



HILLCREST HIGH SCHOOL

PHYSICAL SCIENCE

GRADE 10

PAPER 2- Chemistry



NOVEMBER 2015

TIME: 2 HRS

Total 151

Instructions

1. Answer ALL the questions.
2. This question paper consists of TWO sections:
3. SECTION A (20)
SECTION B (130)

Answer SECTIONS A and B in the ANSWER BOOK.
4. Non-programmable calculators may be used.
5. Appropriate mathematical instruments may be used.
6. Number the answers correctly according to the numbering system used in this question paper.
7. Data sheets and a periodic table are attached for your use.
8. Give brief motivations, discussions, et cetera where required.
9. Numbers must be rounded off to **two decimal** places.

SECTION A

QUESTION 1: MULTIPLE-CHOICE QUESTIONS

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

1.1 Which one of the following can be classified as a mixture?

- A. Sugar
- B. Table salt
- C. Iron
- D. Air

1.2 Which of the options below best describes the reaction represented by the following equation?



- A. Acid-base reaction
- B. Decomposition reaction
- C. Ion exchange reaction
- D. Precipitation reaction

1.3 Pure silicon is classified as a metalloid because it...

- A is malleable and ductile
- B exhibits metallic bonding
- C exhibits metallic and non-metallic properties
- D is an excellent conductor of both heat and electricity

1.4 Freezing means

- A. Liquid changes to a solid
- B. Gas changes to a liquid
- C. Liquid changes to a gas
- D. Solid changes to a liquid

1.5. The correct chemical formula for potassium permanganate is.....

- A. KMnO_4
- B. KMnO_2
- C. CaMnO_4
- D. $\text{Ca}(\text{MnO}_4)_2$

1.6 The name given to the monoatomic gaseous elements found in Group 8 on the periodic table of elements

- A. Halogen gases
- B. Non-metals
- C. Transition gases
- D. Noble gases

1.7 Which of the following represents the correct electron configuration for ${}^{19}_{9}\text{F}$?

- A. $1s^1 2s^2 2p^6$
- B. $1s^2 2s^2 2p^5$
- C. $1s^2 2s^1 2p^6$
- D. $1s^2 2s^2 3s^2 3p^5 4s^1$

1.8 During the heating of water the:

- A. temperature remains constant during the phase change
- B. temperature increases during the phase change
- C. temperature decreases during the phase change
- D. temperature will first decrease then increase

1.9 The state of matter in which there are very strong intermolecular forces between the molecules

- A. Gas
- B. Liquid
- C. Solid
- D. Plasma

1.10 The electrons found in completely filled energy levels

- A. Valence electrons
- B. Core electrons
- C. Free electrons
- D. Anions

[2 X 10 = 20]

Section B

Question 2

Information of four elements, represented by A, B, C AND D, are given in the table below.

Element	Atomic number	Mass number
A	2	4
B	11	23
C	1	1
D	8	16

2.1. Which element (A, B, C, D)

2.1.1. Has 6 valence electrons. (1)

2.1.2. Is stable (not reactive.) (1)

2.1.3. Is a metal. (1)

2.2. Write down one use of element A? (1)

2.3. Two of the above elements are in the same group in the periodic table. Write down:

2.3.1. The letters, from the above table that corresponds to these elements. (1)

2.3.2. Their group number in the periodic table. (1)

2.4. Identify element B and write down its A_ZX notation. (1)

2.5. Write down a balanced chemical equation for the reaction between element C and D. (2)

2.6. Neon (Ne) has 3 naturally occurring isotopes

Ne-20 which is 90, 92 %

Ne-21 which is 0, 26%

Ne-22 which is 8,82% abundant.

2.6.1. Define the term isotope. (2)

2.6.2. What is the relative atomic mass of Neon? SHOW YOUR WORKING. (3)

[14]

Question 3

Magnesium reacts with chlorine to form magnesium chloride.

- 3.1. Write down the chemical formula for magnesium chloride. (2)
- 3.2. For chlorine atom:
 - 3.2.1. Draw the Aufbau diagram. (3)
 - 3.2.2. Write down its number of valence electrons. (1)
- 3.3. For the Magnesium **ion**, write down its:
 - 3.3.1. sp notation (2)
 - 3.3.2. Number of protons. (1)
- 3.4. Use Lewis dot notation to represent the formation of magnesium chloride. (4)
- 3.5. Name the type of bond that forms between magnesium and chlorine (1)
- 3.6. Chlorine exist abundantly as diatomic molecules.
 - 3.6.1. Define the term molecule. (2)
 - 3.6.2. Name the type of bond that forms inside a chlorine molecule. (1)
 - 3.6.3. Represent a chlorine molecule with a Lewis diagram. (2)

[19]

Question 4

The first ionisation energies of the first twenty elements are given below:

H 1 311						He 2 372	
Li 520	Be 899	B 801	C 1 086	N 1 402	O 1 314	F 1 681	Ne 2 081
Na 496	Mg 738	Al 578	Si 786	P 1 012	S 1 001	Cl 1 251	Ar 1 521
K 419	Ca 590						

