 He 4
1,0 3 Li 7	1,5 4 Be 9											2,0 5 B 11	2,5 6 C 12	3,0 7 N 14	3,5 8 O 16	4,0 9 F 19	10 Ne 20
0,9 11 Na 23	1,2 12 Mg 24											1,5 13 Al 27	1,8 14 Si 28	2,1 15 P 31	2,5 16 S 32	3,0 17 Cl 35,5	18 Ar 40
0,8 19 K 39	1,0 20 Ca 40	1,3 21 Sc 45	1,5 22 Ti 48	1,6 23 V 51	1,6 24 Cr 52	1,5 25 Mn 55	1,8 26 Fe 56	1,8 27 Co 59	1,8 28 Ni 59	1,9 29 Cu 63,5	1,6 30 Zn 65	1,6 31 Ga 70	1,8 32 Ge 73	2,0 33 As 75	2,4 34 Se 79	2,8 35 Br 80	36 Kr 84
0,8 37 Rb 86	1,0 38 Sr 88	1,2 39 Y 89	1,4 40 Zr 91		1,8 42 Mo 96	1,9 43 Tc	2,2 44 Ru 101	2,2 45 Rh 103	2,2 46 Pd 106	1,9 47 Ag 108	1,7 48 Cd 112	1,7 49 In 115	1,8 50 Sn 119	1,9 51 Sb 122	2,1 52 Te 128	2,5 53 I 127	54 Xe 131
0,7 55 Cs 133	0,9 56 Ba 137		1,6 72 Hf 179	73 Ta 181	74 W 184	75 Re 186	76 Os 190	77 Ir 192	78 Pt 195	79 Au 197	80 Hg 201	1,8 81 Tl 204	1,8 82 Pb 207	1,9 83 Bi 209	2,0 84 Po	2,5 85 At	86 Rn
0,7 87 Fr	0,9 88 Ra 226	89 Ac															
			58 Ce 140	59 Pr 141	60 Nd 144	61 Pm	62 Sm 150	63 Eu 152	64 Gd 157	65 Tb 159	66 Dy 163	67 Ho 165	68 Er 167	69 Tm 169	70 Yb 173	71 Lu 175	
			90 Th 232	91 Pa	92 U 238	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr	