UNIVERSITY OF SWAZILAND
FACULTY OF HEALTH SCIENCES
DEPARTMENT OF ENVIRONMENTAL HEALTH SCIENCE
SUPPLEMENTARY EXAMINATION [JULY 2013]

TITLE OF PAPER : ENVIRONMENTAL PHYSICS ONE
COURSE CODE : EHS 411
ACADEMIC YEAR : 2012/2013
TIME : 2 HOURS
MARKS : 75

INSTRUCTIONS

1. DO NOT OPEN THIS EXAMINATION PAPER UNTIL YOU ARE INSTRUCTED TO DO SO BY THE INVIGILATOR.
2. CHOOSE AND ANSWER THREE QUESTIONS ONLY, OUT OF THE FOUR QUESTIONS PRESENTED IN THIS PAPER.
3. NO FORM OF PAPER SHOULD BE BROUGHT INTO THE EXAMINATION ROOM.
4. BEGIN YOUR ANSWERS TO EACH QUESTION ON A FRESH PAGE OF THE ANSWER BOOKLET. ENSURE THAT ALL PAGES OF THE ANSWER BOOKLET ARE NUMBERED ACCORDINGLY.
5. WRITE CLEARLY AND USE PROPER ENGLISH LANGUAGE GRAMMAR. MARKS WILL BE WITHHELD FOR CARELESSNESS IN HANDWRITING AND POOR ENGLISH GRAMMAR.

QUESTION ONE [TOTAL NUMBER OF MARKS = 25]

1. Exposure to X rays can result in several cancers while exposure to microwaves does not result in any health effects, why? [5].

2. Discuss any three uses of electromagnetic radiation? [6].

3. A cup of hot coffee has a much lower heat content than a lake but its temperature is much higher compared to that of the lake. How is this possible? [5].

4. According to the first law of thermodynamics, in all physical and chemical changes, energy can neither be created nor destroyed. Does this mean that when you fill a car with diesel you can drive for ever without ever refilling again? Explain your answer [4].

5. Organisms like blind shrimps, giant tube worms, strange crabs, etc are found on the ocean floor, where conditions are extremely harsh. State and define the term used to refer to the process through which such organisms obtain their energy for survival [2].

6. It takes less energy, water and money to recycle an aluminum can than to make a new can from aluminum ore, why? [3].

QUESTION TWO [TOTAL NUMBER OF MARKS = 25]

1. An earthquake measuring 8.0 on the Richter scale is greater than one measuring 4.0 by what size? [2]
   a. 10000
   b. 1000
   c. 100
   d. 10

2. A recently introduced mining technique in which an entire mountain is levelled in an effort to extract mineral resources is known as [2]
   a. Mountaintop removal
   b. Mountain mining

c. Mountain stack mining
d. Heap leaching

3. One of the following factors is not known to cause tsunamis. Which one? [2]
a. Thrust faults in the ocean floor move up or down
b. As a result of a large underwater earthquake
c. A landslide caused by such an earthquake
d. Plate motion

4. Metal ore extracted from the ground typically has two components, and these are; [2]
a. Spoil and tailings
b. Tailings and the ore mineral
c. The waste material called gangue and tailings
d. The ore mineral containing the desired mineral and the waste material called gangue.

5. One of the following is an acid that is produced in active and abandoned mines, which one. [2]
a. HNO_3
b. $(NH_4)_2SO_4$
c. H_2SO_4
d. H_2O_2

6. Which one of the following statements best describes heap leaching? [2]
a. Heap leaching is a process of extracting gold from piles of crushed ore or old tailings.
b. Heap leaching is a process in which the fine particles of cyanide solution are recollected after it has been used in coal burning factories.
c. Heap leaching is a process whereby miners use pans to scoop up mineral resources dissolved in water
d. Heap leaching is a process of preparing land for replanting of trees after mining operations.

