



education

Department of
Education
FREE STATE PROVINCE

CONTROL TEST

GRADE 10

PHYSICAL SCIENCES

MARCH 2018

MARKS: 100

TIME: 2 HOURS

This paper consists of NINE 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 EIGHT 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.

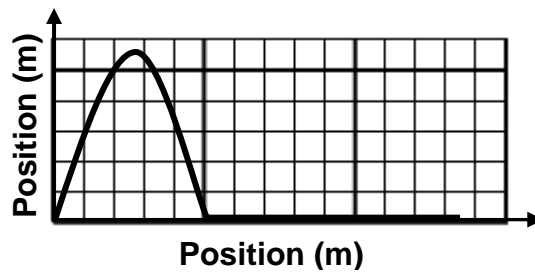
QUESTION 1: MULTIPLE-CHOICE QUESTIONS

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

- 1.1 Which one of the following DOES NOT define the properties of a material?
- A Mass
 - B Ductile
 - C Density
 - D Malleable (2)
- 1.2 The name of the compound represented by the chemical formula CuO is ...
- A copper oxide.
 - B copper dioxide.
 - C copper oxygen.
 - D copper trioxide. (2)
- 1.3 Which one of the following is an example of a metal?
- A Neon
 - B Carbon
 - C Oxygen
 - D Sodium (2)
- 1.4 Which one of the following is a good conductor of electricity?
- A Wood
 - B Plastic
 - C Silicon
 - D Copper (2)

- 1.5 Which one of these scientists discovered that electrons travelled in separate orbits around the nucleus?
- A Rutherford
 - B Chadwick
 - C Thomson
 - D Bohr (2)
- 1.6 Atoms of the same element with the same number of protons but a different number of neutrons are called ...
- A isotopes.
 - B cations.
 - C anions.
 - D ions. (2)
- 1.7 Waves in which the particles of the medium vibrate parallel to the direction in which the waves move are known as ... waves.
- A longitudinal
 - B transverse
 - C horizontal
 - D vertical (2)
- 1.8 A region of low pressure in a longitudinal wave is called a ...
- A concentration.
 - B rarefaction.
 - C compression.
 - D reflection. (2)

- 1.9 The graph below represents the motion of a pulse in a rope. Each small block represents 0,1 m in the horizontal as well as the vertical plane.



What is the magnitude of the amplitude, in metre, of the pulse?

- A 0,5
- B 0,55
- C 5
- D 5,5

(2)

- 1.10 Which one of the combinations below concerning the pitch and volume of sound waves is correct?

	Which factor determines the pitch?	Which factor determines the volume?
A	Amplitude	Frequency
B	Frequency	Speed
C	Frequency	Amplitude
D	Speed	Amplitude

(2)
[20]

QUESTION 2

- 2.1 Define the term *element*. (2)
- 2.2 Define the term *heterogeneous mixture*. (2)
- 2.3 Consider the materials in the table below. Each one is represented by a letter.

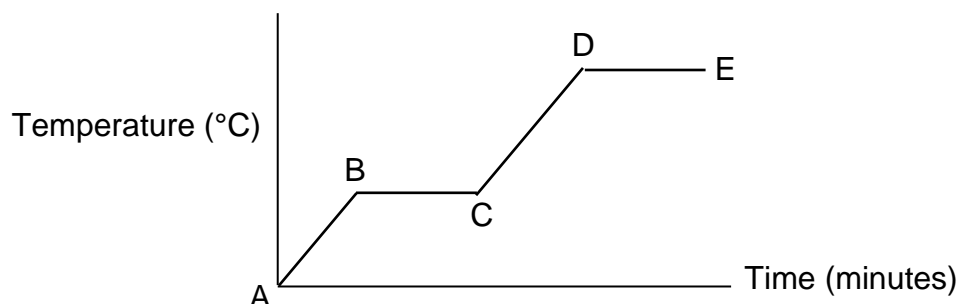
A	B	C	D	E	F
Glass	Brass	Copper	Plastic	Rubber	Steel wool (largely consisting of iron)

Write down ONLY the LETTER(S) (A, B, C, etc.) that represent(s) the following:

- 2.3.1 TWO non-magnetic metals (2)
- 2.3.2 An element (1)
- 2.3.3 One magnetic material (1)
- 2.3.4 One brittle material (1)
- 2.3.5 One ductile material (1)
- [10]**

QUESTION 3

- 3.1 Write down the THREE states of matter and give an example of each. (3)
- 3.2 Define the term *boiling point*. (2)
- 3.3 The following diagram represents the heating curve for a certain substance. Point A represents $t = 0$ minutes where the substance is a solid.



Which letters in the diagram represent the following?

- 3.3.1 Freezing point (1)
- 3.3.2 Boiling point (1)

- 3.3.3 Melting point (1)
- 3.3.4 Liquid phase (1)
- 3.3.5 Change in phase from liquid to gas (1)
- [10]**

QUESTION 4

- 4.1 An atom of element **X** has an atomic number of 11 and a mass number of 23.

4.1.1 Define *atomic number*. (2)

4.1.2 Give the NAME of **X**. (1)

4.1.3 How many protons, electrons and neutrons are in ONE atom of **X**?
Give your answer in the same order. (3)

4.1.4 Write down the electron configuration of element **X** in sp-notation. (3)

- 4.2 Element **Z** is found in nature in the form of three isotopes, with their percentages, as indicated below.

