UNIVERSITY OF SWAZILAND

FACULTY OF EDUCATION

MAIN EXAMINATION PAPER

MAY 2017

B. Ed. III AND PGCE

Title of paper : Curriculum Studies in Chemistry II

Course number: EDC379 B.Ed. III

CTE530 PGCE

Time allowed : 3 hours

Instructions :

1. This paper contains FIVE questions
2. Question 1 is COMPULSORY. You may then choose and answer ANY THREE questions from Questions 2, 3, 4, & 5.
3. Marks for each question and sub-question are indicated at the end of the question.
4. Any piece of material or work that is not intended for marking purposes should be clearly CROSSED OUT
5. Ensure that responses to questions are NUMBERED CORRECTLY
6. You may start with any question; however **follow the sequence of sub-questions** within a major question

Special Requirements

One page attachment of SGCSE Physical Science topic ***C8.0 Acids, bases and salts.***

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

QUESTION 1

This question is compulsory

The information in the box below is an extract from a Physical Science textbook that is used in Swaziland. Use the information to answer the questions given below the box.

> ***The reaction of water with gases and liquids to form acids***
>
> ***Activity 1*** *The reaction of water with hydrogen chloride*
>
> ***You will need****: a thermometer, a jar of hydrogen chloride*
>
> *1. Wipe dry the thermometer and place it in a gas jar of hydrogen chloride*
> *2. Observe any changes in thermometer*
> *3. Now dip the bulb of the thermometer in water and place it in the jar of hydrogen chloride gas.*
> *4. Observe any changes in temperature. What is the difference in temperature?*
>
> *The temperature in the second example [*i.e. step 4] *had increased. The heat given off suggests that there is a reaction between the hydrogen chloride and water. The explanation is as follows: Both water and hydrogen chloride are covalent molecules which do not conduct electricity. When hydrogen chloride reacts with water, the solution conducts electricity well. This suggests that ions are formed. An acid, which is normally a neutral molecule, can ionise and form hydrogen ions in the solution as shown by this equation :*
>
> $$HCl_{(aq)} \rightarrow H^{+}_{(aq)} + Cl^{-}_{(aq)}$$
>
> *(aq) means HCl has reacted with the water and is in solution. Ions have formed.*

Answer the following questions:

a) Identify **three** misconceptions displayed in the information given above. Justify your response. [12]

b) What do you understand by misconceptions in the context of learning chemistry? [5]

c) Discuss how you might address the misconceptions identified in (a) above. [8]

[25]

QUESTION 2

a) Chemistry learning is **hierarchical** and **cumulative** in nature (Sirhan, 2007).

With the help of chemistry examples, describe the characteristics of chemistry indicated by the two terms in **bold.** [7]

a) Attached is a section of the SGCSE Physical Science syllabus: Topic ***C8.0 Acids, bases and salts.***

Analyse the syllabus topic and then arrange the **sub-topics** (**only**) in an order that reflects how you might sequence the sub-topics when preparing a scheme of work. Justify the sequence you have generated. [18]

[25]

QUESTION 3

Improvisation provides useful resources for teaching chemistry. Discuss improvisation in the teaching and learning of chemistry, noting the following in your discussion:

The characteristics of improvisation and its purpose [6]

Advantages and limitations of improvisations in the teaching and learning of chemistry [10]

Requirements for successful improvisation [6]

Sources of improvisations [3]

[25]

QUESTION 4

a) Kind (2004) advises that the learning of scientific vocabulary does not guarantee that learners also learn the chemical ideas behind the words.

What are your views on the above statement? Use chemistry examples to support your response. [15]

b) How might a chemistry teacher ensure that pupils learn chemistry ideas behind the scientific vocabulary? [10]

[25]

QUESTION 5

a) Science teachers in Swaziland are sometimes viewed as responsible for problems experienced in their school science departments, and that the said problems may lead to poor performance of learners in SGCSE Physical Science.

Outline, and justify, ways in which science teachers may be responsible for departmental problems in schools. [5]

b) Show how the following may promote learner understanding of chemistry concepts during instruction:

i) Analogies [5]

ii) Relevant contexts [5]

c) Charts are a versatile teaching resource.

Within the context of chemistry, describe the possible uses of charts for instruction; highlighting the precautions to be observed to ensure maximum benefit. [10]

[25]

C7.4 Redox

1. define oxidation and reduction in terms of oxygen/hydrogen gain/loss
2. define oxidation and reduction in terms of electron transfer limited to the formation of binary compounds
3. identify redox reactions
4. show awareness that light can provide energy needed for certain chemical reactions by:
   - describing the use of silver salts in photography i.e., reduction of silver ions to silver
   - stating that photosynthesis leads to the production of glucose from carbon dioxide and water in the presence of chlorophyll and sunlight (energy)

C8.0 Acids, bases and salts

All learners should be able to:

C8.1 Characteristics and properties of acids and bases

1. define acids and bases in terms of proton transfer, limited to aqueous solutions
2. list common examples of acids and bases
3. define alkalis as soluble bases
4. describe the characteristic properties of acids as in their reactions with metals, bases, carbonates and their effect on indicators, e.g., litmus paper, Universal indicator, phenolphthalein
5. describe neutrality and relative acidity and alkalinity in terms of pH (whole numbers only) measured using Universal Indicator and pH chart
6. use the ideas of acidity, alkalinity and neutrality to explain acid/base reactions
7. describe and explain applications of neutralisation e.g. laboratory preparation of salts, use of lime to control acidity in soil and water, and antacids (e.g. bicarbonate of soda) to control stomach acid

C8.2 Types of oxides

1. classify oxides as either basic or acidic related to metallic and non-metallic character of the element forming the oxide.
2. classify other oxides as neutral or amphoteric given sufficient information

C8.3 Preparation of salts

1. describe and prepare soluble salts from bases, carbonates, metals and ammonium salts
2. prepare, separate and purify insoluble salts (see C2.2 – Methods of purification)

C8.4 Identification of ions

describe and use the following tests to identify:

C8.4.1 Aqueous cations

ammonium, calcium, copper(II), iron(II), iron(III) and zinc using aqueous sodium hydroxide and aqueous ammonia as appropriate. (Formulae of complex ions are **not** required)

C8.4.2 Aqueous anions

carbonate (by reaction with dilute acid and then lime water), chloride (by reaction under acidic conditions with aqueous silver nitrate), iodide (by reaction under acidic conditions with aqueous lead(II) nitrate), nitrate (by reduction with aluminium to ammonia) and sulfate (by reaction under acidic conditions with aqueous barium ions)

C8.5 Identification of gases

1. identify carbon dioxide using limewater
2. identify hydrogen using a lighted splint
3. identify oxygen using a glowing splint
4. identify ammonia using damp litmus paper
5. identify chlorine using damp litmus paper

C9.0 The Periodic Table

All learners should be able to:

C9.1 Periodic trends

1. describe the Periodic Table as a method of classifying elements and its use in predicting properties of elements
2. explain, for the first 20 elements, the basis of the Periodic Table using the proton number and the simple structure of atoms

(note that a copy of the Periodic Table will be provided in Papers 1 and 2.

3. describe the relationship between the periodic number and the number of shells
4. describe the trend from metallic to non-metallic character across a Period
5. identify alkali metals, alkaline earth metals, halogens and noble gases