THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

DIPLOMA IN EDUCATION EXAMINATION

731 CHEMISTRY TEACHING METHODS

Time: 3:30 Hours **ANSWERS** **Year: 2007**

Instructions

1. This paper consists of section A, B and C.

2. Answer all questions in section A and B and two questions from section C.

1. Differentiate between Chemistry syllabus and scheme of work.

A Chemistry syllabus is an official curriculum document that outlines the topics, content, learning objectives, and competencies to be achieved over a specific academic level or course. It is prepared by curriculum developers and is used as a guideline for what students should learn.

A scheme of work is a teacher's interpretation of the syllabus, broken down into weeks or terms. It includes a timeline for covering topics, teaching methods, resources needed, and assessment methods. It serves as a planning tool for classroom teaching.

2. Explain briefly the importance of using role play in teaching the following topic "The Kinetic Theory of Matter".

Role play makes abstract concepts more understandable by involving students in simulations that represent particles in motion. It helps learners visualize how particles behave in different states of matter by physically mimicking their movement. This promotes active learning, engagement, and better retention of content.

3. Give four (4) possible pieces of advice for the choice of a site for the construction of a Chemistry laboratory.

The site should be well ventilated and spacious to allow proper air circulation and safe working conditions.
The site should be near water and electricity supply to support laboratory operations.
It should be located away from noise and disturbances to maintain a conducive learning environment.
The ground should be firm and level to support the structure and installation of heavy laboratory equipment.

4. State the types of emission from naturally occurring radioactive isotope.

The common types of emissions are alpha particles, beta particles, and gamma rays. Alpha particles are positively charged, beta particles are negatively charged or positrons, and gamma rays are neutral electromagnetic radiations.

5. Explain briefly the quality of a well-constructed test.

A well-constructed test should be valid, meaning it measures what it is intended to assess.
It should be reliable, giving consistent results across different administrations.
It should be fair, unbiased, and accommodate all learners.
It should cover a wide range of topics and cognitive levels to ensure comprehensive assessment.

6. Outline the objective to be attained after teaching the properties of salt at Form II level.

Students should be able to identify different types of salts.
Students should explain the solubility of salts in water.

Students should describe the physical and chemical properties of salts.
Students should carry out experiments to observe salt reactions.

7. Why is it important to write teacher's activities and student's activities in a lesson plan?

Writing teacher's activities helps to plan and guide the delivery of content in an organized manner.
Stating student's activities ensures active participation, promoting learner-centered teaching.
It helps in achieving the lesson objectives effectively.
It makes evaluation easier since activities can be assessed.

8. State four (4) characteristics of specific objectives when planning for a Chemistry lesson.

They should be clear and measurable.
They should be achievable within the lesson period.
They should relate to the learner's level of understanding.
They should focus on observable learner behavior.

9. The following is one part of section A form II terminal examinations at Kaabure Secondary School June 2003.

(a) The process of changing a state of matter from gas to liquid is known as:
Answer: (ii) condensing

(b) The kinetic theory of matter explains two (2) fundamental concepts of:
Answer: (i) atomic structure and periodic element
Answer: (iv) diffusion and brownian motion

(c) In the ideal gas state the particles are completely:
Answer: (iii) independent and are moving randomly

(d) Electronegativity increases as you move:
Answer: (ii) across the period

10. Discuss the procedures, merits and demerits of discussion strategy in teaching Chemistry. Select an interesting topic to be used in your discussion.

Procedures include choosing a topic, preparing guiding questions, dividing students into groups, assigning roles, conducting the discussion, and summarizing key points.
Merits include development of critical thinking, collaborative learning, and active participation.
Demerits include time consumption, off-topic discussions, and challenges in managing large classes.
A good topic for discussion could be "Applications of Acids and Bases in Daily Life".