²⁸ Z	²⁹ Z	³⁰ Z
92,23%	4,67%	3,10%

4.2.1 Which one of these is the heaviest? Give a reason for your answer. (2)

4.2.2 Calculate the relative atomic mass of element **Z**. (5)

[16]

QUESTION 5

5.1 Consider the element magnesium.

5.1.1 Give the name of the group on the periodic table in which magnesium appears. (1)

5.1.2 Write down the formula or name of any element which appears in the same group as magnesium but has a SMALLER atomic radius than magnesium. (1)

5.1.3 Write down the formula or name of any element which is a HALOGEN and appears in the same period as magnesium. (1)

5.1.4 Does magnesium have the same chemical properties as lithium? Answer YES or NO and give a reason for your answer. (2)

5.2 Define *first ionization energy*. (2)

5.3 Write down the formula or name of any element which appears in the same group as magnesium but has a HIGHER first ionization energy than magnesium. (1)
[8]

QUESTION 6

6.1 Define a *covalent bond*. (2)

6.2 Describe what a *molecule* is. (2)

6.3 Consider the molecule with the formula NH_3 .

6.3.1 What is the name of this substance? (1)

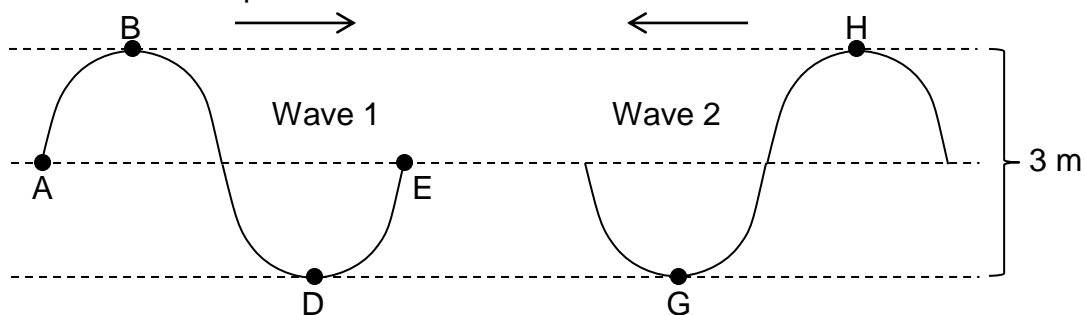
6.3.2 Draw the Lewis structures of NH_3 . (2)

6.4 Define an *ionic bond*. (3)

6.5 Use Lewis structures to show the bond formation between magnesium and bromine to form an ionic substance. Show all the steps and write down the chemical formula of magnesium bromide. (4)
[14]

QUESTION 7

The diagram below represents two identical transverse wave that are approaching each other. Certain points on the waves are marked with letters.



7.1 What is the magnitude of the amplitude of wave 1? (1)

7.2 Define the term *wavelength*. (2)

7.3 Refer to the letters and identify two points on wave 1 that are:

7.3.1 In phase (1)

7.3.2 Out of phase (1)

7.4 At a certain INSTANT points **D** and **H** are exactly in line with each other in the vertical plane. Which wave phenomenon will be observed at that instant? (2)

[7]

QUESTION 8

8.1 A flute produces a sound wave that travels at a speed of $320 \text{ m}\cdot\text{s}^{-1}$. The frequency of the sound is 0,128 kHz. Calculate the:

8.1.1 Period of the sound wave (3)

8.1.2 Wavelength of the sound wave (4)

8.2 A sound wave travels to a high wall which is 225 m away from the source and is then reflected back.

8.2.1 Calculate the time it takes to hear the echo if the speed of sound in air is $340 \text{ m}\cdot\text{s}^{-1}$. (4)

8.2.2 The same sound source is used to produce an echo by sending the sound into water to a depth of 225 m where it is reflected. Will the time taken to hear the echo be LESS THAN, EQUAL TO or GREATER THAN the answer obtained to QUESTION 8.2.1? Give a reason for your answer. (4)

[15]

GRAND TOTAL: 100

**DATA FOR PHYSICAL SCIENCES GRADE 10
CONTROL TEST - TERM 1**

**GEGEWENS VIR FISIESE WETENSKAPPE GRAAD 10
KONTROLETOETS - KWARTAAL 1**

TABLE 1: PHYSICAL CONSTANTS / TABEL 1: FISIESE KONSTANTES

NAME / NAAM	SYMBOL / SIMBOOL	VALUE / WAARDE
Speed of light in a vacuum <i>Spoed van lig in 'n vakuum</i>	c	$3,0 \times 10^8 \text{ m}\cdot\text{s}^{-1}$
Planck's constant <i>Planck se konstante</i>	h	$6,63 \times 10^{-34} \text{ J}\cdot\text{s}$
Charge on electron <i>Lading op elektron</i>	e	$-1,6 \times 10^{-19} \text{ C}$
Electron mass <i>Elektronmassa</i>	m_e	$9,11 \times 10^{-31} \text{ kg}$

TABLE 2: FORMULAE / TABEL 2: FORMULES

WAVES, SOUND AND LIGHT / GOLWE, KLANK EN LIG

$v = f\lambda$	$f = \frac{1}{T}$ or/of $T = \frac{1}{f}$
speed = $\frac{\text{distance}}{\text{time}}$ spoed = $\frac{\text{afstand}}{\text{tyd}}$	

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)	
<div><div>KEY/SLEUTEL</div><div>Atomic number <i>Atoomgetal</i></div><div>Electronegativity <i>Elektronegatiwiteit</i></div><div>Symbol <i>Simbool</i></div><div>Approximate relative atomic mass <i>Benaderde relatiewe atoommassa</i></div></div>																		2 He 4
2,1 1 H							29 1,9 Cu 63,5					5 B 11	6 C 12	7 N 14	8 O 16	9 F 19	10 Ne 20	
1,0 3 Li 7	1,5 4 Be 9											13 Al 27	14 Si 28	15 P 31	16 S 32	17 Cl 35,5	18 Ar 40	
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		
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 57 La 139		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	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		