



# education

Department of  
Education  
FREE STATE PROVINCE

**CONTROL TEST**

**GRADE 10**

**PHYSICAL SCIENCES**

**MARCH 2020**

**MARKS: 75**

**TIME: 1,5 HOURS**

**This paper consists of EIGHT pages and TWO information 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 SEVEN questions. Answer ALL 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 is a good conductor of electricity?

- A Wood
- B Plastic
- C Silicon
- D Copper (2)

1.2 Iron, nickel and cobalt are classified as ...

- A insulators.
- B metalloids.
- C non-metals.
- D ferromagnetic materials. (2)

1.3 A positively charged ion has ...

- A more electrons than protons, because it lost protons.
- B more protons than electrons, because it lost electrons.
- C more electrons than protons, because it gained electrons.
- D more protons than electrons, because it gained protons. (2)

1.4 Which one of the following is correct?

- A  $F^-$  is a cation.
- B  $Cu^{2+}$  is a cation.
- C  $CO_2$  is an element.
- D  $F_2$  is a compound. (2)

1.5 What is the process called when a solid substance is changed directly into a gas?

- A Deposition
- B Sublimation
- C Evaporation
- D Condensation

(2)

1.6 How many electrons does a neutral atom of  $^{27}_{13}\text{Al}$  have?

- A 13
- B 14
- C 27
- D 40

(2)

1.7 Which element on the periodic table is in group two and period three?

- A Be
- B B
- C Ca
- D Mg

(2)

1.8 A region of low pressure in a longitudinal wave is called a ...

- A reflection.
- B rarefaction.
- C compression.
- D concentration.

(2)

**[16]**

## QUESTION 2

2.1 Define the term *compound*. (2)

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

2.3 Consider the following substances.

A	B	C	D	E
Copper	Glass	Iron filings	Water	Sodium chloride powder

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

2.3.1 One magnetic material (1)

2.3.2 Two elements (2)

2.3.3 Two compounds (2)

2.3.4 One brittle material (1)

2.3.5 One material that conducts electricity very well. (1)

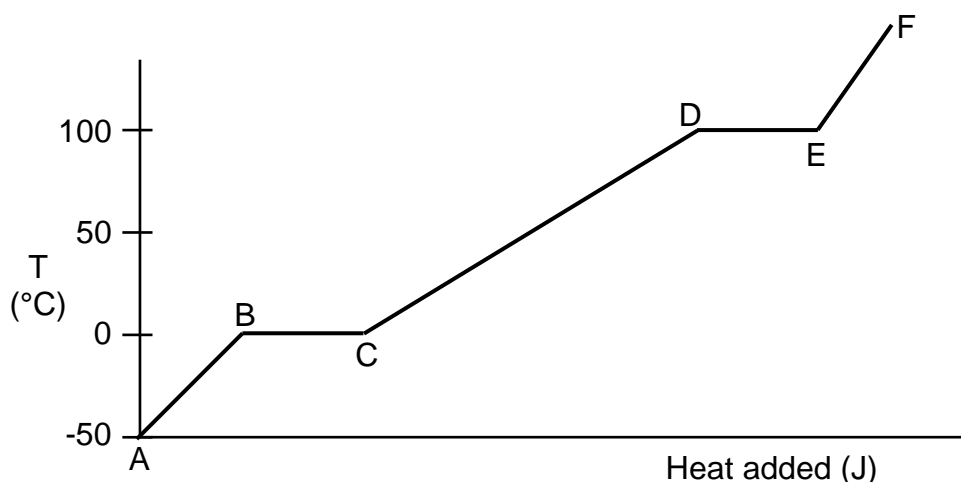
2.3.6 One compound that undergoes ionic bonding. (1)

2.3.7 One compound that undergoes covalent bonding. (1)

**[13]**

### QUESTION 3

Consider the following heating curve that was obtained when a constant heat source was used to supply energy to water.



