NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF SCIENCE AND TECHNOLOGY EDUCATION
DEPARTMENT OF SCIENCE, MATHEMATICS AND TECHNOLOGY EDUCATION

ASSESSMENT IN SCIENCE, MATHEMATICS AND TECHNOLOGY EDUCATION

PST6205

Supplentary Examination Paper **December 2024**

Time Allowed:	**3 hours**
Total Marks:	**100**
Special Requirements:	**1. Statistical Tables** **2. Drawing instruments** **3. Scientific Calculator**
Internal Examiner:	**Prof N Phuthi**
External Examiner:	

INSTRUCTIONS AND INFORMATION

1. **Answer ALL Questions in Section A and any THREE questions in Section B.**
2. **This Examination Paper consists of 7 printed pages and 20 questions.**
3. **It is to your best interest to use neat and legible handwriting.**

MARK ALLOCATION

	QUESTION NUMBER	ALLOCATED MARKS
Section A	1 – 15	25
Section B	16	25
	17	25
	18	25
	19	25
	20	25

SECTION A

1. **Answer all questions in this section**
2. **The first 10 questions (20 marks) consist of TWO parts each, the ASSERTION and the REASON. Answer both parts by writing down ONLY the letters corresponding to your chosen answers.**

	Assertion	Reason
1.	In STEM education, the achievement test is used for measuring: A. Maximum performance B. Minimum performance C. Performance D. None of the above	A. Achievement is specific B. Achievement is absolute C. Performance varies from low to high D. Performance is achievement
2.	The continuous and comprehensive evaluation of STEM learning content is: A. Evaluation of all aspects of STEM content B. Formative and summative evaluation C. Frequent oral, written and practical tests D. Daily assessment during STEM teaching	A. Evaluation takes place at the end B. Assessment is learning in action C. Continuity of learning is achieved D. This covers more evaluation
3.	Construct validity refers to _____. A. How well an instrument compares with a second assessment concurrently done B. The degree to which an instrument can forecast an outcome C. A logic link between research instrument and objective D. The degree to which scores on the instrument are indicative of a theoretical concept	A. To link with concurrent validity B. To link with predictive validity C. To link test with what it claims to measure D. To link with what has been measured
4.	Which of the following is limited to the quantitative description of the pupil's performance? A. Test B. Measurement C. Assessment D. Evaluation	E. It occurs all the time F. It is done at specific times G. It provides a basis for comparison H. It limits the areas of performance
5.	The purpose of evaluation is to make ..... A. Decisions B. Predictions C. Judgements D. Opinions	A. Evaluation covers one learning activity B. Evaluation is ongoing C. Evaluation leads to future action D. Evaluation changes people's opinions
6.	The first step in educational measurement is: A. Deciding what to measure B. Determining the Method of measurement C. Checking what is measured D. None of the above	A. Educational measurement is wholesome B. Linking measurement to objectives C. Making sure all steps are followed D. Using traditional tests

7. The main objective of continuous assessment is _____.
   A. to help teacher complete the syllabus
   B. to lay emphasis on thought processes and de-emphasize memorisation
   C. to satisfy parents with children's progress
   D. to award certificates to learners

   A. learning must be organised and complete
   B. continuous assessment is regular and covers several skills
   C. learners prefer examinations
   D. parents and guardians want certificates

8. Which one is true of a standard normal distribution?
   A. Mean = variance = 1
   B. Standard deviation = variance = 0
   C. Mean = 0, Variance = 1
   D. Mean = standard deviation

   A. The variance does not change
   B. The mean is fixed and the variance changes
   C. The variance is the square of the standard deviation
   D. The mean changes

9. Which of the following is a procedure for verifying the internal consistency of the reliability of a measure?
   A. The split-half technique
   B. Parallel forms of the same test
   C. Test/retest
   D. None of the above

   A. Internal consistency involves comparing different tests
   B. Reliability works with validity
   C. Parallel and test/retest are popular
   D. There is the least variability for respondents

10. Which of these tools does not seem to be good for formative assessment?
   A. Criterion-referenced test
   B. Conversation
   C. Quizzes
   D. Group discussions

   A. Formative assessment measures success
   B. Formative and summative assessment complement each other
   C. This is a terminal assessment
   D. Conversations are good tools

