**UNIVERSITY OF SWAZILAND**

**FACULTY OF EDUCATION**

**MAIN EXAMINATION PAPER**

**December 2016**

**B. Ed. 11 and PGCE**

**TITLE OF PAPER:** Curriculum Studies in Physics 1

**COURSE NUMBER:** CTE 233/CTE 533

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

**INSTRUCTIONS:**

1. This paper contains five (5) questions.
2. Question 1 is COMPULSORY. You may then choose ANY THREE questions from questions 2,3,4 and 5
3. Each question carries 25marks
4. Any piece of material or work which is not intended for marking purposes should be clearly CROSSED OUT.
5. Ensure that responses to questions are NUMBERED CORRECTLY
6. Attached is a section of the November 2017-2018 SGCSE Physics Syllabus.

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

This paper consists of **3** printed pages

**Question 1 COMPULSORY**

**a.** What do you understand by practical work in physics lessons? **(7)**

**b.** From the Physical Science Syllabus 6888, P5.0 Thermal Physics (attached), device and explain fully, **two** activities that would engage learners in practical work. **(10)**

**c** .How can the teacher make best use of practical work in teaching physics? **(8)**

**Question 2**

**a.** "It's time we should use Information Communication Technology in our teaching of physics," unknown.. As a teacher of Physics, what do you understand by Information Communication Technology (ICT)? **(5)**

**b.** Describe how Information Communication and Technology can be used to effectively enhance the teaching of a named concept in Physics. **(10)**

**c.** Mention **five** advantages of using ICT in teaching physics topics to your students. **(5)**

**d.** Explain **five** general guidelines you have to consider when making a formal writing such as a research project. **(5)**

**Question 3**

**a.**With the use of examples, explain the following analogies as used in the teaching of physics:

**i.**Physical models

**ii.** Mathematical models

**iii.**Substance based conceptions **(12)**

**b.** What are the practical uses of analogies in the teaching of physics? **(4)**

**c.** What factors should be considered when teaching using analogies? **(4)**

**d.** Explain ways in which concept maps can be of help to a Physics student in Swaziland. **(5)**

**Question 4**

**a.** Write **five** benefits which well written instructional objectives would provide both to a physics teacher and his/her students. **(5)**

**b.** Prepare a lesson plan for a named class to develop at least a certain skill from a given topic chosen from the attached copy of the curriculum. You must clearly show both the teacher and student activities that lead to the development of the skill. **(15)**

c. Instructional objectives for a 40-minute lesson:

*By the end of the lesson, pupils will be able to:*

*i. identify the parts on a diagram for an electric circuit*
*ii. label the parts on a diagram for an electric circuit.*

Comment on the instructional objective as to which one clearly conveys instructional intent? Give reasons for your answer. **(5)**

**Question 5**

a. How does the knowledge of the **structure** of the subject matter knowledge help the teacher of physics to be effective in his teaching? **(9)**

b .Magnusson et.al. (1999) gave five components of pedagogic content knowledge. Apply how any two of the concepts help the teacher of physics to be an effective teacher? **(10)**

c. Which three qualities of a physics teacher would you consider the students would expect of a physics teacher? **(6)**

**P3.4 Moments**

1. describe the moment of a force as a measure of its turning effect and give everyday examples
2. calculate the moment of a force given the necessary information
3. define centre of mass
4. describe qualitatively the effect of the position of the centre of mass on the stability of simple objects.
5. perform and describe an experiment (involving vertical forces) to verify that there is no net moment on a bod in equilibrium (including calculations)

## P4.0 Work, energy, power

All learners should be able to:

**P4.1 Work**

1. recognise that work is done against an opposing force
2. recall and use the equation work done = force x distance moved in the direction of force

**P4.2 Energy**

1. relate energy transfer to work done and state the unit of energy as the joule
2. identify different forms of energy including kinetic and potential energy

**P4.3 Energy conversion and conservation**

1. use the terms kinetic and potential energy in context
2. give examples of conversion and conservation of energy and apply the principle of conservation to simple examples
3. describe energy transfer in terms of work done and make calculations involving F x d
4. describe processes by which energy is converted from one form to another, including reference to:
   - chemical/fuel energy (a regrouping of atoms)
   - energy from water (hydroelectric energy, tides, waves)
   - geothermal energy
   - nuclear energy (fission)
   - solar energy (fusion of atoms in the Sun)
5. recall and use the equations k.e.= ½ $mv^2$ , p.e. = $mgh$
6. identify examples of energy changes that are less than 100% efficient and explain why this happens

