UNIVERSITY OF SWAZILAND

Faculty of Health Sciences

(BSC) IN ENVIRONMENTAL HEALTH

FIRST SEMESTER FINAL EXAMINATION PAPER DECEMBER 2009

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

1. An earthquake is most directly caused by
    a. The creation of a fault or shifting along an existing fault
    b. A change in ocean currents
    c. Dumping of toxic wastes
    d. Comets crushing into the earth

2. Protons, neutrons, and electrons are all
    a. forms of energy
    b. equal in mass
    c. subatomic particles
    d. negative ions

3. All of the following are examples of kinetic energy except
    a. speeding bullet
    b. a stick of dynamite
    c. a flow of electric current
    d. a falling rock

4. Which of the following is the source of most non-renewable resources we use?
    a. core
    b. asthenosphere
    c. mantle
    d. crust

5. A distinctive building block of matter is called
    a. element
    b. mixture
    c. compound
    d. isotope

6. The earth zone with the most volume and mass is the
    a. lithosphere
    b. core
    c. crust
    d. mantle

7. 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

8. 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

9. 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

10. 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

11. 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

12. Which of the following terms include the other?
   a. Nonmetallic mineral resources
   b. Energy resources
   c. Mineral resources
   d. Metallic mineral resources

13. Which of the following is not an example of subsurface mining?
   a. dredging
   b. contour strip mining
   c. long wall mining
   d. area strip mining

14. Slate, anthracite, and marble are ------- rocks
   a. Primary
   b. Secondary
   c. Metamorphic
   d. igneous

15. Acid mine drainage
   a. occurs when anaerobic bacteria produce nitric acid from nitrogen oxides
   b. 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. A strategic disadvantage of oil is that it
    a. produces more carbon dioxide than any other fuel
    b. produces destruction of nature through oil spills
    c. can contaminate ground water supplies
    d. will be commercially depleted within 90 years

18. Natural gas from wells consists of 50% to 90%
    a. methane
    b. butane
    c. propane
    d. ethane

19. The world's most abundant conventional fossil fuel is
    a. crude oil
    b. natural gas
    c. biomass
    d. coal

20. Which of the following rocks is most likely to be formed from compacted shells and skeletons?
    a. coal
    b. limestone
    c. rock salt
    d. igneous

21. The strength of an earth quake is measured on the ---------- scale.
    a. Richter
    b. Miller
    c. Mercalli
    d. Geiger

22. The type of rock that covers most of the earth's land surface is
    a. Metamorphic
    b. Sedimentary
    c. Igneous
    d. Gemstones

23. The fraction of the ore containing waste minerals is called the
    a. Hazardous waste
    b. Spoil
    c. Gangue
    d. Tailings

24. When ore undergoes processing, a waste called ---------- is produced
    a. Hazardous waste
    b. Spoil
    c. Gangue
    d. Tailing

25. Environmental impact would be greatest mining for a ---------- ore.
    a. high-grade
    b. moderate-grade
    c. low-grade
    d. plentiful

TOTAL 25 MARKS

QUESTION TWO

(a) Define environmental physics and clearly elucidate what it deals with (4 marks)

(b) Environmental science is a great dilemma! Discuss this statement (8 marks)

(c) What are the three factors that determine the severity of a pollutant's harmful effects? (3 marks)

(d) State the following laws and explain what each deals with!
    i. Charles' law (2 marks);
    ii. Boyle's law (2 marks);
    iii. The law of conservation of matter (2 marks)

(e) Briefly describe the earth's internal processes (4 marks).

TOTAL 25 MARKS

QUESTION THREE

(a) An acrobatic airplane flying in the skies of Mbabane during a top lotto advertisement dropping money all over the city. It flew with a velocity of 460m/s at its lowest point of the loop of a vertical circle of radius 300m. What is the velocity of the airplane at the highest point of its loop? Show all calculations (10 marks).

(b) Consider a box of mass 450 kg allowed to fall freely from rest at a height of 60m above the ground and landed in a hole 30m below the ground.

a. Calculate the work done by this falling box (5 marks).
b. Find its kinetic energy (Take the acceleration due to gravity as $9.8m/s^2$) (5 marks).
c. How do you compare your answer of the work done to that of the kinetic energy? Explain (5 marks).

TOTAL 25 MARKS

QUESTION FOUR

(a) Mr. Sukati has a mass of 90kg and loses 70kJ of heat energy. If his normal temperature is $t = 37^0C$, what will it be after the heat loss? Compare this loss with the loss that occurs in an aluminum block of the same size that has lost the same quantity of heat. Take the specific heat capacities of the body and aluminum as $4.19kJ/kg^0C$ and $0.915kJ/kg^0C$ respectively. All calculations must be clearly written (9 marks).

(b) Using the principles of thermal physics, explain the thermoregulatory mechanism in a thermos flask (7 marks).

(c) Name and write short notes on the three major concentric zones of the Earth. (9 marks).

TOTAL 25 MARKS

QUESTION FIVE

(a) Differentiate between a first class liver and a third class liver (6 marks).

(b) A load of 4000kg is raised by an effort of 400kg, using a first order lever; calculate the mechanical advantage (4 marks).

(c) Name the two types of pulleys you know and draw labeled drawings for each (10marks).

(d) A pendulum bob is pulled to one side until it is at a vertical height of 40cm above its lowest position. The bob is then released. Find its speed as it swings through its lowest position (5 marks).

TOTAL 25 MARKS