education

Department of Education
FREE STATE PROVINCE

GRADE 10
PROVINCIAL FORMAL ASSESSMENT TASK

TERM 1 - 2016

PHYSICAL SCIENCES
CONTROL TEST

TIME: 2 HOURS

MARKS: 100

This paper consists of 8 pages and two information sheets.

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INSTRUCTIONS AND INFORMATION

1. Write your name and grade on the ANSWER BOOK.
2. This question paper consists of SEVEN (7) 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 paper.
5. Leave ONE line between two subquestions, for example between QUESTION 2.1 and QUESTION 2.2.
6. You may use a non-programmable 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.
11. Give brief motivations, discussions, et cetera where required.
12. Write neatly and legibly.

QUESTION 1

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–D) next to the question number (1.1–1.10) in the ANSWER BOOK, for example 1.11 E

1.1 Which ONE of the following is an example of a heterogeneous mixture?

A Distilled water

B Concrete

C Milk

D Ice (2)

1.2 The correct formula for potassium permanganate is:

A $KMnO_4$

B $PMnO_3$

C K_3MnO_2

D K_2PMnO_3 (2)

1.3 The formula SO_3^{2-} represents a ...

A sulphide ion.

B sulphite ion.

C molecule.

D sulphate ion. (2)

1.4 Silicon (Si), found in group IV on the periodic table, can be classified as a …

A metal.

B non-metal.

C metalloid.

D molecule. (2)

1.5 The fact that electrons of all substances have the same charge and mass was proved by...

A Chadwick.

B Rutherford.

C Bohr.

D Thomson. (2)

1.6 A symbol that represents an isotope of oxygen, is ...

A $^{16}_{8}X$.

B $^{8}_{5}X$.

C $^{8}_{8}X$.

D $^{17}_{10}X$. (2)

1.7 The mean distance from the nucleus to the border of the outer orbital is …

A atomic radius.

B Aufbau diagram.

C excited state.

D orbital. (2)

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1.8 A measure of the tendency of an atom in a molecule to attract bonding electrons is …

A electron affinity.

B ionic bond.

C electronegativity.

D metallic bond. (2)

1.9 The speed of sound is ...

A the same in all media.

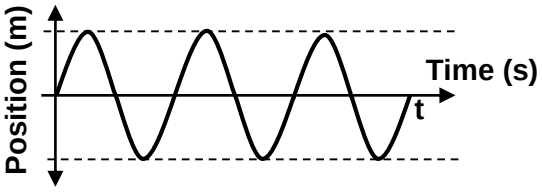
B the fastest in gases.

C the slowest in fluids.

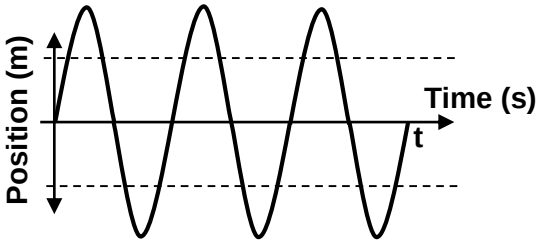
D the fastest in solids. (2)

1.10 I,II, III AND IV represent sound waves on the screen of an oscilloscope.

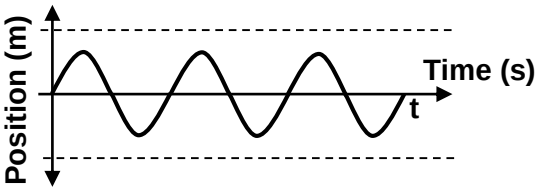
I



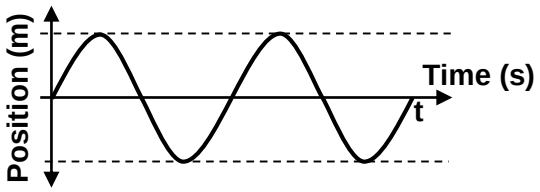
II



III



IV



Which ONE of the following statements is correct?

A I and II have the same loudness.

B III and IV have the smaller pitch than II.

C I, II and IV have a greater pitch than III.