11. Continuous assessment should NOT be implemented:
   A. To compare and publicly rank students against one another
   B. To improve the overall teaching-learning process
   C. To cause undue stress and anxiety among students for their performance
   D. To monitor and support the holistic development of students

12. To make 'Formative Assessment' a fruitful and engaging experience, one should be mindful of:
   A. Implementing various methods to track the student's progress in both academic and co-curricular areas
   B. Using complex technical language during feedback sessions.
   C. Making direct comparisons between the performances of different students.
   D. Labelling students as 'high-achievers' or 'average-learners' based on their performance

13. The following are targets for teaching and learning.

i. To rank students strictly based on their academic performance in examinations.
ii. To understand the student's strengths and areas of improvement beyond academics.
iii. To monitor the student's progress in various aspects over a period of time.
iv. To engage parents in understanding their child's holistic development.

Which of the above should be the reasons for the continuous assessment of students?

A. (i), (ii), (iii)
B. (ii), (iii), (iv)
C. (iii), (iv)
D. (i), (ii), (iii), (iv)

14. Analyse the following statements and select the correct explanation below:

Assertion (A): School-based assessments should be integrated as a part of the school curriculum.
Reason (R): A single final examination does not allow for continuous evaluation of a student's comprehension and improvement.

A. Both (A) and (R) are true and (R) is the correct explanation of (A).
B. Both (A) and (R) are true but (R) is not the correct explanation of (A).
C. (A) is true and (R) is false.
D. Both (A) and (R) are false

15. Study the table below and answer the question:

Concepts In Assessment	Some Types Of Assessment
(I) Assessment at the end of a course.	(a) Formative assessment
(II) Assessment during learning process.	(b) Self-assessment
(III) Assessment of own skills and knowledge.	(c) Summative assessment

Which of the following pairs show correct matching?

A. (I, a) and (II, b)
B. (III, a) and (II, c)
C. (II, a) and (I, c)
D. (II, c) and (III, b)

SECTION B

1. **Answer any THREE questions in this section.**
2. **All questions carry equal marks.**
3. **Begin each question on a fresh page and keep all parts of the same question together.**

Question 16

Figure Q16 is a diagram of a model showing two forms of assessment in science education.