**P4.4 Power**

1. define power as energy transferred (work done) per unit time
2. recall and use the equation P = E/t = W/t in simple systems

## P5.0 Thermal Physics

All learners should be able to:

**P5.1 Expansion and contraction**

1. describe, using the kinetic theory, the thermal expansion/contraction of liquids, solids and gases
2. identify and describe some of the everyday applications and consequences of thermal expansion/contraction including bimetallic strips in thermostats
3. explain in terms of intermolecular forces why solids, liquids and gases expand with temperature at different rates

**P5.2 Thermometry**

1. describe how a physical property which varies with temperature may be used for the measurement of temperature and state examples of such properties (volume, potential difference, resistance)
2. describe how to determine the fixed points and use them to calibrate the thermometer
3. describe the structure and function of liquid-in-glass thermometers
4. demonstrate understanding of sensitivity, range and linearity
5. describe the structure and action of a thermocouple and show understanding of its use for measuring high temperatures and those which vary rapidly

**P5.3 Change of state**

1. describe the difference between boiling and evaporation
2. interpret a cooling and heating curve
3. state the meaning of melting point and boiling point in terms of energy input without change in temperature
4. describe how thermal energy is transferred in solids in terms of molecular vibrations and free electrons

**P5.4 Thermal energy transfer**

1. describe experiments to demonstrate the good and bad conductors of heat
2. relate convection in fluids to density changes and describe experiments to illustrate convection
3. identify infra-red radiation as electromagnetic radiation
4. describe experiments to show the properties of good and bad emitters and good and bad absorbers of infra-

## PHYSICS SECTION

### P1.0 Introduction to Physics

All learners should be able to:

1. name quantities and their units including base SI units
2. use and describe how to use metre rules, micrometer screw gauge, vernier callipers to determine length and volume of regular objects
3. use and describe how to use clocks and other devices for measuring an interval of time including the period of a pendulum
4. use suitable balances to measure mass of solids and liquids
5. measure the volume of regular and irregular objects using the displacement method
6. determine density
7. state that an object floats when put in a liquid of higher density than it
8. work with significant figures

### P2.0 Speed, velocity and acceleration

All learners should be able to:

1. calculate speed/velocity from:

$$\frac{\text{total distance}}{\text{total time}}$$

2. identify speed as a scalar quantity and velocity as a vector quantity
3. define acceleration, speed and velocity
4. recognise from a speed-time graph when a body is (a) at rest, (b) moving with constant speed, (c) moving with constant acceleration and calculate the acceleration
5. plot and interpret speed-time graphs
6. calculate the area under a speed-time graph to determine the distance travelled for motion with constant acceleration
7. state that the acceleration of free-fall, g, for a body near to the Earth is constant ($g = 10 m/s^2$)
8. recognise and interpret graphs of motion for which the acceleration is not constant
9. describe qualitatively the motion of bodies falling in an uniform gravitational field with and without air resistance (including reference to terminal velocity)
10. describe some applications on terminal velocity including reference to parachutes and hailstorms

### P3.0 Mass and force

All learners should be able to:

**P3.1 Mass and weight**

1. define mass as the amount of substance in a body
2. measure the weight of a body using appropriate balances
3. state that weight is a force
4. describe, and use the concept of weight as the effect of a gravitational field on a mass
5. calculate the weight of a body from its mass ($w = mg$)
6. describe how weights (and hence masses) can be compared using a balance

**P3.2 Forces and stretching**

1. perform and describe extension load experiments
2. plot and interpret extension load graphs (Hooke's Law as such is not required)
3. identify and interpret the significance of the term, limit of proportionality for an extension-load graph
4. use limit of proportionality in simple calculations

**P3.3 Forces and motion**

1. describe the ways in which a force may change the motion of a body
2. state the advantages and disadvantages of friction
3. use the relationship between force, mass and acceleration ($F = ma$)