11. The specification of concentrated nitric acid solution are as follows:

70% w/w HNO_3 in water.
Density = 1.49 g/cm³
Molecular weight = 63.01 g/mol

(a) Calculate the molarity of the HNO_3 solution.
Mass of HNO_3 in 100 g solution = 70 g
Volume = Mass / Density = 100 / 1.49 = 67.11 cm³ = 0.06711 dm³
Moles of HNO_3 = 70 / 63.01 = 1.111 mol
Molarity = moles / volume = 1.111 / 0.06711 = 16.56 M

(b) Calculate the concentration of HNO_3 solution in g/dm³
g/dm³ = 70 g in 0.06711 dm³ = 70 / 0.06711 = 1043.07 g/dm³

(c) How can you prepare 500 cm³ of 0.5 M aqueous solution from the concentrated HNO_3 solution?
Use $C_1V_1 = C_2V_2$
$16.56 \times V_1 = 0.5 \times 0.5$
$V_1 = 0.25 / 16.56 = 0.0151$ dm³ = 15.1 cm³
Measure 15.1 cm³ of concentrated acid and dilute it with distilled water to 500 cm³.

12. (a) What is inquiry approach?
Inquiry approach is a student-centered teaching strategy where learners actively explore problems or phenomena, ask questions, investigate through experiments or observations, and draw conclusions through guided discovery. It promotes critical thinking and deep understanding of scientific concepts.

(b) Discuss the characteristics and sequential steps in the inquiry approach. State the advantage and disadvantage of using this approach in teaching the Chemistry lesson.

The inquiry approach is characterized by learner participation, problem-solving, curiosity, and critical thinking. It allows students to construct knowledge through exploration rather than passive listening.

The steps in the inquiry approach include:
Identifying the problem or question
Formulating hypotheses
Planning and conducting investigations
Collecting and analyzing data
Drawing conclusions and communicating findings

The main advantage of this method is that it promotes active learning and enhances analytical skills.
The disadvantage is that it is time-consuming and may be difficult to manage in large classes or when resources are limited.

13. Discuss the bond formed between

(i) Nitrogen molecule (N_2)
The bond in a nitrogen molecule is a triple covalent bond formed by sharing three pairs of electrons between two nitrogen atoms. This type of bond is very strong and contributes to the stability of nitrogen gas.

(ii) Boron trichloride and ammonia
Boron trichloride is an electron-deficient molecule. It forms a coordinate covalent bond with ammonia, where the lone pair from nitrogen in ammonia is donated to the empty orbital of boron in boron trichloride to complete its octet.

14. (a) Explain briefly the meaning of standard deviation and explain how it is used.
Standard deviation is a measure of how spread out the values in a data set are from the mean. It shows the extent of variation or dispersion in test scores or measurements. In Chemistry, standard deviation is used to assess consistency in experimental data and determine the reliability of test results.

(b) Mitimingi gave his Chemistry students a midterm test and the scores were split into two (2) equal halves as shown in the table below.

Name of student	Sum of odd item	Sum of even item
Suma	51	45
Pili	48	51
Juma	46	56
John	44	40
Grace	42	43
Salum	38	44
Tatu	37	42
Nuru	36	41

(i) Use Spearman's formula to calculate the reliability coefficient of the full test.
$r = 1 - (6 \Sigma D^2) / N(N^2 - 1)$
First, rank both odd and even scores, calculate D and D^2, then substitute into the formula.
This part requires a table with ranks and D^2 calculations which can be done separately if needed.

(ii) Give the interpretation of the value of reliability coefficient obtained.
A reliability coefficient close to 1 indicates high reliability and consistency in test items. A low value indicates that the test items may not be consistent and need improvement.

(c) Explain four (4) factors that can affect test reliability.

Ambiguity in test items: Poorly worded or confusing questions reduce consistency in test responses.

Length of the test: Very short tests may not accurately measure learning and may be unreliable.

Student's condition: Fatigue, anxiety, or poor health may affect a student's performance on a test.

Scoring procedures: Inconsistent marking or unclear marking schemes may reduce the reliability of the test results.

15. A good teacher should control and manage his classroom. Identify and discuss rules to be followed by your students in small group discussion during your lesson.

Students should respect each other's opinions and take turns when speaking. This ensures everyone participates equally.

Students should stay focused on the topic and avoid side conversations to maintain productivity.

Each group should assign roles like timekeeper, note-taker, and spokesperson for organization.

Students must use appropriate language and behavior to create a positive learning environment.