education

Department:
Education
PROVINCE OF KWAZULU-NATAL

NATIONAL SENIOR CERTIFICATE

GRADE 10

PHYSICAL SCIENCE: CHEMISTRY (P2)

COMMON TEST

MARCH 2020

MARKS: 50

TIME: 1 hour

This question paper consists of 6 pages and a Periodic Table.

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INSTRUCTIONS AND INFORMATION

1. This question paper consists of FIVE questions. Answer ALL the questions in the ANSWER BOOK.

2. Number the answers correctly according to the numbering system used in this question paper.

3. Leave ONE line between two sub questions, for example between QUESTION 2.1 and QUESTION 2.2.

4. You may use a non-programmable calculator.

5. You may use appropriate mathematical instruments.

6. YOU ARE ADVISED TO USE THE ATTACHED DATA SHEET.

7. Show ALL formulae and substitutions in ALL calculations.

8. Round off your FINAL numerical answers to a minimum to TWO decimal places.

9. Give brief motivations, discussions, et cetera where required.

10. Write neatly and legibly.

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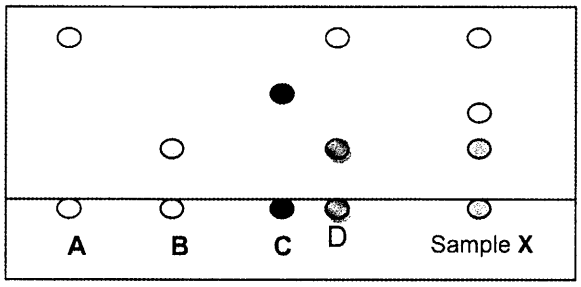
QUESTION 1: MULTIPLE- CHOICE

Four options are provided as possible answers to the following questions. Each question has only ONE correct answer. Write down only the letter (A – D) next to the question number (1.1 – 1.3) in the answer book, for example 1.4 **A.**

1.1 Which term describes the ability of material to change shape on hammering?

A. Brittle
B. Ductile
C. Malleable
D. Tensile strength (2)

1.2 Substances A, B, C and D are pure substances. The following diagram represents the results of a separation technique using a sample X.



Which ONE of the pure substances is not present in sample X?

A. B
B. C
C. D
D. A (2)

1.3 Which ONE of the following reactions represents the FIRST ionization energy of Sodium (Na)?

A. $Na\,(g) + energy \rightarrow Na^+(g) + e^-$
B. $Na\,(s) + energy \rightarrow Na^+(g) + e^-$
C. $Na^+\,(aq) + e^- + energy \rightarrow Na\,(s)$
D. $Na^+\,(s) + e^- + energy \rightarrow Na\,(s)$ (2)

[6]

QUESTION 2

2.1 Given the following information answer the questions that follow.

A.	Diamond	B.	Ethanol
C.	Potassium dichromate	D.	ClO_3^-
E.	Water		

2.1.1 Identify the substance that is composed of one element. (1)

2.1.2 Write down the name for **D**. (2)

2.1.3 Write down the chemical formula for **C**. (1)

2.2 Equal volumes of **B** and **E** are thoroughly mixed together in a beaker.

2.2.1 Is this a homogeneous or heterogeneous mixture? (1)

You are required to separate this mixture into its components.

2.2.2 Name the suitable separation technique that can be used here. (1)

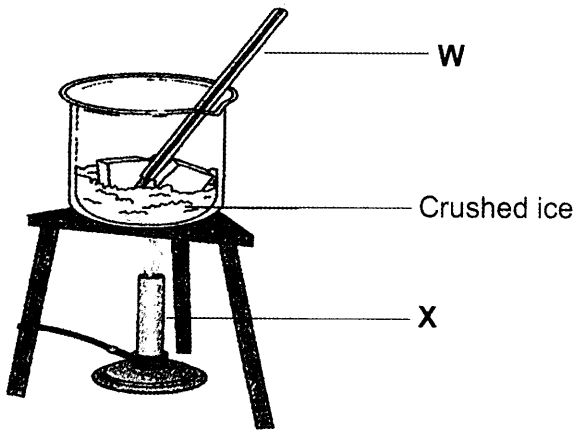
2.2.3 Describe the method by which this mixture can be separated into its components. (2)

[8]

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QUESTION 3

Grade 10 learners conducted an experiment to determine the heating curve of water by using CRUSHED ICE under standard pressure. The experimental set up is shown below.