D I and IV have the same loudness. (2)

[20]

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QUESTION 2

Study the substances in the table below

Ice cubes in a fizzy drink, milk, air, marbles and sand, tap water, copper wire, table salt, oxygen gas

2.1 Define the term *homogeneous mixture*. (2)

2.2 Use the information in the table above and write down:

2.2.1 Two examples of heterogeneous mixtures (2)

2.2.2 Two examples of pure substances (2)

2.2.3 An example of a metal (1)

2.3 Is table salt an element or a compound? Give a reason for the answer. (2)

2.4 Define the term *covalent bond*. (2)

[11]

QUESTION 3

3.1 A certain element **X** is in group VI on the periodic table. For this element, write down the:

3.1.1 Normal valency (1)

3.1.2 Ionic charge (1)

3.1.3 Number of half-filled orbitals (1)

3.1.4 Chemical equation to show the formation of its ion (2)

The symbol notation for element **X** is $^{16}_{8}\mathrm{X}$. For this element:

3.1.5 Draw the energy level (Aufbau) diagram (3)

3.1.6 Write down its NAME (1)

3.2 An element has the electron configuration $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^1$. Write down the group and period numbers of the periodic table where it can be found? (2)

3.3 Use Lewis structures to write down the equations showing the bond formation between Na and F. Show ALL the steps involved. (4)

[15]

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QUESTION 4

4.1 Consider the symbol notations below

$^{19}_{9}X^{-}$; $^{20}_{10}Y$; $^{23}_{11}R^{+}$; $^{27}_{13}S^{3+}$

4.1.1 Write down:

(a) Two similarities between **X** and **Y** (2)

(b) Two differences between **X** and **Y** (2)

(c) The symbol(s) that represent(s) an anion (1)

4.1.2 Which of these elements have a noble gas structure? (1)

4.1.3 Write down the NAMES or SYMBOLS of **Y** and **S**. (2)

4.1.4 Do **R** and **X** have identical chemical properties? Give a reason for the answer. (2)

4.2 Identify the type of bonding which occurs in each of the following substances:

4.2.1 KF (1)

4.2.2 Carbon dioxide (1)

4.2.3 Calcium phosphate (1)

4.3 Write down the chemical formula of :

4.3.1 Chlorine gas (1)

4.3.2 Sodium nitrate (1)

4.4 Write down the chemical name of:

4.4.1 $NaHCO_3$ (1)

4.4.2 $ZnSO_4$ (1)

[17]

QUESTION 5

Chlorine occurs naturally as $^{37}_{17}C\ell$ and $^{35}_{17}C\ell$ and these two are referred to as isotopes of chlorine. The percentage abundance of the two when they naturally exist are 24,5 % and 75,5 % respectively.

5.1.1 Define the term *isotope* (2)

5.1.2 Use the information given above to calculate the average relative atomic mass of chlorine (4)

5.1.3 Write down the reason why the above isotopes have identical chemical properties. (1)

5.2 Refer to electrons and ions to explain how a chlorine atom reacts with a metal. (2)

5.3 Magnesium and fluorine react to form a compound. Write down the ratio in which the cations and the anions are found respectively. (1)
[10]

QUESTION 6

Two boys sail in a boat. When the boat is 425 m from a vertical cliff, one boy screams. The boys hear the echo of the sound waves after 2,5 s.

6.1 Is a sound wave a LONGITUDINAL OR TRANSVERSE wave? (1)

6.2 Briefly describe how the echo is formed? (1)

6.3 Calculate the speed of the sound wave. (4)

6.4 How will the speed of the sound wave in water compare to the speed calculated in QUESTION 6.3? Write down only HIGHER THAN, LOWER THAN or EQUAL TO. (1)
[7]

QUESTION 7

7.1 The vibrator in a water tank generates waves with a frequency of 10 Hz.

7.1.1 Define the term *frequency*. (1)

7.1.2 What type of waves is generated by the vibrator? (1)

7.1.3 Write down the name of another type of wave motion that you have studied. Explain how it differs from the type of wave referred to in QUESTION 7.1.2 (2)

