



**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY  
SCHOOL OF BIOLOGICAL, PHYSICAL MATHEMATICS AND ACTUARIAL SCIENCES  
BACHELOR OF EDUCATION (SCIENCE) WITH IT  
THIRD YEAR FIRST SEMESTER EXAMINATIONS**

**ECB 2331 (ECT 333): SPECIAL METHODS OF TEACHING CHEMISTRY**

**UNIVERSITY EXAMINATIONS: 2021/2022 ACADEMIC YEAR**

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**EXAM VENUE:**

**STREAM: (BEd. Science)**

**DATE:**

**EXAM SESSION:**

**TIME: 2.00 HOURS**

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**Instructions:**

- 1. Answer question 1 (Compulsory) in Section A and ANY other 2 questions in Section B.**
- 2. Candidates are advised not to write on the question paper.**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room.**

**ANSWER ALL QUESTIONS IN SECTION A AND ANY TWO QUESTIONS IN SECTION B**

**SECTION A: ANSWER ALL QUESTIONS**

**QUESTION 1 (COMPULSORY) (30 MARKS)**

Attached is Form IV second term chemistry topics that should be taught in a period of 12 weeks. Outline a scheme of work that would help you as the subject teacher to deliver this content effectively. [30 marks]

**FORM IV SECOND TERM CHEMISTRY TOPICS (KCSE SYLLABUS [14 WEEKS])**

**Topic 1: Electrochemistry (25 Lessons)**

**1.1 Redox reactions**

- Electron transfer (gain and loss of electrons)
- Determination of oxidation numbers
- Use an illustration of iron(II) (acidified with dilute sulphuric acid) to iron(III) with hydrogen peroxide.
- Identify reactant. Iron(II)(aq), and product Iron (III) (aq), with hydroxide ion. Other examples; sodium/water magnesium/dilute acid (hydrochloric acid/sulphuric acid)

**1.2 Displacement reactions; (as redox reactions)**

- Reducing power
  - Reaction of metal/metallic cation ( $M/M^{2+}$  (aq)). Calcium, magnesium, zinc, iron, lead, copper.
- Oxidizing power of halogens chlorine, bromine and iodine only.

**1.3 Electrochemical cell**

- Qualitative treatment of the electron flow in:  $Zn(s) | Zn^{2+}(aq) || Cu^{2+}(aq) | Cu(s)$  cell.

**Note:** Conventions, vertical line (|) represents a phase boundary where a potential difference develops e.g.  $Zn | Zn(aq)$ ; two vertical parallel lines (||) represent salt bridge.

**1.4 Electrochemistry**

- The role of water in electrolysis
- Preferential discharge in electrolysis of the following solutions:
  - Sodium chloride
  - Dilute sulphuric acid (acidified water).
  - Magnesium sulphate
  - Electrolysis of copper ( sulphate using graphite and copper electrodes. (product changes in electrolytes)
- Factors affecting preferential discharge
  - Quantitative treatment of electrolysis (Note: First Faraday's law only).

**Topic 2: Metals (20 Lessons)**

**2.1 Metals: methods of extraction:**

- Chief metal ores of: sodium, aluminium, zinc, iron, copper and lead

- General methods of extraction (electrolysis and reduction)
- The electrolytic production of sodium and aluminium
- Extraction of iron, copper, and zinc from their ores.

## 2.2 Properties of Metals (sodium, aluminium, iron, copper and zinc):

- Physical properties (melting point, boiling point, thermal and electrical conductivity, density, malleability and ductility)
- Chemical properties (reaction with air, water, chlorine, dilute hydrochloric acid and oxidizing acids (concentrated nitric and sulphuric acid))

(Note: the reaction of sodium and dilute acid is explosive)

## 2.3 Uses of metals and their alloys (alloys: brass, bronze, steel, duralumin)

- construction (air craft, bridges etc.),
- electrical materials (copper)

## 2.4 Pollution effect of the industrial production of metals on the environment

## 2.5 Projects

- Analysis of ores
- Construction of a mini-blast furnace
- Carrying out iron - smithing

## Topic 3: Radioactivity (10 lessons)

### 3.1 Stability of isotopes of elements

- Stability of isotopes of elements
- Radioactivity, types of radiation, (alpha (a), beta (b) particles and gamma (g) rays; characteristics and properties
- Radioactive decay as measured by half-life ( $t_{1/2}$ ), calculations involving half- life ( $t_{1/2}$ )
- Nuclear equations: changes in nuclei resulting from radioactive decay by alpha (a), beta (b) particles and gamma (g) rays
- Qualitative treatment of fission and fusion
- mention nuclear reactions as source of energy

**NB:** Nuclear reactions are different from chemical reactions.

### 3.2 Applications

Uses and importance of radioisotopes in chemistry, medicine, carbon dating and agriculture.

### 3.3 Pollution effects of radioactivity

Dangers of radio isotopes Environmental pollution e.g. the chernobyl disaster, titanium mining in Kwale

## QUESTION 2 (20 MARKS)

- a. State and explain **FIVE** philosophical questions related to the teaching chemistry [10 marks]
- b. With reference to **FIVE** counts, explain why teaching/learning resources form an

integral part of teaching/learning process.

[10 marks]

### **QUESTION 3 (20 MARKS)**

- a. Outline the philosophy of Chemistry sine Aristotle's time. [10 marks]
- b. Explain the following FOUR main approaches of teaching [10 marks]
- i. Expository
  - ii. Heuristic
  - iii. Inductive-deductive
  - iv. Teaching-complex

### **QUESTION 4 (20 MARKS)**

- a. Briefly explain any FIVE psychosocial factors a Chemistry teacher should understand [10 marks]
- b. Briefly explain the storage, safety and use of Chemicals in a Chemistry Laboratory [10 marks]

### **QUESTION 5 (20 MARKS)**

- a. Briefly explain any FIVE circumstances that may lead a teacher to employ demonstration to deliver a lesson [10 marks]
- b. Outline FIVE pre-requisites for a successful class experiment. [10 marks]

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