7. A combination of technological advances, recycling, conservation and the manipulation of markets can ensure an endless supply of mineral resources. [2]

a. True
b. False

8. Processes that are generated by heat from the earth's interior, which build up the earth's surface in the form of continental and oceanic crust, including mountains and volcanoes are known as [2]

a. Internal geologic processes
b. External geologic processes
c. Middle geologic processes
d. Terrestrial geologic processes

9. Select one correct statement below; [2]

a. Placer mining/hydraulic mining is a process in which powerful water cannons blast away entire hillsides, where soil and rock containing gold are washed down.
b. Placer mining/hydraulic mining is a process that is used to extract coal that is found deep within the earth's crust.
c. Placer mining/hydraulic mining is a process that can trigger the release of carbon monoxide and ultimately result in increased respiratory diseases.
d. Placer mining is a technique that is mostly used in the extraction of gold and coal lying close to the earth's surface.

10. With regards to the supply of nonrenewable mineral resources, the law of supply and demand states that; [2]

a. When the demand for natural resources decrease, there is going to be many economic losses in the mining sector because many companies will not make significant profits.
b. Raising prices of mineral resources will eventually lead to an early depletion of resources because more will be extracted at faster rate.
c. When demand of raw materials surpasses its supply, industries that want to buy those materials will find themselves paying more.
d. Raising prices is not desirable in mining because the interests that the companies are going to pay are high, and hence they will be forced to shut down.

11. A toy motor car of mass 0.1kg is moving with a velocity of 2m/s. It hits a second toy car, which moves off after the collision. The velocity of the second car is recorded as 0.3m/s. How much work was done on the second car? [3]

12. What are undiscovered resources? [2]

QUESTION THREE [TOTAL NUMBER OF MARKS = 25]

1. Distinguish between chemosynthesis and photosynthesis [4].

2. For over 50 years, most incinerators (facilities where waste is burned) in Mbabane were not well managed. There was foul odour everywhere due to use of short chimneys. Last year, all incinerators were fitted with very tall chimneys and there is no more foul smell because all the gases are emitted high in the atmosphere. Everybody in town says the problem has been solved for good. Using your knowledge of the Laws of energy and environmental problems, why are you not happy like everybody else? [3].

3. What work is done when a mass of 5kg is lifted through a vertical height of 225cm? Consider g to be 9.80m/s^2 [3].

4. Beginning in the 80s, scientists discovered that about 40 – 50% of the ozone layer over Antarctica was being destroyed during the Antarctic spring and early summer (September – December), when sunlight returned after the dark Antarctic winter. Using your knowledge of the processes that make Antarctica vulnerable to ozone destruction, describe;

a. The role of ice crystals in the processes that lead to ozone destruction [3]
b. The role of the returning of sunlight and summer in the processes that lead to ozone destruction [3].

5. Discuss any two benefits of natural ozone to life on earth [4].

6. What is a polar vortex? [2].

7. State any three properties of CFCs [3].

QUESTION FOUR [TOTAL NUMBER OF MARKS = 25]

1. The warming potential of CO_2 is the lowest compared to all other atmospheric greenhouse gases (with the exception of O_3). Despite this fact, why is CO_2 considered the major greenhouse gas and one on which there has been so much focus in recent years? [3].

2. Worldwide, the first major source of CO_2 in the atmosphere is fossil fuel burning. In order of importance, state two fossil burning activities that result in the release of huge quantities of CO_2 into the atmosphere [3].

3. Historically, the main greenhouse gases have always been present in the atmosphere in pre-industrial revolution times. Pre-industrial revolution concentration of these gases ranged from 25ppb to 700ppb and there are no major impacts that these gases caused back then. Why, however, are these gases a problem in current times? [2].

4. Oceans are said to be one of the sinks of CO_2; however, continued global warming may render them less dependable as CO_2 sinks. Discuss two factors that might render oceans less dependable [4].

5. Using your knowledge of formation of minerals, explain how minerals can be formed in a desert [3].

6. The absorption of infrared radiation by atmospheric gases, and prevention of this energy from escaping into outer space results in the warming of the lower atmosphere, making it conducive for life to occur. Why is this process referred to as a greenhouse effect? [3].

7. Placer mining, which is also called hydraulic mining, is particularly known to result in the pollution of streams and the killing of fish and other aquatic animals. Describe how placer mining leads to these impacts [4].

8. What are the three main factors determining the extent of effects of ionizing radiation? [3].