

UNIVERSITY OF SWAZILAND
FACULTY OF EDUCATION
SUPPLEMENTARY EXAMINATION PAPER
B. Ed. III/PGCE

July 2015

Title of paper: Curriculum Studies in Chemistry

Course number: EDC 379

Time allowed: 3 hours

Instructions:

1. This paper contains FIVE questions.
2. Answer **any four** questions.
3. Marks for each question or sub-question are indicated at the end of the question
4. Any piece of material or work which is not intended for marking purposes should be clearly **CROSSED OUT**
5. Ensure that responses to questions are **NUMBERED CORRECTLY**
6. The examination paper comprises three pages and a two page attachment

Special Requirements

SGCSE Physical Science Syllabus section on Topic C12 Non-metals (Attached)

THIS PAPER SHOULD NOT BE OPENED UNTIL PERMISSION HAS BEEN GRANTED BY THE INVIGILATOR

QUESTION 1

- a) Studies on students' conceptions of chemical concepts identify that many students hold the following ideas on ionic bonding:

1. *The atomic electronic configuration determines the number of ionic bonds formed. For example, a sodium atom can only donate one electron, so it can form only one bond.*
2. *Bonds are only formed between atoms that donate/accept electrons. For example, in sodium chloride, the chloride is bonded to the specific sodium atom that donated an electron to it.*
3. *Ions interact with the counter ions around them, but for those not ionically bonded these interactions are just forces. For example, in sodium chloride, a chloride ion is bonded to one sodium ion and attracted to a further five sodium ions, but just by forces and not bonds.*

Discuss the possible sources of these erroneous ideas. [12]

- b) Discuss a strategy you might use to minimise the development of the misconceptions noted in (a) above by learners in a Chemistry class. [13]

QUESTION 2

- a) Improvisations are an important strategy for acquiring resources for teaching Chemistry.

i) With the aid of example(s) **describe fully** what you understand by improvisation with respect to resources for teaching chemistry? [6]

ii) Teachers often complain about pupils' lack of chemistry textbooks.

State and explain **four** factors that may contribute to pupils lack chemistry textbooks? [8]

- b) Below is a passage taken from a school Chemistry book. Read the passage and then answer the questions that follow the passage.

"The alkali metals, group I, are very reactive. The reason they are called alkali metals is because they react with water to form a water-soluble base, called an alkali. These metals will react with moisture or oxygen in the air and for this reason they are stored in paraffin or oil".

i) What pre-requisite concepts should pupils have developed to be able to understand the passage? [3]

ii) What chemical ideas might pupils learn from reading the above passage? [8]

QUESTION 3

Science (and its teaching) and society are interrelated.

Discuss, with clear justification, the relation between science and society. [25]

QUESTION 4

- a) i) Why might it be important for a Chemistry teacher to be aware of the reasons for the under representation of women in science fields? [5]
- ii) Outline four strategies a teacher may employ in a classroom to improve *interest*, *career aspirations* and *confidence* of girl learners with respect to learning Chemistry. [8]
- b) The following are some of the criteria used in selecting content during curriculum development:

scope; feasibility and continuity

Describe what each criterion entails in the context of Chemistry. [12]

QUESTION 5

Attached is the SGCSE –Physical Science syllabus section on Topic C12 Non-metals

- a) Propose a possible sequence for teaching the **sub-topics** for Topic C12. [5]
- b) Study the sub-topics C12.1 Air and C12.2 Water. Then, **identify**, and **justify**, **5 aspects** that make these sub-topics relevant for Swaziland. [20]

C12. Non-metals

C12.1 Air

- describe the volume composition of air.
- name common pollutants in air as carbon monoxide, sulfur dioxide, oxides of nitrogen and lead compounds.
- list the sources of each of the pollutants:
carbon monoxide (from incomplete combustion of carbon-containing compounds),
sulfur dioxide (from the combustion of fossil fuels containing sulfur compounds leading to 'acid' rain),
oxides of nitrogen and lead compounds from car exhausts.
- state adverse effects of common pollutants on buildings, plants and health.

C12.2 Water

- describe and perform a chemical test for water using anhydrous copper (II) sulfate or cobalt (II) chloride.
- show understanding that hydration may be reversible e.g., by heating hydrated copper (II) sulfate or hydrated cobalt (II) chloride.
- distinguish between soft and hard water.
- distinguish between temporary hardness and permanent hardness.
- state advantages and disadvantages of hard water.
- describe how hard water can be made soft.
- describe in outline the purification of water in terms of filtration, sedimentation and chlorination.

C12.3 Hydrogen

- name the uses of hydrogen in the manufacture of ammonia, margarine (see C13 – Organic Chemistry) and as a fuel in rockets.
- describe the preparation, collection and properties of hydrogen.

C12.4 Oxygen

- describe combustion of elements e.g., magnesium.
- state the uses of oxygen including use in oxygen tents, in hospitals and with acetylene in welding.
- describe, in simple terms, respiration, combustion and rusting.

- describe the catalytic removal of nitrogen oxides from car exhausts.

- describe in simple terms the role of carbon dioxide and other polyatomic molecules in global warming.

- describe the roles of ozone in absorbing ultraviolet (UV) radiation.

- show understanding that chlorofluorocarbons (CFCs) can lead to the depletion of the ozone layer (limited to the idea that electromagnetic absorption by CFCs leads to decomposition of ozone, i.e., free-radical mechanism not required).

- describe formation of hydrogen as a product of electrolysis of water (see C11 – Electricity and Chemistry).

<p>- describe methods of rust prevention: paint and other coatings e.g., galvanising to exclude oxygen.</p> <p>C12.5 Carbon dioxide - describe formation of carbon dioxide: From the complete combustion of carbon containing substances, as a product of respiration, as a product of the reaction between an acid and a carbonate.</p> <p>C12.6 Nitrogen - describe the need for nitrogen, phosphorus and potassium compounds in plant life. - name the uses of nitrogen in the manufacture of ammonia. - name the uses of ammonia in the manufacture of fertilisers e.g., ammonium sulfate, ammonium nitrate and in the manufacture of household detergents.</p> <p>C12.7 Carbon and carbonates - define allotropy as an existence of an element in two or more forms in the same physical state. - name the allotropes of carbon as graphite and diamond. - describe the manufacture of calcium oxide (quick lime) from calcium carbonate (limestone) in terms of the chemical reaction involved. - state some uses of lime and slaked lime in treating acidic soil and neutralising acidic industrial waste products. - state the uses of calcium carbonate in the manufacture of iron, glass and cement.</p>	<p>- describe the essential conditions for the manufacture of ammonia by the Haber process.</p> <p>- relate their structures to the use of graphite as a lubricant and in diamond cutting.</p>
<p>C13. Organic chemistry</p>	
<p>C13.1 Name of compounds - name, and draw the structure of unbranched alkanes, alkenes, alcohols and acids containing up to four carbon atoms; and the products of the reactions stated in C13.5, C13.6, C13.7, C13.8 below. - state the type of compound present given a chemical name, ending in <i>-ane</i>, <i>-ene</i>, <i>-ol</i> or <i>-oic acid</i> or a molecular structure.</p> <p>C13.2 Fuels - name as fuels coal, natural gas and petroleum. - name methane as the main constituent of natural gas. - describe petroleum as a mixture of hydrocarbons and its separation into useful fractions by fractional distillation.</p>	<p>- name, and draw the structure of unbranched alkanes, alkenes, alcohols and acids containing up to six carbon atoms; and the products of the reactions stated in C13.5, C13.6, C13.7, C13.8 below.</p>