- 4.1. Define the term ionisation energy. (2)
- 4.2. How does the first ionisation energy change **from right to left** in a period with increase in atomic number? Only write down INCREASE, DECREASE or REMAIN THE SAME. (1)
- 4.3. Explain why the first ionisation energy for Potassium is smaller than that of Argon. Make reference to atomic radius when explaining (4)

[7]

Question 5

- 5.1. A pot of boiling water is left in a freezer overnight.
 - 5.1.1 Define boiling point. (2)
 - 5.1.2 Draw a graph to show the relationship between temperature ($^{\circ}\text{C}$) versus time (in minutes) for the water in the pot. In your graph show; the different phases of water. (2)
- 5.2. Explain the changes taking place in the water in terms of;
 - 5.2.1. Energy and movement of the particles (from liquid to solid phase). (2)
 - 5.2.2. Attractive forces between particles (from liquid to solid phase). (2)
- 5.3. Solid carbon dioxide is known as dry ice. Under normal circumstances dry ice sublimates as it warms up. Define sublimation. (2)
- 5.4. When you take a block of butter out of the fridge, it is hard. However, after 15 minutes at room temperature it is soft enough to spread.
Use the kinetic molecular theory to explain the above observation. (3)

[13]

Question 6

Give the correct names of each of the following substances.

6.1 HCl (2)

6.2 NaOH (2)

6.3 Mg (NO₃)₂ (2)

6.4. The substance in 6.1 is mixed with the substance in 6.2.

6.4.1. Write down the name of the reaction in 6.4. (1)

6.4.2. HCl is regarded as an Arrhenius acid, define Arrhenius acid (2)

6.4.3 Write a balanced chemical equation for the above reaction in 6.4. (2)

[11]

Question 7

Give the chemical formula for each of the following substances

7.1. Sulphuric acid (2)

7.2. Copper (II) sulphate (2)

7.3 Silver carbonate (2)

7.4. Hydrochloric acid is added to calcium carbonate; write a balanced chemical equation for the reaction between the 2 substances. (3)

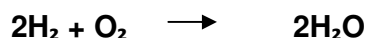
[9]

Question 8

In chemistry, qualitative aspects of substances is essential in making conclusions. Mass is one of these important aspects.

8.1. State the law of conservation of mass. (2)

8.2. Show that the mass is conserved in the reaction below (3)



[5]

Question 9

When carbon reacts with oxygen, carbon dioxide gas is formed.

9.1. Calculate the mass of CO₂ in 12, 5 moles. (3)

9.2. A calcium salt consists of 29, 4% calcium, 23, 5% sulphur and 47, 1% oxygen by mass.

Work out the empirical formula of this salt. (6)

9.3 You are given a 370 g sample of Magnesium nitrate.

Calculate:

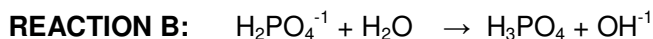
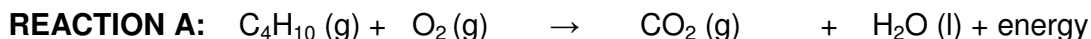
9.3.1 the number of moles of nitrate ions in the sample. (5)

9.3.2 the number of oxygen atoms in the sample. (4)

[18]

QUESTION 10

Three chemical reactions are shown below:



10.1 What does (g) represent in **REACTION A**? (1)

10.2 Rewrite **REACTION C** in chemical symbol form and balance the equation. (4)

10.3 Which reaction (A, B or C) represents a decomposition reaction? (1)

10.4 Write **REACTION B as a word equation.** (4)

10.5 Rewrite and balance **REACTION A** (2)

10.6. Identify the conjugate acid-base pairs in REACTION B (2)

10.7. Give one example of a weak acid. (1)

10.8 Give one example of a strong base. (1)

10.9 Complete and balance the following equation:



[19]

Question 11

- 11.1. Hydrated Magnesium Sulphate has a formula $\text{MgSO}_4 \cdot x\text{H}_2\text{O}$. A sample containing 5g of hydrated magnesium sulphate was heated until all water has evaporated. The final mass was found to be 2.6g. How many moles of water were there in the original sample? (6)
- 11.2. Calculate the volume of 0,5 mol hydrogen gas at STP. (3)
- 11.3. Define the term concentration (2)
- 11.4. Calculate the concentration of a 200 cm^3 solution with 0,08g sodium hydroxide (NaOH) dissolved in it. (5)

[16]

Section B: 130
Grand total: 151

FORMULA SHEET

Mass formula	$n = \frac{m}{M}$	
Particle formula	$n = \frac{No}{NA}$	$N_A = 6.02 \times 10^{23}$
Volume formula	$n = \frac{V}{V_0}$	$V_0 = 22.4 \text{ dm}^3$
Concentration formula	$C = \frac{n}{V}$	mol.dm^{-3}
Neutrons	$n^0 = A - Z$	

