NATIONAL UNIVERISTY OF LESOTHO

B. SC. ED. EXAMINATIONS

SCE 3302: PRINCIPLES OF SCIENCE AND MATHEMATICS INSTRUCTION

JUNE 2023 **MARKS: 100** **TIME: 3 HOURS**

INSTRUCTIONS: ANSWER ANY **FOUR** OF THE FIVE QUESTIONS

EACH QUESTION CARRIES 25 MARKS

DO NOT OPEN THIS SPACE UNTIL YOU HAVE BEEN TOLD TO DO SO BY EXAMINATION OFFICER

Question 1

(a) Discuss **three** reasons why a science teacher needs a strong knowledge of Nature of Science. [6]

(b) *'Scientific knowledge is Methodical'.*

(i) With the use of appropriate examples, **explain** what is meant by this statement. [4]

(ii) With the use of appropriate example from your subject area, discuss what the statement implies for your teaching of Science. [5]

(c) Describe a *Cause-to-Effect* type of analogy. Provide an example. [3]

(d) Use a Glynn's (2007) TWA model to design and describe an analogy for teaching a topic of your choice. Show all the steps of your design. State the type of analogy you have designed. [7]

Question 2

(a) With an emphasis on effective communication, explain what each of the following stages of communication entail: ***message; encoding; context***.
Make an appropriate example with a specific concept from your subject area. [10]

(b) (i) State and describe one type of barrier to effective communication. [2]

(ii) With an appropriate example from your subject area, explain how you would overcome this type of a barrier in your Science/Mathematics classroom. [6]

(c) Describe ***physical simulations*** as they apply in teaching and learning.
Use a specific example from your subject area to demonstrate how physical simulations can be used effectively in teaching a concept of your choice. [7]

Question 3

(a) Choose an appropriate topic from your subject area (at Grades 8 or 9 level) and show clearly how you would develop a specific concept through the use of *Principle 1 (Problem centered).*
Clearly indicate critical attributes, non-critical attributes and shared attributes. [10]

(b) Distinguish between Problem-Based Learning (PBL) and Inquiry-based teaching/learning. Provide appropriate examples in each case. [7]

(c) (i) Describe a *One teach One assists* type of co-teaching as it may apply in the Mathematics/Science classroom teaching. [1]

(ii) Design and clearly describe a classroom teaching scenario in which you use the *One teach One assist* co-teaching while teaching a specific concept of your choice.
Clearly indicate roles and activities of each teaching-partner and the learners. [4]

(iii) Suggest one possible drawback that could arise from a classroom in which this type of co-teaching is used, and suggest strategies you could use to prevent or mitigate it. [3]

Question 4

(a) (i) One of the distinguishing characteristics between assessment and evaluation is that *'the purpose of assessment is formative, i.e. to improve quality, whereas evaluation is all about judging the quality, hence the purpose is summative*'.
Elaborate further on this statement by providing appropriate examples related to the teaching profession. [6]

(ii) State and describe any two types of evaluation as it applies to teaching and learning of Science/Mathematics. [2]

(b) One of the essential tasks a Mathematics/Science teacher has to perform prior to the teaching process is the evaluation of a learner's textbook.

(i) Discuss one important purpose of this task. [4]

(ii) The pre-evaluation criteria for learner's textbook include, among others, two domains: *Language content* and *Learner appeal*.
Elaborate on each of the two domains, and explain how accurate consideration of each can assist in the effectiveness of your teaching. [8]

(c) State and describe one type of a test item.
Describe a most suitable teaching strategy you would use to prepare your students for this type of test item. [5]

Question 5

(a) (i) State and describe the two camps of Constructivism. Use appropriate examples to clarify your description. [6]

(ii) Discuss at least three educational implications (*in terms of Teaching strategies, and Learning practices*) for a constructivist teaching practice. [10]

(b) State and elaborate on any two ***test-item components*** which are always present in all types of test items. [5]

(c) Discuss two implications that teacher's understanding of Nature of science have on his/her teaching of Science. [4]