UNIVERSITY OF SWAZILAND
Faculty of Health Sciences

DEGREE IN ENVIRONMENTAL HEALTH

SUPPLEMENTARY EXAMINATION PAPER 2007/2008

TITLE OF PAPER	:	**ENVIRONMENTAL PHYSICS I**
COURSE CODE	:	**EHS 411**
DURATION	:	**2 HOURS**
MARKS	:	**100**
INSTRUCTIONS	:	**READ THE QUESTIONS & INSTRUCTIONS CAREFULLY**
	:	**ANSWER ONLY FOUR QUESTIONS**
	:	**QUESTION ONE OR TWO ARE COMPULSORY**
	:	**EACH QUESTION CARRIES 25 MARKS**
	:	**WRITE NEATLY & CLEARLY**
	:	**NO PAPER SHOULD BE BROUGHT INTO NOR OUT OF THE EXAMINATION ROOM**
	:	**BEGIN EACH QUESTION ON A SEPARATE SHEET OF PAPER**

DO NOT OPEN THIS QUESTION PAPER UNTIL PERMISSION IS GRANTED BY THE INVIGILATOR.

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QUESTION ONE

(a) State the Charles and Boyle's gas laws and derive their equations (8 marks).
(b) A balloon made of an elastic fabric which carries meteorological instruments contains $30m^3$ of hydrogen gas at atmospheric pressure and a temperature of 20^0C. What will be the volume of the hydrogen gas when the balloon has reached a height of 11000m, where the pressure is now one third that at sea level and the temperature is -25^0C? Given that 1 atmosphere = 1×10^5Pa. Give an explanation of the answer you obtained. (7 marks).
(c) Derive the combined gas laws equation and calculate the volume of a gas at a temperature of 10^0C and pressure of 2×10^5Pa when $100cm^3$ of it was collected at a temperature of 40^0C and a pressure of 1×10^5Pa (10 marks).

Total 25 Marks.

QUESTION TWO

1. One of the first practical chemical cells was the Daniel cell invented by John Daniel in 1836.
   (a) Draw a labeled diagram to show this type of a cell (7 marks)
   (b) This cell in (a) is capable of generating about 1.1 Volts and was used to operate small electric items such as doorbells. Write the electrode reactions taking place at both the anode and the cathode electrodes (4 marks).
   (c) Which way would the electrons flow in the wire connected to the voltmeter (2 marks)
   (d) Why should Copper (II) sulphate crystallize at the bottom of the container (2 marks)?
   (e) What is the function of the porous pot (2 marks)
   (f) There are problems associated with the Daniel cell which has led to it being replaced by other types of cell. Give two reasons why Daniel cells are no longer in use today (2 marks).

2. Calculate the power of an electric heater which raises the temperature of 1.5kg of water by 50^0C in five minutes. Assume c for water is $4200J/Kg^0C$ (4 marks).

Total 25 Marks.

QUESTION THREE

1. The mass of a thick copper calorimeter is 1.0kg and its temperature is 295k. 200g of water at 335K are added to the calorimeter and the final temperature is 323K. Calculate the heat capacity and the specific heat capacity of the copper. Given that, the specific heat capacity of water is 4200L/kgK. (8 marks)

2. Describe briefly, with the aid of a diagram,
   (a) How a household refrigerator works (8 marks).
   (b) Use the kinetic theory to explain the cooling effect inside the refrigerator (5 marks).
   (c) Using the first and second laws of thermodynamics, explain what happens to the heat removed from the inside of the refrigerator (4 marks)

Total 25 Marks.

QUESTION FOUR

1. Four cells, each of e.m.f. 1.5V and internal resistance 1.0Ω are in series. They are connected to a resistor of resistance 8.0Ω. ~~Calculate~~
   (a) Draw and label the circuit arrangement (4 marks), and calculate
   (b) The current (5 marks)
   (c) The p.d. of the battery of the four cells (3 marks), and
   (d) The lost volts (3 marks).

2. A galvanometer of resistance 20Ω has a full scale reading of 15mA. Calculate
   (a) the shunt required to convert it to an ammeter reading to 1.0A (5 marks), and
   (b) The resistance of the ammeter (5 marks)

Total 25 Marks.

QUESTION FIVE

1. Describe the rock cycle and name the three main rock types that it produces (8 marls).
2. What are tectonic plates and why are they important to us (10 marks)?
3. Describe the processes that cause Tsunamis and explain how they affect our lives on earth (7 marks).

Total 25 Marks.

GOOD LUCK!!!!