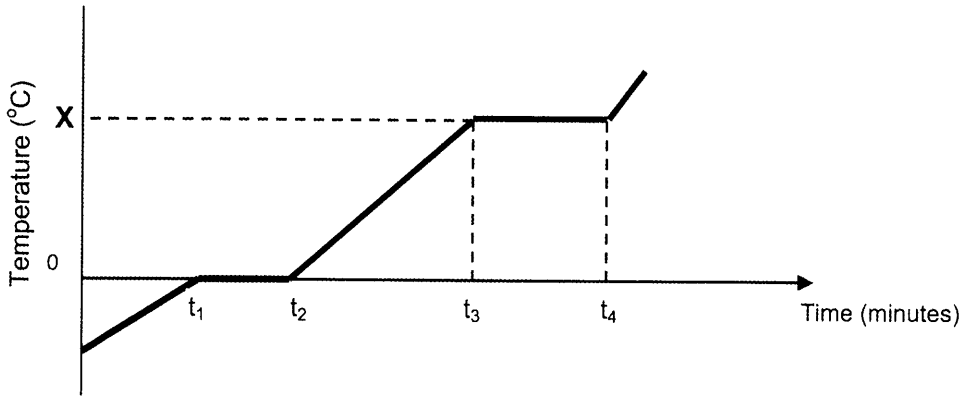


3.1 Define *boiling point*. (2)

3.2 Write down the name of the instrument labelled **W**. (1)

3.3 Why is crushed ice used instead of ice cubes? (2)

3.4 The graph below, not drawn to scale, shows the results obtained.



3.4.1 Write down the value represented by **X**. (1)

3.4.2 Name the predominant phase of this substance between t_2 and t_3. (1)

3.4.3 Write down the process taking place between t_3 and t_4. (1)

3.4.4 Explain the increase in temperature between t_2 and t_3. (2)

3.4.5 How will the above graph be affected if a larger quantity of crushed ice was used? (1)
[11]

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QUESTION 4

4.1

4.1.1 Define *atomic radius*. (2)

4.1.2 Explain the trend in atomic radius across a period. (3)

4.2 Complete the table below for substances P and K^+. Write down **ONLY** the question number (4.2.1 and 4.2.2) and the answer in the answer book.

ELEMENT	NUMBER OF PROTONS	NUMBER OF ELECTRONS	NUMBER OF NEUTRONS
^{31}P	15	15	4.2.1 _____
$^{39}K^+$	19	4.2.2 _____	20

(2)

4.3 Define *relative atomic mass*. (1)

4.4 In nature, magnesium has the following common Isotopes.

Isotopes	Molar Mass	Abundance (%)
^{24}Mg	23,985	78,70
^{25}Mg	24,959	10,13
^{26}Mg	25,983	**x**