7.1.4 Calculate the wavelength of the wave motion if the distance between 21 consecutive wave crests is 84 mm (2)

7.1.5 Calculate the speed of propagation of the wave in $m \cdot s^{-1}$ (3)

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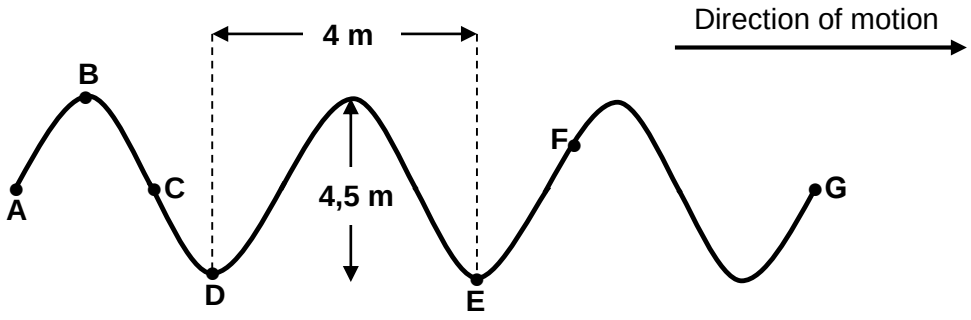
7.2 The diagram below illustrates the wave pattern of a wave with a frequency of 30 Hz.



7.2.1 Calculate the period of the above wave. (3)

7.2.2 Calculate the time taken for the wave to move from **A** to **G**. (2)

7.2.3 Write down the letter(s) that represent(s):

(a) The wavelength of the wave (1)

(b) A wave crest (1)

(c) Two consecutive points in phase (1)

7.4 Calculate the amplitude of the wave. (2)

7.5 In what direction is point **F** about to move? (1)

[20]

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 *Spoed van lig in 'n vakuum*	c	$3,0 \times 10^{8}$ m·s^{-1}
Planck's constant *Planck se konstante*	h	$6,63 \times 10^{-34}$ J·s
Charge on electron *Lading op elektron*	e	$-1,6 \times 10^{-19}$ C
Electron mass *Elektronmassa*	m_e	$9,11 \times 10^{-31}$ kg

TABLE 2: FORMULAE / *TABEL 2: FORMULES*

WAVES, SOUND AND LIGHT / *GOLWE, KLANK EN LIG*

$v = f\lambda$	$f = \frac{1}{T}$ or/*of* $T = \frac{1}{f}$
$\text{Speed} = \frac{\text{distance}}{\text{time}}$	$E = hf = \frac{hc}{\lambda}$

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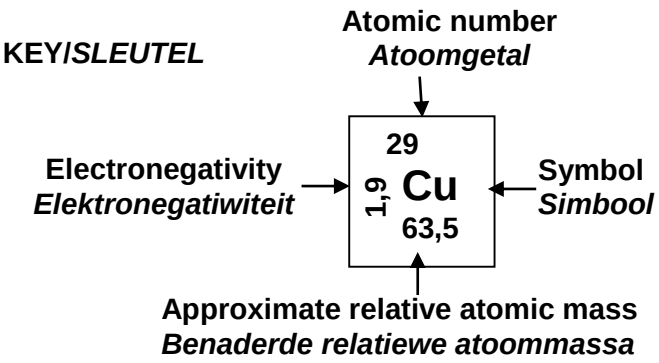
TABLE 3: THE PERIODIC TABLE OF ELEMENTS
TABEL 3: DIE PERIODIEKE TABEL VAN ELEMENTE



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)
2,1 H 1																	2 He 4
1,0 Li 7	1,5 Be 9											2,0 B 11	2,5 C 12	3,0 N 14	3,5 O 16	4,0 F 19	10 Ne 20
0,9 Na 23	1,2 Mg 24											1,5 Aℓ 27	1,8 Si 28	2,1 P 31	2,5 S 32	3,0 Cℓ 35,5	18 Ar 40
0,8 K 39	1,0 Ca 40	1,3 Sc 45	1,5 Ti 48	1,6 V 51	1,6 Cr 52	1,5 Mn 55	1,8 Fe 56	1,8 Co 59	1,8 Ni 59	1,9 Cu 63,5	1,6 Zn 65	1,6 Ga 70	1,8 Ge 73	2,0 As 75	2,4 Se 79	2,8 Br 80	36 Kr 84
0,8 Rb 86	1,0 Sr 88	1,2 Y 89	1,4 Zr 91	41 Nb 92	1,8 Mo 96	1,9 Tc	2,2 Ru 101	2,2 Rh 103	2,2 Pd 106	1,9 Ag 108	1,7 Cd 112	1,7 In 115	1,8 Sn 119	1,9 Sb 122	2,1 Te 128	2,5 I 127	54 Xe 131
0,7 Cs 133	0,9 Ba 137	57 La 139	1,6 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 Tℓ 204	1,8 Pb 207	1,9 Bi 209	2,0 Po	2,5 At	86 Rn
0,7 Fr 87	0,9 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