UNIVERSITY OF SWAZILAND

FACULTY OF EDUCATION

MAIN EXAMINATION PAPER

November 2017

PGCE (Full Time)

TITLE OF PAPER: Curriculum Studies in Physics I

COURSE NUMBER: CTE 533

TIME ALLOWED: **Three (3) hours**

INSTRUCTIONS:

1. This paper contains FIVE questions.
2. Question 1 is **COMPULSORY**. You may choose **ANY THREE** questions from questions 2,3,4,5.
3. Each question carries 25 marks.
4. Any piece of material not intended for marking purposes should be clearly CROSSED OUT.
5. Ensure that responses to questions are NUMBERED CORRECTLY

SPECIAL REQUIREMENT: Attached Copy of SGCSE Physical Science Syllabus 6888.

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

This paper consists of **5** printed pages

Question 1 **COMPULSORY.**

Instructions: Read the passage below and answer the questions that follow.

Eleven years ago, M was referred to the Feuerstein Institute for life-long placement in custodial care. At the time of his referral, he was 15-years-old and his IQ, according to the reports, was in the 35–44 range. His vocabulary consisted of 40–50 words and he manifested severe impairment of spatio -temporal orientation, imitation, retention, and social behavior. Echolalia (repetition of words) and echopraxia (repetition of movement) were observed, but no psychotic-autistic signs were detected. Trainability had been considered very poor, and custodial care seemed unavoidable.

M was the second of three brothers. His father, a schizophrenic, alcoholic, and poorly adjusted Foreign Legion soldier, met and married M's mother in an Asian country. The mother was retarded and illiterate and died as a hospitalized, diagnosed psychotic. M suffered from brain damage caused by prematurity and low weight at birth and required prolonged incubator care. His infancy was marked by nutritional difficulties and by repeated and prolonged separations in nurseries and foster homes. His early adolescence was spent largely in socially and educationally restrictive environments (Feuerstein, 1980, p. 10).

a. i. Which two factors from M's history are regarded as innate? **(2)**
   ii. Which two factors are due to environmental issues? **(2)**
   iii. Explain the Theory of structural cognitive modifiability. **(3)**
b. Feuerstein believes there are two approaches of looking at such cases as M's, that is, a passive acceptance approach and an active modification approach.
   Compare the two approaches in relation to the case of M. **(6)**
c. Explain what each of the following concepts means to the teacher in the process of modifiability:

   i. child responsivity

   ii. Transfer skills
   iii. Examiner effort. **(12)**

(25 marks)

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Question 2

a. Explain with the help of a simple illustration or example what you understand by conceptual model. **(7)**
b. What two assumptions are made when the model of a pendulum is used in the classroom? **(4)**
c. Describe three stages followed when teaching using models in Physics. **(6)**
d. Explain three purposes of using models in the teaching/learning session in Physics. **(6)**
e. What precaution can a teacher make in using models during a teaching/ learning session in Physics? **(2)**

(25 marks)

Question 3

a. Explain, using dimensional analysis, how you will help a student who questions why the units of Work and Energy are the same. **(6)**
b. i. What is the role of language in concept learning? **(4)**
ii. With respect to physics teaching, describe two classroom practices that may promote language problems. **(6)**
Iii. What steps might a teacher take to assist students to learn the language of science? **(9)**

(25 marks)

Question 4

a. "The use of concept maps as a learning tool enables gaps in knowledge and misunderstandings, which later might lead to misconceptions, to be targeted and then rectified through a series of planned activities supported by suitable remedial work ..."Adamczyk and Wilson (1996).

i. Explain **three** ways in which concept maps can be used in class to teach Physics. **(6)**

ii. Construct a concept map using links to connect the following concepts: elastic energy, work-energy principle, potential energy, work, gravity, energy. **(10)**

b. The correct use of units is a necessary skill in physics for investigating relationships between variables and making correct references to quantities.

i. A pupil realizes that 1 Joule can be expressed as 1 Nm and hence gives the unit of a moment in Joules. Identify the pupil's problem and show how you could help him/her formulate the correct concept. **(4)**

ii. SGSCE uses SI system of units. Why is it necessary for the scientific community to have SI system? **(4)**

iii. Measurement is one of the first skills that a learner of physics must be able to do. Briefly analyze the fundamental role of measurement skills of all physics learning. **(6)**

(25 marks)

Question 5

Mathematical skills are essential for physics concepts. For the given mathematical concepts, examples have been given of some common quantities that are calculated in physics.

Rates of change	Force= $\Delta mv/\Delta t$, acceleration = $\Delta v/\Delta t$,
Gradients of graphs	$y=mx + c$, $V=IR$
Area under graphs	Displacement, Work
Indices	Scientific notation e.g. 6.02×10^{23}

a. Mathematical skills are developed in the subject mathematics and used in physics, which is usually in a different department and taught by different teachers. Outline a strategy you would recommend for teaching mathematical concepts and the physics ideas that require those concepts. **(10)**

b. Some students are limited in understanding physics because of mathematical relationships. How would you help a student who says, "Sir I understand the physics of jet propulsion, but I just can't work out the problems!" **(10)**

c. Explain two other challenges you think most students encounter in the learning of physics? **(5)**

(25 marks)

red radiation
5. identify and explain some of the everyday applications and consequences of conduction, convection, and radiation

P6.0 Waves

All learners should be able to:

P6.1 Wave properties

1. describe what is meant by wave motion
2. name and identify longitudinal and transverse waves as illustrated by vibrations in ropes, springs and by experiments using water waves, and distinguish between longitudinal and transverse waves
3. define and draw wave fronts
4. state what is meant by wave speed, frequency, wavelength and amplitude
5. demonstrate the use of water waves to show:
   - reflection at a plane surface,
   - refraction due to a change of speed
   - diffraction
6. describe reflection, diffraction and refraction in water
7. recall and use the equation $V = f \times \lambda$

P6.2 Light

1. perform and describe experiments to find the position of an optical image formed by a plane mirror
2. perform simple constructions, measurements and calculations to show reflection of light and formation of images by a plane mirror
3. use the law of angle of incidence = angle of reflection
4. describe refraction, including the angle of refraction, in terms of the passage of light through a parallel sided glass block
5. describe the action of thin lenses (concave and convex lenses) on light rays
6. perform an experiment to find the focal point and the focal length of a thin converging lens
7. perform simple constructions to show the action of a thin converging lens on light rays
8. determine and calculate the refractive index using $n = \sin i / \sin r$
9. use and describe the use of a single lens as a magnifying glass

P6.3 Electromagnetic spectrum

1. describe the main features of the electromagnetic spectrum and state that all e.m. waves travel at the same speed in vacuum
2. state the approximate value of the speed of the electromagnetic waves in a vacuum
3. state the everyday applications of e.m. waves

P6.4 Sound

1. state that sound waves are longitudinal
2. state the approximate range of audible frequencies
3. explain why a medium is required for the transmission of sound waves
4. relate the loudness and pitch of sound waves to amplitude and frequency
5. describe how the reflection of sound may produce echoes
6. describe an experiment to determine the speed of sound in air and make the necessary calculations

P7.0 Electrostatics

All learners should be able to:

1. describe simple experiments to show the production and detection of electrostatic charges
2. state that there are positive and negative charges
3. state that like charges repel and unlike charges attract
4. state that charge is measured in coulombs
5. carry out and interpret experiments with the electroscope
6. explain in simple terms the occurrence of the phenomenon of lightning