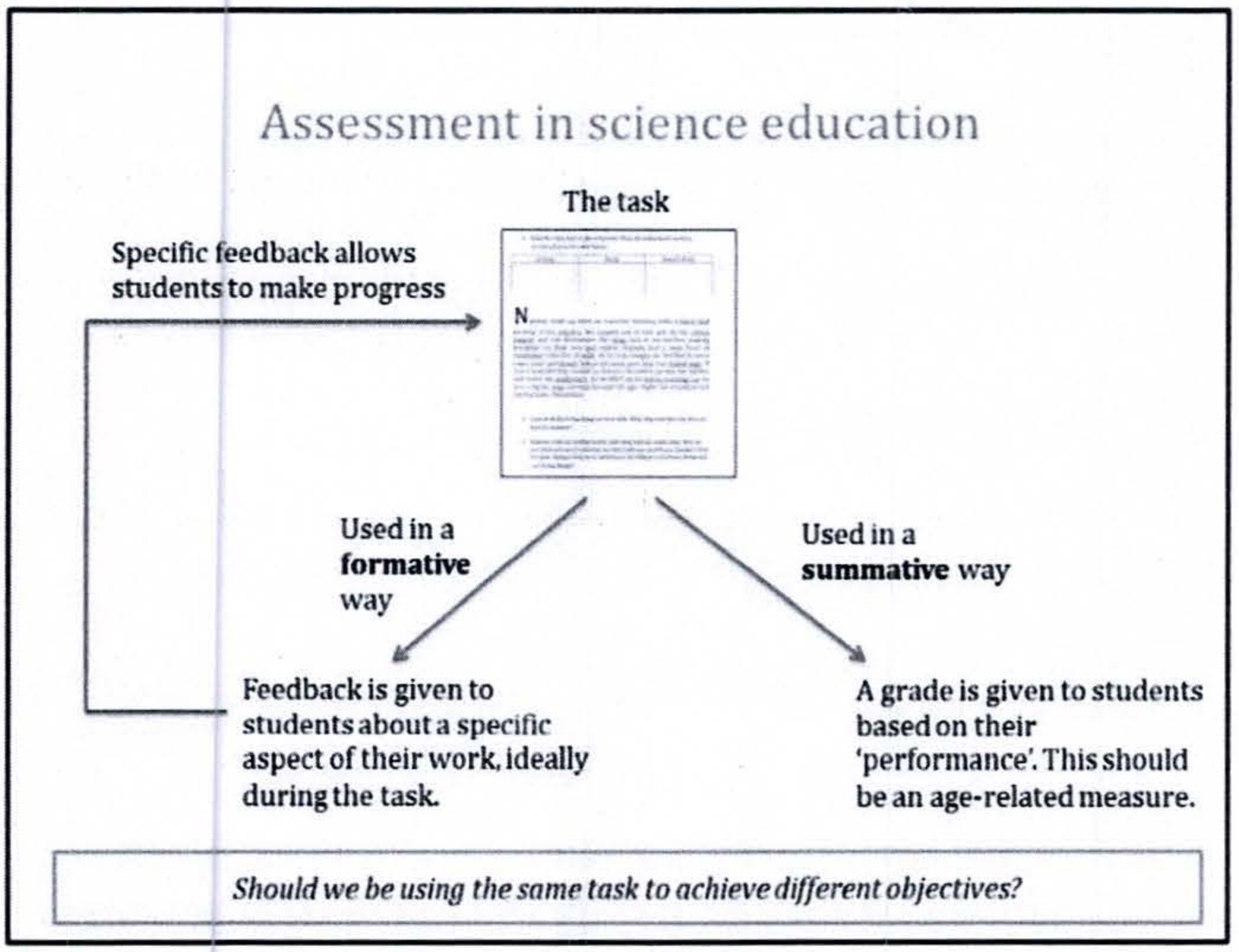

Fig Q16: Assessment in Science Education

(a) Discuss the role of 'feedback' as it is portrayed in this model. Make special reference to negative and positive feedback to a specified 'task'. [10]

(b) Select one form of assessment indicated in the model and discuss in detail the processes in your subject area that promote 'self-directed learning'. [10]

(c) Answer the question posed at the bottom of the model diagram. [5]

Question 17

Read the passage below, which is a research abstract, and answer the questions below it.

STEM education has received increasing attention in recent years. However, developing valid and **reliable assessment** of interdisciplinary learning in STEM has been a challenge. This study is a comprehensive review of assessment of interdisciplinary STEM education during the last two decades. A total of 49 **empirical research** articles were collected from an initial library of 635 articles focusing on interdisciplinary STEM education. A two-dimensional framework was developed to examine the literature. The first dimension concerns the nature of disciplines being assessed and includes three categories: monodisciplinary, interdiscipline, and transdiscipline. The second dimension concerns the learning objectives and includes four aspects: knowledge, skill, practice, and **affective domain.** The results show that most assessments focused on monodisciplinary knowledge, monodisciplinary affective domains, and transdisciplinary affective domains. Although many programs aimed to improve students' interdisciplinary understanding or skills, their assessments did not align with their aims. Based on the review, future directions are proposed for developing assessments for **interdisciplinary STEM educational programs.**

A. Define the terms in **bold** letters giving sound examples. [8]
B. Suggest a suitable title to the study, and give two reasons for your suggestion. [4]
C. How do the sampling techniques and the research methodology used in the study justify the author's desire to achieve 'valid and reliable assessment' in STEM education? [8]
D. Discuss the problem of assessments that do not align with program aims in Zimbabwe's education system. [5]

Question 18

(a) Define the following terms and describe key processes involved in them, giving examples.
- Peer assessment in STEM learning
- Item analysis
- Specification grid
- Marking guides and model answers
- Assessment of scientific skills in STEM learning [15]

(b) Analyse fully this statement: **By diversifying the manner of assessment in project-based learning, teachers can get a fuller picture of what students know.** [10]

Question 19

The quality of tests and test items depends on the examiner, the learners, and the adherence to certain guiding principles. Select **Four** of the qualities below, define it, and then describe fully a situation where each of them was used.

- Efficiency
- Speededness
- Reliability
- Validity
- Discrimination
- Fairness

[25]

Question 20

Figure Q20 is one version of the normal distribution curve describing a standardised population parameter such as the performance of students who wrote a particular test at national level.

