

**UNIVERSITY OF ESWATINI**  
**FACULTY OF EDUCATION**  
**MAIN EXAMINATION PAPER**  
**PGCE-FT/IDE-PGCE**

**October 2021**

**Course Code/Title of paper:** CTE530 Curriculum Studies in Chemistry II  
IDE-CTE530 Curriculum Studies in Chemistry II

**Time allowed:** 3 hours

**Instructions:**

1. This paper contains FIVE questions.
2. Question 1 is COMPULSORY, so you must attempt it.
3. You may then choose, and answer, ANY THREE questions from Questions 2, 3, 4, and 5.
4. Marks for each question and sub-question are indicated at the end of each question/sub-question.
5. Any piece of material or work that is not intended for marking purposes should be clearly **CROSSED OUT**.
6. Ensure that responses to each question have the same number as the question and are not intercepted by responses to other questions.
7. Maintain the sequencing of sub-questions within a question in your responses.

**Special Requirements Information sheets:**

**Appendix A: EGCSE Physical Science Topic Organic chemistry**

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

## QUESTION 1

This question is compulsory

- a) Below is a section of the EGCSE Physical Science syllabus on the sub-topic **C9.3 Speed of reactions**. Study the **content** to be learned from the sub-topic and then answer the questions that follow below it.

### C9.0 Chemical reactions

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### C9.3 Speed of a reaction

All learners should be able to:

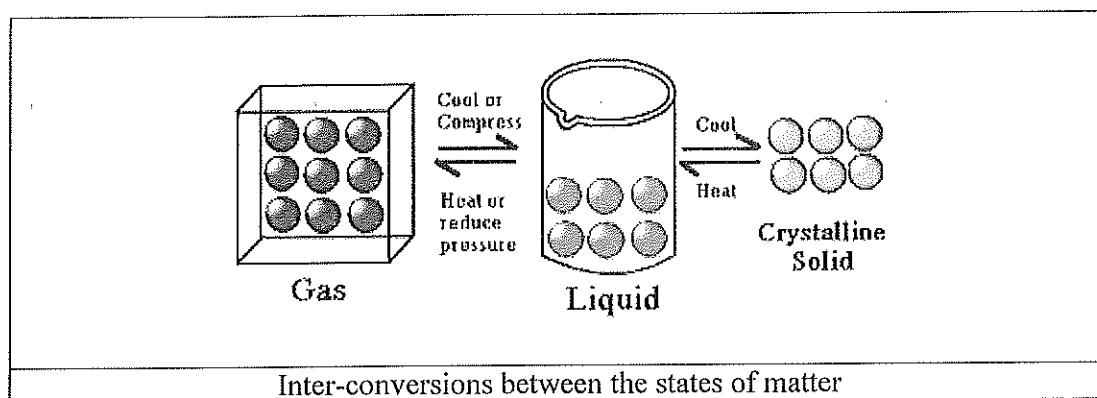
1. define speed of a reaction
2. define a catalyst
3. classify catalysts into inorganic and organic (enzymes)
4. investigate the effect of concentration, particle size, catalysts (including enzymes) and temperature on the speed of reactions
5. plot graphs and interpret data obtained from experiments concerned with speed of a reaction
6. explain the effect of concentration, particle size, catalysts (including enzyme) and temperature on the speed of reactions in terms of the collision theory
7. describe the application of the above factors to the danger of explosive combustion with fine powders (e.g. flour mills) and gases (e.g. mines)
8. devise and explain a suitable method for investigating the effect of a given variable on the speed of a reaction.

- i) What do you understand by the term “concepts” in the context of chemistry? [3]
- ii) For the content in sub-topic C9.3 shown above:
- (1) Identify and list new concepts to be learned [3]
- and
- (2) Identify, and list, pre-requisite concepts required to learn the new concepts [*it is not necessary to align the pre-requisite concept to each new concept*] [3]
- b) Eswatini has since placed English at the same level as other school subjects. It is no longer a “failing subject”, yet the medium of instruction continues to be English.
- What justifications may be used for the continued use of English as a language of instruction for Chemistry (and other subjects) in Eswatini? [8]
- c) Why might it be important for a Chemistry teacher to be aware of the reasons behind the under-representation women in science fields? [5]

- d) Planning for a chemistry lesson comprises a written part and unwritten part. State **three** things a chemistry teacher has to plan for that are not stated in the lesson plan. [3]

### QUESTION 2

- a) Describe fully **three** functions of concepts in learning chemistry, and indicate their implications for teaching chemistry for understanding. [15]
- b) Suppose your learners accessed the diagram below while searching the internet, and used it to appreciate, at particle level, the changes that take place when matter changes from one state to another. Analyse the diagram and then answer the question below it.



What conceptions might learners develop from studying the diagram? Classify these as *appropriate* conceptions or *inappropriate* conceptions. [10]

### QUESTION 3

The language of instruction plays an important communicative role in learning Chemistry. However, learners in Eswatini may experience problems with learning Chemistry in English—a second language, as well as learning the language of Chemistry.

- a) Using relevant examples, describe the communicative role of the language of instruction in the teaching and learning of chemistry. [6]
- b) Discuss the challenges learners may experience from:
- Learning chemistry in English, a second language [8]
  - The language of Chemistry [11]

#### QUESTION 4

- a) Below is a section of the JC Science syllabus. Study the content and then answer the questions that follow below it.

