UNIVERSITY OF SWAZILAND

FACULTY OF EDUCATION

MAIN EXAMINATION PAPER

May 2013

B. Ed. III AND PGCE

Title of paper: Curriculum Studies in Chemistry II

Course number: EDC 379

Time allowed: 3 hours

Instructions:

1. This paper contains FIVE questions
2. Question 1 is COMPULSORY. You may then choose ANY THREE questions from Questions 2, 3, 4, and 5.
3. Marks for each 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

Special Requirements

SGCSE Physical Science syllabus (6888) (Chemistry section)

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

QUESTION 1

a) Give, and justify, a sequence for teaching the following sub-topics (see attached Physical Science syllabus 6888 for any additional information).

Hydrogen; Bonding and the structure of matter; Reactivity series; Atomic structure; Extraction of metals [11]

b) Sometimes schools need to improvise to make up for inadequate equipment required to teach various chemistry concepts.

i) Describe improvisation in the context of chemistry teaching. [4]

ii) What **two** precautions might a teacher need to consider when using improvised equipment? [4]

c) Compare and contrast **advance organisers** and **analogies** in the context of the learning of chemistry concepts. [6]

[25]

QUESTION 2

a) Describe **three** functions of concepts in chemistry teaching and learning situations. Use examples from chemistry to illustrate your answer. [12]

b) Suppose your learners display a conception that *there is an increase in mass in chemical reactions that result in the production of a precipitate (solid).*

i) Show, with justification, why the learners' conception may be considered a misconception? [6]

ii) Describe how you might help learners modify this misconception? [7]

[25]

QUESTION 3

a) Language is important in the science classroom because of the various roles it plays in teaching and learning.

Discuss **three** roles language may play in the teaching and learning of chemistry? [7]

b) Suppose you give the passage attached, Sheet A, as reading homework for chemistry learners in your class. [Source: Dube et al. (2008). *Macmillan Physical Science for Southern Africa: Learner's Book.* Macmillan Boleswa) (Pty) LTD Swaziland Manzini p147-148).

i) What challenges might the learners experience while reading and attempting to understand the text in Sheet A? [10]

ii) Construct **three** assessment items you might use to assess leaners' understanding of the content in Sheet A. [8]

[25]

QUESTION 4

a) State **two** purposes of resources in **learning** chemistry concepts. [4]

b) The syllabus section on Topic C11. Electricity and Chemistry, given in the table below, presents two learning outcomes to be attained by learners studying the topic.

C11. Electricity and Chemistry	*Strategy of choice*
All learners should be able to ... • *Outline the manufacture of aluminium from pure aluminium oxide* • *[Outline the manufacture] of chlorine and sodium hydroxide from concentrated aqueous sodium chloride* ...	*Chart* *Practical work*

Suppose you want to use a chart and practical work to assist learners attain the stated outcome, as shown in the chart:

i) Justify the choice of strategy by showing its strengths for the stated learning outcomes. [8]

ii) Describe how you might use the identified strategy to help learners attain the corresponding learning outcome. [8]

c) *Chemistry content is hierarchical, and its learning cumulative.*

What is your view regarding this assertion? [5]

[25]

QUESTION 5

Curriculum development is implemented in stages that include the stages stated below.

Indicate the importance of each stage in developing a chemistry curriculum.

a) Identifying and stating objectives [4]

b) Selecting content [7

c) Selecting teaching and learning experiences and [7]

d) Evaluating the curriculum [7]

[25]

Sheet A

Extraction of aluminium

Aluminium occurs in the earth's crust mainly as alumino-silicates, kaolin or china clay, $Al_2Si_2O7 \cdot 2H_2O$; mica or feldspar, $K_2Al_2Si_6O_{16}$ as the oxide and in the hydrated form known as bauxite $Al_2O_3 \cdot 2H_2O$. It also occurs as cryolite, Na_3AlF_6 or sodium aluminium fluoride. Aluminium is extracted by electrolysis from its ore called bauxite, which is reddish brown in colour. Bauxite is a mixture of impurities and aluminium.

To obtain pure oxide (alumina) the bauxite, hydrated aluminium oxide, $Al_2O_3 \cdot 2H_2O$ is dissolved in sodium hydroxide solution under pressure forming sodium aluminate – $NaAl(OH)_4$. The solution is filtered

and then seeded with pure aluminium oxide. This seeding causes the aluminium hydroxide to crystallise in a pure state. Subsequent heating to 1 200 °C in rotary kilns produces pure aluminium oxide.

The equations for the reactions are as follows:

$$Al_2O_{3\,(s)} + 3H_2O_{(\ell)} + 2NaOH_{(aq)} \rightarrow NaAl(OH)_{4\,(aq)}$$
(sodium aluminate)

$$NaAl(OH)_{4\,(aq)} \rightarrow NaOH_{(aq)} + Al(OH)_{3\,(s)}$$
(aluminium hydroxide)

$$Al(OH)_{3\,(s)} \rightarrow 3H_2O_{(g)} + Al_2O_{3\,(s)}$$
(aluminium oxide)

The pure oxide is dissolved in molten cryolite Na_3AlF_6 and the mixture acts as the electrolyte in the cell below. The aluminium is deposited at the cathode which is the carbon lining of the container. Oxygen is evolved at the carbon anodes.

Liquid aluminium metal collects at the bottom of the steel container and it tapped off.

$$Al^{3+} + 3e^- \rightarrow Al_{(s)}$$

Oxygen bubbles out at the anode and some carbon dioxide also bubbles out from the anode

$$2O^{2-} \rightarrow O_{2\,(g)} + 4e^-$$

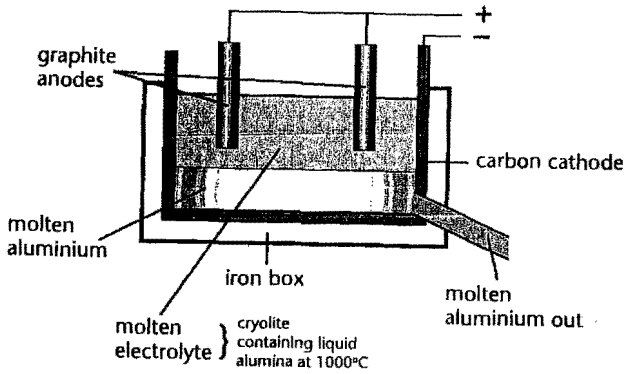

Figure 2 Electrolytic extraction of aluminium from its oxide