- 3.1 Define the term *melting point*. (2)
  - 3.2 Identify the DEPENDENT variable on the graph. (1)
  - 3.3 What is represented by **DE** on the graph? Choose your answer from MELT, BOIL, CONDENSATE or EVAPORATE. (1)
  - 3.4 In which PHASE is water for part **CD** of the graph? (1)
  - 3.5 Which letter or letters on the graph represent the HIGHEST average kinetic energy of the water molecules? (1)
- [6]**

### QUESTION 4

Element **Y** has an atomic number of 17 and a mass number of 35. An isotope of element **Y** has a mass number of 37.

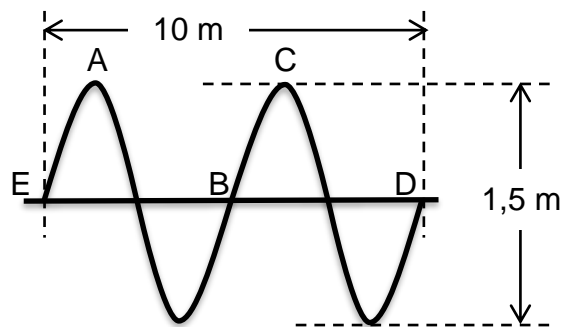
- 4.1 Define the term *mass number*. (2)
  - 4.2 Define the term *isotope*. (2)
  - 4.3 How many of the following does the ISOTOPE of **Y** have?
    - 4.3.1 Number of protons (1)
    - 4.3.2 Number of electrons (1)
    - 4.3.3 Number of neutrons (1)
  - 4.4 Write down the chemical name of  $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$ . (1)
  - 4.5 Write down the chemical formula of lead(II) chloride. (1)
- [9]**

### QUESTION 5

- 5.1 Define the term *covalent bond*. (2)
- 5.2 Draw the Lewis dot diagram of:
- 5.2.1  $\text{NH}_3$  (1)
- 5.2.2 Oxide, i.e.  $\text{O}^{2-}$  (1)
- 5.3 What is the name of the scientist who indicated that a maximum of two electrons can be in one orbital provided they spin in opposite directions? (1)
- 5.4 In which group of the periodic table do we find carbon? (1)
- 5.5 Draw the Aufbau diagram of a carbon atom. (3)
- 5.6 Carbon atoms bond covalently to hydrogen atoms.
- 5.6.1 Use the sp-notation to write down the electron configuration for one hydrogen atom. (1)
- 5.6.2 Write down the formula of the compound that is formed when a carbon atom bonds to hydrogen atoms. (1)
- [11]**

### QUESTION 6

The wave represented below, with the dimensions indicated, is completed in three seconds.



- 6.1 Write down the LETTERS which represent any TWO points that are:
- 6.1.1 In phase (1)
- 6.1.2 ONE wavelength apart (1)
- 6.2 Determine the magnitude of the:
- 6.2.1 Amplitude of the wave (1)
- 6.2.2 Wavelength of the wave (1)
- 6.3 Define the term *frequency* of a wave. (2)
- 6.4 Calculate the wave's:
- 6.4.1 Frequency (3)
- 6.4.2 Period (3)
- [12]**

### QUESTION 7

- 7.1 A piano produces a sound wave that travels at a speed of  $320 \text{ m}\cdot\text{s}^{-1}$ . The frequency of the sound is 0,2 kHz. Calculate the:
- 7.1.1 Period of the wave (2)
- 7.1.2 Wavelength of the wave (3)
- 7.2 A boy makes a sound wave that moves to a high wall 200 m away from him. The sound wave is then reflected from the wall. Calculate how long it takes the echo to reach the boy, from the moment the sound was produced, if the speed of the sound is  $340 \text{ m}\cdot\text{s}^{-1}$ . (3)