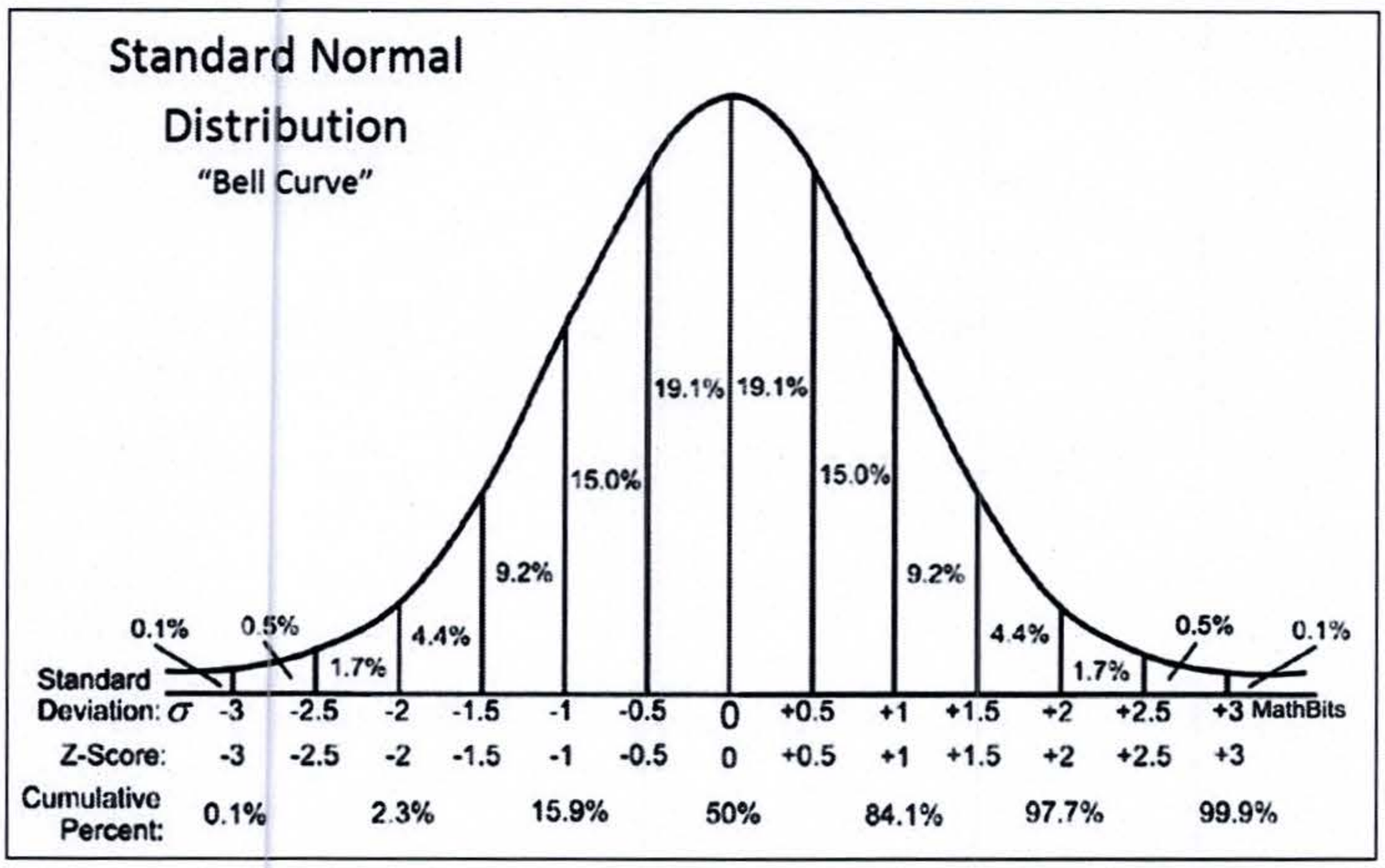

Figure Q20 Standard normal curve

(a) What percentages of the population fell:

i. between z = -2 and z = 2.5 [2]

ii. between minus infinity and z = 1.5 [2]

iii. above 1.5 standard deviations [2]

(b) How many standard deviations are there between the percentile ranks of 2.3 and 84.1? [2]

(c) If the test had a mean score of 56 and a standard deviation of 5, re-draw a sketch of the above diagram, and on it, insert and label accurately the positions of the scores between ±3 standard deviations. [8]

(d) Discuss the successes, challenges and expectations for the implementing STEM practical examinations in Zimbabwe schools. [9]

END OF EXAMINATION PAPER