4.4.1 Calculate the isotopic abundance of ^{26}Mg. (1)

4.4.2 Calculate the relative atomic mass of Mg. (3)

4.5 Write down the electronic configuration (sp notation) for the chloride ion. (2)

4.6 What is the valency of sulphur? (1)

4.7 What is the name given to group II elements? (1)
[16]

QUESTION 5

5.1 HCℓ is a gaseous molecule.

5.1.1 What is the name of the HCℓ molecule? (1)

5.1.2 Name type of bond between atoms in the HCℓ molecule? (1)

5.1.3 Is the above molecule polar or non-polar? Explain the answer by referring to the electronegativity. (3)

5.2 Draw Lewis structures for:

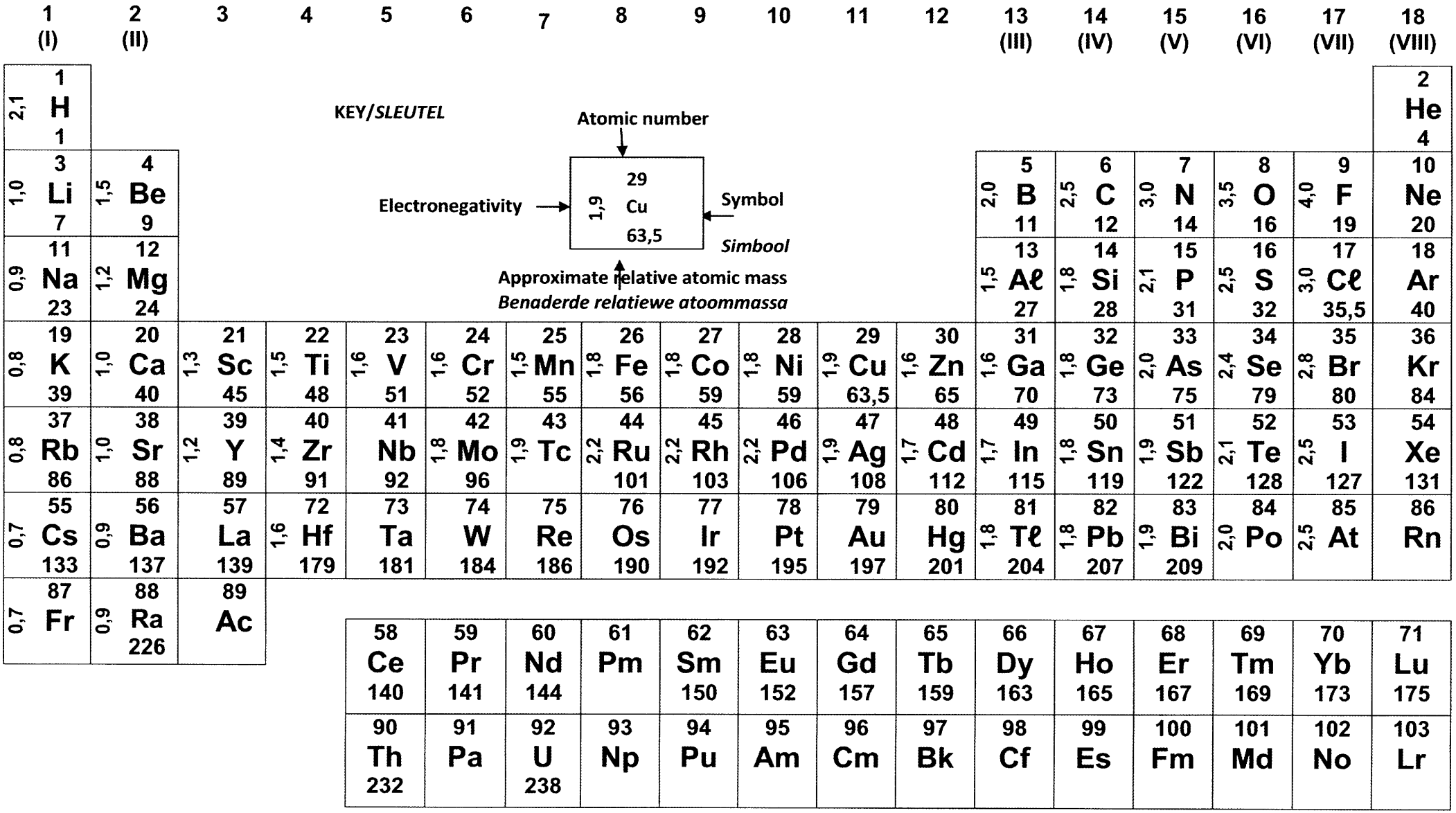
5.2.1 NH_3. (2)

5.2.2 CO_2. (2)
[9]

TOTAL MARKS: [50]

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TABLE 3: THE PERIODIC TABLE OF THE ELEMENTS



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PHYSICAL SCIENCES: CHEMISTRY P2

MARKING GUIDELINE

COMMON TEST

MARCH 2020

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N.B: This marking guideline consists of 4 pages.

