

UNIVERSITY OF SWAZILAND

Faculty of Health Sciences

(BSC) IN ENVIRONMENTAL HEALTH

FIRST SEMESTER FINAL EXAMINATION PAPER 2007

TITLE OF PAPER: **ENVIRONMENTAL PHYSICS 1**

COURSE CODE : **EHS 411**

DURATION : **TWO HOURS**

MARKS : 100

INSTRUCTIONS : **ANSWER ONLY FOUR QUESTIONS.**

: **EACH QUESTION CARRY 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:

1. Liquid, solid, and gas are
 - A. physical forms of matter
 - B. chemical form of matter
 - C. mixtures
 - D. compounds

2. Which of the following sources of iron would be of the highest quality?
 - A. iron deposits on the ocean floor
 - B. a field of spinach
 - C. a large, scrap metal junkyard
 - D. a one-half-mile-deep deposit of iron ore

3. All of the following statements can be concluded from the law of conservation of matter *except*
 - A. we can't throw anything away because there is no away
 - B. we will eventually run out of matter if we keep consuming it at current rates
 - C. there will always be pollution of some sort
 - D. everything must go somewhere.

4. The earth is essentially a closed system for
 - A. matter
 - B. energy
 - C. matter and energy
 - D. neither matter nor energy

5. Of the following options to deal with non-degradable pollutants, the *least* effective is to
 - A. remove them from contaminated air, water, or soil
 - B. reuse them
 - C. recycle them
 - D. refrain from introducing them into the environment

6. Which of the following statements does *not* apply to the second law of thermodynamics?
 - A. energy conversion results in lower-quality energy
 - B. energy can neither be created nor destroyed
 - C. energy conversion results in more-dispersed energy
 - D. heat is usually given off from energy conversion

7. In an energy transformation, some of the energy usually end up as
- A. heat energy that flows into the environment
 - B. mechanical energy that performs useful work
 - C. chemical energy that performs useful work
 - D. electrical energy that performs useful work.
8. "You are a raft of order floating on the high seas of entropy." which scientific law is best described by this analogy?
- A. law of conservation of matter
 - B. law of conservation of energy
 - C. law of conservation of matter and energy
 - D. second law of thermodynamics
9. Which of the following represents the most common way ore deposits are formed?
- A. hydrothermal processes
 - B. magma cooling
 - C. chemosynthesis
 - D. sedimentary sorting
10. Nodules of ----- are found on the floor of deep ocean
- A. chromium
 - B. boron
 - C. platinum
 - D. manganese
11. Which of the following mineral resources often occur in placer deposits?
- A. manganese
 - B. cobalt
 - C. gold
 - D. lead
12. One example of subsurface mining is
- A. dredging
 - B. contour strip mining
 - C. long wall mining
 - D. area strip mining
13. Acid mine drainage
- A. occurs when anaerobic bacteria produce nitric acid from nitrogen oxides
 - B. enhances aquatic life
 - C. neutralizes the pH of surface and groundwater
 - D. may contaminate groundwater

14. When ore undergoes processing, a waste called ----- is produced
- A. hazardous
 - B. spoil
 - C. gangue
 - D. tailings
15. Which of the following statements is *not* an observation derived from applying the second law of thermodynamics to living systems?
- A. life is a creation and maintenance of ordered structures.
 - B. high-quality energy sources are required to maintain life.
 - C. living things give off heat.
 - D. cooking foods turn them into high-quality energy sources.
16. The matter and energy laws tell us that, we can recycle
- A. both matter and energy
 - B. neither matter nor energy
 - C. matter but not energy
 - D. energy but not matter
17. High quality energy is needed to do all of the following *except*
- A. run electric lights
 - B. run electric motors
 - C. run electric appliances
 - D. heat the parliament during winter.
18. An earthquake is most directly caused by
- A. the creation of a fault (fracture in rock) or shifting along an existing fault
 - B. a change in ocean currents
 - C. dumping of toxic wastes
 - D. comets crashing into earth
19. An ejecta is
- A. debris released from a volcano
 - B. substances injected into faults to relieve pressure
 - C. material released from rifts on the floor of the ocean
 - D. the depressed region inside the cone of an inactive volcano
20. The strength of an earthquake is measured on the ----- scale
- A. Richter
 - B. Miller
 - C. Mercalli
 - D. Geiger
 - E.
21. The matter and energy laws tell us that we can recycle
- A. both matter and energy
 - B. neither matter nor energy

