

# **UNIVERSITY OF SWAZILAND**

**Faculty of Health Sciences**

**(BSC) IN ENVIRONMENTAL HEALTH**

**FIRST SEMESTER FINAL EXAMINATION PAPER 2008**

**TITLE OF PAPER** : ENVIRONMENTAL PHYSICS 1

**COURSE CODE** : EHS 411

**DURATION** : TWO HOURS

**MARKS** : 100

**INSTRUCTIONS** :

- : ANSWER ONLY FOUR QUESTIONS
- : EACH QUESTION CARRIES 25 MARKS
- : QUESTIONS ONE AND TWO ARE COMPULSARY
- : NO QUESTION 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**

### QUESTION ONE

- Find the size of the current flowing through a wire when 0.8C of charge passes a point in the wire in 2s.
  - 0.3A
  - 0.4A
  - 0.3mA
  - 0.4mA
- The self-starter of a motor car uses a current of 20A for 10s. What quantity of electricity flows through the starter?
  - 200C
  - 200 $\mu$ C
  - 2C
  - 2 $\mu$ C
- a distinctive building block of matter is called
  - element
  - mixture
  - compound
  - isotope
- protons, neutrons, and electrons are all
  - forms of energy
  - equal in mass
  - subatomic particles
  - negative ions
- isotopes differ from each other by their number of
  - ions
  - protons
  - atoms
  - neutrons
- all of the following are examples of kinetic energy except
  - speeding bullet
  - a stick of dynamite
  - a flow of electric current
  - a falling rock
- the matter and energy laws tell us that we can recycle
  - both matter and energy
  - neither matter nor energy
  - matter but not energy
  - energy but not matter

8. a low-through put economy would do all of the following except
- use energy more efficiently
  - shift to perpetual and renewable energy sources
  - recycle and reuse most matter that is now discarded
  - create goods with a short life cycle to increase recycling
9. which of the following is true
- the common element in the center of the earth's core is iron
  - the inner core is liquid, whereas the outer core is solid
  - extreme pressure makes the interior of the earth liquid
  - the core of the earth occupies most of its volume
10. A current of 0.5A is drawn from a 12V battery for 20s. How much charge is drawn in this time?
- $0.1\mu\text{C}$
  - $10\mu\text{C}$
  - 10C
  - 0.1C
11. the asthenosphere is
- the outer atmosphere
  - the inner core of the earth
  - a plastic region in the mantle
  - a plastic region in the crust
12. the majority of earthquakes and volcanoes occur
- in the interior of continents
  - on oceanic islands
  - along the edge of continents
  - in the open ocean
13. which of the following terms include the other?
- Nonmetallic mineral resources
  - Energy resources
  - Mineral resources
  - Metallic mineral resources
14. one example of subsurface mining is
- dredging
  - contour strip mining
  - long wall mining
  - area strip mining
15. acid mine drainage
- occurs when anaerobic bacteria produce nitric acid from nitrogen oxides
  - enhances aquatic life

- c. neutralizes the pH of surface waters
  - d. may contaminate groundwater
16. the net energy ratio is
- a. the ratio of the energy it took to produce it to the new useful energy product
  - b. the ratio of the useful energy produced to the useful energy used to produce it
  - c. high when the net energy yield is high
  - d. high when the net energy yield is low
17. Calculate the current flowing through a  $5\Omega$  resistor that has 20V across it.
- a. 4mA
  - b. 4A
  - c. 100A
  - d. 100mA
18. Resistors of  $2\Omega$ ,  $4\Omega$ ,  $6\Omega$  are connected in series and a voltage of 24V applied across them. How much current is flowing?
- a. 0.2A
  - b. 0.2mA
  - c. 2A
  - d. 2mA
19. The EMF of a battery is 4.00V and its internal resistance is  $0.50\Omega$ . Find the potential difference between the terminals of the battery when they are connected by a conductor of  $7.50\Omega$  resistance.
- a. 3.00V
  - b. 3.75V
  - c. 4.00V
  - d. 2.75V
20. Calculate the power dissipated in a motor which has a p.d. of 250V applied across it when a current of 0.4A passes through it.
- a. 100W
  - b. 100kW
  - c. 100mW
  - d.  $100\mu\text{W}$
21. A television set of power 100W is switched on every day for 5 hours. What is the monthly cost of electricity if one unit (1kWh) costs 12c?
- a. 150c
  - b. 180c
  - c. 1200c
  - d. 15000c

22. An air-conditioner operates at 1800W, 240V. Which is the most suitable fuse for the appliance?
- 2A
  - 5A
  - 10A
  - 15A
23. A galvanometer has a resistance of  $100\Omega$  and gives a full-scale deflection of 1mA. What shunt (resistance) must be used to make the meter suitable to measure currents up to 5A?
- $0.02\Omega$
  - $0.20\Omega$
  - $2.00\Omega$
  - $100\Omega$
24. The triple point of water is the phase where
- Liquid water, water vapor, and gaseous water are in equilibrium
  - Solid water, liquid water, and water solution are in equilibrium
  - Gaseous phase, liquid phase, and solid phase are in equilibrium
  - Ice, water vapor, and solid phase are in equilibrium
25. Levers are machines which operate on the principle of moments or turning forces. In a second class lever,
- The pivot is situated between the load and the effort
  - The load is situated between the pivot and the effort
  - The effort is situated between the pivot and the load
  - The pivot is situated between the fulcrum and the load.

**TOTAL 25 MARKS**

### **QUESTION TWO**

- (a) Environmental science is a great necessity and a great dilemma! Discuss this statement. (10 marks)
- (b) A pendulum bob is pulled to one side until it is at a vertical height of 30cm above its lowest position. The bob is then released. Find its speed as it swings through its lowest position. (5 marks)
- (c) A hospital uses a small hydroelectric power generation station to produce its electricity for meeting its energy needs. 800kg of water are supplied per second from a height of 10m to the small hydroelectric generation station. Calculate,
- How much p.e. is available per second to rotate the water turbine?  
(3 marks)

- (ii) What is the maximum output of electrical power if the efficiency is 75%? (3 marks)
- (d) Complete the table below by filling in the blank spaces. Where necessary, take  $g = 10\text{N/kg}$ . (4 marks)

Force (F/N)	Distance (s/m)	Work done (energy transferred) (E/J)
20	1.5	
	5	500
$10^5$		$3 \times 10^6$
$9 \times 10^{-30}$	$3 \times 10^{-2}$	

**TOTAL 25 MARKS**

### QUESTION THREE

- (a) List four ways in which heat can be transferred from one point to another. (4 marks)
- (b) Explain how each way of heat transfer you mentioned in (a) is achieved. (15 marks)
- (c) Discuss the process of heat balance in the human body under cold environmental conditions. (6 marks)

**TOTAL 25 MARKS**

### QUESTION FOUR

- (a) List three properties that can be used to characterize (categorize) liquid materials and three that can be used to characterize gaseous materials. (6 marks)
- (b) Explain how one can use the coefficient of thermal expansivity to characterize solid materials. (4 marks)
- (c) Draw and label a phase diagram of water and explain what the different curves represent. (8 marks)
- (d) Explain what do you understand by the plasma state of matter? Where is it always formed? How can plasma torches be used? (7 marks)

**TOTAL 25 MARKS**

### **QUESTION FIVE**

- (a) Describe the internal and external earth's processes responsible for forming earth's landscape (4 marks)
- (b) Distinguish three different tectonic plate boundaries and the geologic features often found at each (6 marks)
- (c) Briefly describe the geology of Swaziland (15 marks)

**TOTAL 25 MARKS)**

**GOOD LUCK!!!**