##### 14.3 Environmental pollution and conservation

- (a) state the human activities which bring about water pollution (fertilisers and industrial/household waste), land pollution (non-biodegradable waste), and air pollution (smoke, motor car exhaust fumes, dust from industries, pesticides and herbicides)
- (b) explain the effects of water, land and air pollution (including global warming)
- (c) define conservation as maintenance and protection of a habitat or species

In the context of Eswatini environment, use the information provided in the syllabus section given above to discuss how:

- i) Science and technology affect society; [10]
- ii) Society affects science and technology. [10]
- b) Why might it be important for a Chemistry teacher to be aware of the reasons for the under representation women in science fields? [5]

#### QUESTION 5

- a) A chemistry teacher is required to carry out a **syllabus analysis** and a **topic analysis** prior to preparing a scheme of work for a given syllabus.
- i) Describe each of the **bolded** terms, and show how they benefit the process of preparing a scheme of work. [9]
- ii) Why is it necessary to specify the teaching and learning resources at the time of preparing a scheme of work? [4]
- b) Study the EGCSE –Physical Science syllabus sub-topics under Organic chemistry provided in Appendix A.

Using only the sub-topics from the syllabus content provided in Appendix A, suggest and justify, a sequence for teaching the sub-topics in the Topic Organic chemistry. [12]

**End of questions. Next is Appendix A.**

## Appendix A: [For use with Question 5]

### EGCSE Physical Science Topic Organic chemistry

#### 1.0 Uses of petroleum fractions

1.1 name the uses of the fractions:

- liquefied petroleum gas, as a fuel for cooking
- petrol in petrol engines
- the paraffin fraction in oil stoves and aircraft fuel
- the diesel fraction for fuel in diesel engines
- the lubricating fraction for lubricants and making waxes and polishes
- bitumen for making roads

1.2. discuss the hazards associated with the use of petroleum fractions in terms of flammability and harm to the environment

#### 2.0 Name of compounds

2.1. 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 C14.5 -C14.8

2.2. distinguish between the molecular and structural formula of alkanes, alkenes, alcohols and acids

2.3. state the type of compound present given a chemical name, ending in *-ane*, *-ene*, *-ol* or *-oic acid* or a molecular structure

#### 3.0 Fuels

3.1. name as fuels coal, natural gas and petroleum

3.2. name methane as the main constituent of natural gas

3.3. describe petroleum as a mixture of hydrocarbons and its separation into useful fractions by fractional distillation

#### 4.0 Alkenes

4.1. describe the catalytic and thermal cracking of alkanes

4.2. explain why cracking of longer chain alkanes to manufacture alkenes and hydrogen is an important industrial process

4.3. describe the properties of alkenes in terms of:

- (a) combustion,
- (b) addition reactions with
  - bromine
  - hydrogen
  - and steam

#### 5.0 Carboxylic acids

5.1. describe the formation of ethanoic acid by the

- oxidation of ethanol using potassium dichromate(VI)
- the action of atmospheric oxygen

5.2. describe the reaction of ethanoic acid with ethanol to give an ester (ethyl ethanoate), a sweet-smelling compound

5.3. draw the structure of ethyl ethanoate

5.4. identify the ester linkage structure in ethyl ethanoate

5.5. state the uses of esters as components of flavouring and perfumes

## 6.0 Alkanes

- 6.1 describe the properties of alkanes (exemplified by methane) as being generally unreactive, except in terms of burning
- 6.2. predict the structures of longer-chained alkanes given the number of carbon atoms
- 6.3. explain physical trends in their density, state of matter, melting and boiling points

## 7.0 Alcohols

- 7.1. describe the formation of ethanol by the catalytic addition of steam to ethene
- 7.2. describe the formation of ethanol (and carbon dioxide) by fermentation and its importance to the wine and brewing industry
- 7.3. describe the properties of alcohols in terms of combustion and dehydration
- 7.4. state the uses of ethanol as:
  - a solvent
  - a fuel
  - for sterilization
  - as a constituent of alcoholic beverages
- 7.5. state the advantage of using alcohol as a fuel over petrol

## 8.0 Macromolecules

- 8.1. describe macromolecules (polymers) in terms of large molecules built up from small units (monomers), different macromolecules having different units and/ or different linkages
- 8.2. classify macromolecules as man-made/synthetic (poly(ethene), terylene, nylon) and natural (fats, proteins, carbohydrates)
- 8.3. state the monomers of the natural and synthetic macromolecules (carbohydrates, fats, nylon, poly(ethene), proteins and terylene)
- 8.4. describe the formation of poly(ethene) as an example of addition polymerisation of monomer units
- 8.5. explain why non-biodegradable plastics cause serious pollution problems
- 8.6. describe the formation of carbohydrates, fats and proteins, nylon and terylene macromolecules as examples of condensation polymerisation
- 8.7. draw part - structures of the following macromolecules (at least four monomer units):
  - poly(ethene),
  - nylon,
  - terylene,
  - fats,
  - proteins
  - and carbohydrates macromolecules
- 8.8. identify monomers from the structures of given macromolecules with reference to structures in C14.9.7

## 9.0 Homologous series

- 9.1. describe the homologous series as a 'family' of similar compounds with similar properties due to the presence of the same functional group
- 9.2. describe the general characteristics of a homologous series