- C. matter but not energy
 - D. energy but not matter
22. A low-through put economy would do all of the following except
- A. use energy more efficiently
 - B. shift to perpetual and renewable energy sources
 - C. recycle and reuse most matter that is now discarded
 - D. create goods with a short life cycle to increase recycling
23. Which of the following is true
- A. the common element in the center of the earth's core is iron
 - B. the inner core is liquid, whereas the outer core is solid
 - C. extreme pressure makes the interior of the earth liquid
 - D. the core of the earth occupies most of its volume
24. The asthenosphere is
- A. the outer atmosphere
 - B. the inner core of the earth
 - C. a plastic region in the mantle
 - D. a plastic region in the crust
25. The majority of earthquakes and volcanoes occur
- A. in the interior of continents
 - B. on oceanic islands
 - C. along the edge of continents
 - D. in the open ocean

Total 25 marks.

QUESTION TWO

- (a) Derive the equation for calculating
- i. The total resistance of two circuit resistors connected in parallel (5 marks).
 - ii. The internal resistance of a cell (5 marks)
- (b) Three accumulators of e.m.f. 2.0V are connected in series with three resistors of 1.0Ω , 2.0Ω and 3.0Ω also in series. The internal resistance of the accumulator is negligible. Draw the circuit connection and calculate the current in the circuit. (9 marks)
- (c) Calculate the current if the three accumulators in (b) above are connected in parallel and the three resistors are also connected in parallel. (6 marks)

Total 25 marks.

QUESTION THREE

(a) Define the following terms:

- i. Heat capacity (1 marks)
- ii. Specific heat capacity (1 marks)
- iii. Temperature (1 marks)
- iv. Hyperthermia (1 marks)
- v. Hypothermia (1 marks)

(b) Draw a labeled diagram of a thermos flask and explain the principles on which its action depends. Give two uses of the vacuum flask in the health professional practice (10 marks)

(c) A cardboard tube, of negligible heat capacity, contains lead shot. The tube is inverted quickly 200 times and the lead shot falls 0.8m each time. The temperature rise of the shot is 11.2°C . Calculate the specific heat capacity of lead ($g = 9.8\text{N/kg}$) (10 marks).

Total 25 marks

QUESTION FOUR

Assess the possibility of increasing mineral resource supplies through

- (a) finding new deposits (5 marks),
- (b) improving technology of mining low-grade ore (5 marks),
- (c) getting minerals from ocean (5 marks),
- (d) finding substitutes (5 marks), and
- (e) Take a position and defend it, on the mining of the Antarctica

Total 25 marks

QUESTION FIVE

(a) Photosynthesis and cellular respiration are complementary processes. Explain how they exemplify the laws of conservation of matter and thermodynamics (8 marks).

(b) Semelane wanted to estimate the size of her electricity bill for the month. The table below shows the information which she noted down about the appliances she uses. Complete the table and estimate her monthly bill. Given that, one unit of electricity costs E.0.18

Appliance	Power	Hours used each week	Units used
Iron	2000W	4	
Fan heater	1500W	42	
Light	100W	88	
Kettle	2000W	4	
Hi-fi	100W	32	
Computer	150W	12	
Geyser	4500W	670	
Stove	6000W	56	
Fridge	100W	670	
Television	100W	32	

(10 marks)

(c) Briefly describe how electric charges can be acquired by different materials. How can these electric charges be overcome in a hospital (7 Marks)?

Total 25 Marks.

GOOD LUCK!!!!

ADDITIONAL USEFUL MATERIALS

$$Q = It$$

$$V = IR$$

$$R_T = R_1 + R_2 + R_3$$

$$E/I = R + r$$

$$r = (E-V)/I$$

$$V_T = V_1 + V_2 + V_3$$

$$I_T = I_1 + I_2 + I_3$$

$$R = (R_1 R_2) / (R_1 + R_2)$$

$$R = \rho L / A$$

$$W = QV$$

$$QV/t = IV$$

$$P = W/t$$

$$P = IV$$

$$P = I(IR)$$

$$P = I^2 R$$

$$P = V^2 / R$$

$$W = I^2 R t$$

$$W = V^2 t / R$$

$$W = VI t$$

$$W = Pt$$

$$W = V(Vt) / R$$

$$W = V^2 t / R$$

$$W = F \times s$$

$$F \cos \theta \times s$$

$$F = Fs \cos \theta$$