**[8]**

**GRAND TOTAL: 75**



**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**

$v = \lambda f$	$f = \frac{1}{T}$ or/of $T = \frac{1}{f}$
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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)
1 2,1 <b>H</b> 1																	2 <b>He</b> 4
3 1,0 <b>Li</b> 7	4 1,5 <b>Be</b> 9											5 2,0 <b>B</b> 11	6 2,5 <b>C</b> 12	7 3,0 <b>N</b> 14	8 3,5 <b>O</b> 16	9 4,0 <b>F</b> 19	10 20 <b>Ne</b>
11 0,9 <b>Na</b> 23	12 1,2 <b>Mg</b> 24											13 1,5 <b>Al</b> 27	14 1,8 <b>Si</b> 28	15 2,1 <b>P</b> 31	16 2,5 <b>S</b> 32	17 3,0 <b>Cl</b> 35,5	18 40 <b>Ar</b>
19 0,8 <b>K</b> 39	20 1,0 <b>Ca</b> 40	21 1,3 <b>Sc</b> 45	22 1,5 <b>Ti</b> 48	23 1,6 <b>V</b> 51	24 1,6 <b>Cr</b> 52	25 1,5 <b>Mn</b> 55	26 1,8 <b>Fe</b> 56	27 1,8 <b>Co</b> 59	28 1,8 <b>Ni</b> 59	29 1,9 <b>Cu</b> 63,5	30 1,6 <b>Zn</b> 65	31 1,6 <b>Ga</b> 70	32 1,8 <b>Ge</b> 73	33 2,0 <b>As</b> 75	34 2,4 <b>Se</b> 79	35 2,8 <b>Br</b> 80	36 84 <b>Kr</b>
37 0,8 <b>Rb</b> 86	38 1,0 <b>Sr</b> 88	39 1,2 <b>Y</b> 89	40 1,4 <b>Zr</b> 91	41 <b>Nb</b> 92	42 1,8 <b>Mo</b> 96	43 1,9 <b>Tc</b>	44 2,2 <b>Ru</b> 101	45 2,2 <b>Rh</b> 103	46 2,2 <b>Pd</b> 106	47 1,9 <b>Ag</b> 108	48 1,7 <b>Cd</b> 112	49 1,7 <b>In</b> 115	50 1,8 <b>Sn</b> 119	51 1,9 <b>Sb</b> 122	52 2,1 <b>Te</b> 128	53 2,5 <b>I</b> 127	54 131 <b>Xe</b>
55 0,7 <b>Cs</b> 133	56 0,9 <b>Ba</b> 137	57 <b>La</b> 139	72 1,6 <b>Hf</b> 179	73 <b>Ta</b> 181	74 <b>W</b> 184	75 <b>Re</b> 186	76 <b>Os</b> 190	77 <b>Ir</b> 192	78 <b>Pt</b> 195	79 <b>Au</b> 197	80 <b>Hg</b> 201	81 1,8 <b>Tl</b> 204	82 1,8 <b>Pb</b> 207	83 1,9 <b>Bi</b> 209	84 2,0 <b>Po</b>	85 2,5 <b>At</b>	86 <b>Rn</b>
87 0,7 <b>Fr</b>	88 0,9 <b>Ra</b> 226	89 <b>Ac</b>															
			58 <b>Ce</b> 140	59 <b>Pr</b> 141	60 <b>Nd</b> 144	61 <b>Pm</b>	62 <b>Sm</b> 150	63 <b>Eu</b> 152	64 <b>Gd</b> 157	65 <b>Tb</b> 159	66 <b>Dy</b> 163	67 <b>Ho</b> 165	68 <b>Er</b> 167	69 <b>Tm</b> 169	70 <b>Yb</b> 173	71 <b>Lu</b> 175	
			90 <b>Th</b> 232	91 <b>Pa</b>	92 <b>U</b> 238	93 <b>Np</b>	94 <b>Pu</b>	95 <b>Am</b>	96 <b>Cm</b>	97 <b>Bk</b>	98 <b>Cf</b>	99 <b>Es</b>	100 <b>Fm</b>	101 <b>Md</b>	102 <b>No</b>	103 <b>Lr</b>	

KEY/SLEUTEL

Atomic number  
*Atoomgetal*

Electronegativity  
*Elektronegatiwiteit*

Symbol  
*Simbool*

Approximate relative atomic mass  
*Benaderde relatiewe atoommassa*