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SECTION A

QUESTION 1

1.1 C ✓✓ (2)

1.2 B ✓✓ (2)

1.3 A ✓✓ (2)
[6]

QUESTION 2

2.1 2.1.1 Diamond ✓ (1)

2.1.2 Chlorate (ion) ✓✓ (2)

2.1.3 $K_2Cr_2O_7$ ✓ (1)

2.2 2.2.1 Homogeneous ✓ (1)

2.2.2 (Fractional) distillation ✓ (1)

2.2.3 Heat the mixture until the component that boils first leaves the flask. ✓
Condense the gaseous component and collect it in another flask.✓ (2)
[8]

QUESTION 3

3.1 Temperature of a liquid at which its vapour pressure is equal to the external (atmospheric) pressure**.** ✓✓ (2)

3.2 Thermometer ✓ (1)

3.3 Allows easy flow of heat energy from one particle to the next. ✓✓ (2)

3.4 3.4.1 100 ^{o}C ✓ (1)

3.4.2 Liquid (phase) ✓ (1)

3.4.3 Boiling ✓ (1)

3.4.4 Water molecules / particles gain potential (internal) energy ✓
Particles vibrate vigorously /kinetic energy increases✓, hence temperature rises. (2)

3.4.5 Time taken for the process would increase. ✓ (1)
[11]

QUESTION 4

4.1 4.1.1 The mean distance from the nucleus to the border of the outer orbital of an atom. ✓✓ (2)

4.1.2 Across the period, the number of electrons increases✓ within the same energy level✓**,** thus effective attraction between electrons increases✓. Therefore, the atomic radius decreases. (3)

4.2 4.2.1 16 (neutrons) ✓ (1)

4.2.2 18 (electrons) ✓ (1)

4.3 Mass of a particle on a scale where an atom of carbon-12 has a mass of 12. ✓ (1)

4.4 4.4.1 Abundance = 100 – (78,70 + 10,13) = 11,17% ✓ (1)

POSITIVE MARKING FROM 4.4.1.

4.4.2

$$\text{R.A.M} = \frac{M^{24}_{Mg} \times \%\text{ abundance}}{100\%} + \frac{M^{25}_{Mg} \times \%\text{ abundance}}{100\%} + \frac{M^{26}_{Mg} \times \%\text{ abundance}✓}{100\%}$$

$$= \frac{23{,}985 \times 78{,}70\%}{100\%} + \frac{24{,}959 \times 10{,}13\%}{100\%} + \frac{25{,}983 \times 11{,}17\%✓}{100\%}$$

$$= 24{,}30\ 6\text{g.mol}^{-1}✓$$

(3)

4.5 $1s^2 2s^2 2p^6 3s^2 3p^6$ ✓✓ (2)

4.6 Two ✓ (1)

4.7 Alkali-earth metals. ✓ (1)
[16]

QUESTION 5

5.1 5.1.1 Hydrogen chloride ✓ (1)

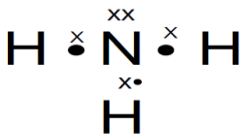
5.1.2 Polar covalent (bond) ✓ (1)

5.1.3 Polar ✓ (1)

5.1.4 Chlorine has higher electronegativity than hydrogen ✓.The shared electron pair is found closer to the chlorine end ✓of the molecule. The chlorine end becomes negative and hydrogen end is positive. (2)

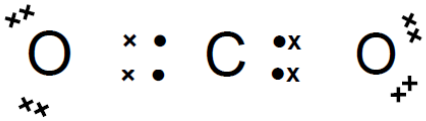
5.2

5.2.1



✓✓ (2)

5.2.2



✓✓ (2)

[9]

TOTAL MARKS: [50]

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