

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

TITLE OF PAPER : ENVIRONMENTAL PHYSICS
COURSE CODE : EHM 103
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. QUESTION ONE IS COMPULSORY. CHOOSE ANY OTHER TWO QUESTIONS IN ADDITION TO QUESTION ONE [THREE QUESTIONS IN TOTAL].
3. 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.
4. NECESSARY PENALTIES SHALL BE APPLIED FOR ANY UNACCEPTABLE BEHAVIOUR DURING THE COURSE OF THIS EXAMINATION.
5. NO MARKS SHALL BE AWARDED FOR POOR HANDWRITING AND POOR ENGLISH LANGUAGE GRAMMAR.

QUESTION ONE [TOTAL NUMBER OF MARKS = 25]

1. In 2010, over 50 scientific soil studies concluded that soils below the Lubombo Mountains are way more fertile than those found in any other regions in Swaziland. Most likely, some 1000 years before 2010;
 - a. An earthquake occurred in this area
 - b. A massive flood occurred in this area
 - c. A volcanic eruption occurred in this area
 - d. A massive landslide occurred in this area
2. The occurrence of a violent earthquake in water-saturated sediment is likely to result in which hazard?
 - a. Aftershocks
 - b. Quicksand
 - c. Liquefaction
 - d. Elastic rebound
3. After shocks are normally associated with;
 - a. A major volcanic eruption
 - b. The ejection of debris high into the upper layers of the troposphere
 - c. A major landslide occurring as a result of construction of dwellings on steep sides of mountains.
 - d. A major earthquake
4. A destructive earthquake is one that measures;
 - a. 4.5 on the Richter Scale
 - b. 5.5 on the Richter Scale
 - c. 6.5 on the Richter Scale
 - d. 7.5 on the Richter Scale
5. Some of the human activities that may trigger earthquakes are;
 - a. The construction of high rise buildings
 - b. The disposal of toxic waste in deep injection wells
 - c. The release of lots of CO into the atmosphere
 - d. The increase of paved surfaces
6. In deep water, the waves of a tsunami are;
 - a. Far apart with speed that is $> 800\text{km/hr}$
 - b. Closer together with a speed that is $< 800\text{km/hr}$
 - c. Far apart with a speed that is $< 800\text{km/hr}$
 - d. Closer together with a speed that is $> 800\text{km/hr}$

7. Gases that are released during a volcanic eruption include;
 - a. Nitric acid
 - b. Nitrous oxide
 - c. Nitrogen
 - d. Nitrate
8. A volcanic eruption often results in significant destructive impacts. Apart from the initial destructive impacts, a volcano may (after some time) result in;
 - a. Landslides
 - b. Mass wasting
 - c. Liquefaction
 - d. Acid deposition
9. The lithosphere is;
 - a. The combination of the outer core and the asthenosphere
 - b. The combination of the asthenosphere and the crust
 - c. The combination of the upper mantle and the asthenosphere
 - d. The combination of the crust and the uppermost mantle
10. The main constituents of the core are;
 - a. Fe and Al
 - b. Fe and Ni
 - c. Al and Fe
 - d. Ca and Na
11. Most of the mantle is solid rock, but under its rigid outermost part there is a zone of very hot, partly melted rock that flows like soft plastic. This plastic region is called the;
 - a. Lithosphere
 - b. Lithosmantle
 - c. Asthenosphere
 - d. Asthenosmantle
12. From the crust to the inner core, density;
 - a. Increases
 - b. Decreases
 - c. Is constant
 - d. Has no particular pattern
13. The source of the magnetic field that envelopes the earth is the;
 - a. Lithosphere
 - b. Crust
 - c. Core
 - d. Mantle

14. Tectonic plates are about 100km thick and are composed of;
- The crust and the asthenosphere
 - The asthenosphere and the lithosphere
 - The crust and the outermost part of the mantle
 - The crust and the inner mantle
15. The theory explaining the movement of the plates and the process that occur at their boundaries is called;
- Plate tectonics
 - Plate motion
 - Plate boundaries
 - Plate movement
16. The type of plate movement that is likely to result in minimal destruction or no destruction at all is;
- Divergent plate boundary
 - Transform fault boundary
 - Convergent boundary
 - Subduction boundary
17. The Mall Spar Group of companies has recently started the construction of a new shopping mall in an area that has been a flood plain for over a thousand years. When construction began, it was found that the construction site is quite rocky. Most likely, the rocks encountered are;
- Igneous rocks
 - Metamorphic rocks
 - Sedimentary rocks
 - Granite rocks
18. The most commonly used energy source, the most easily stored and the most conveniently transported energy form is;
- Light energy
 - Thermal energy
 - Chemical energy
 - Electrical energy
19. In the evening, pour hot coffee in a flask and close it tightly to ensure that no heat escapes. To make sure that you retain all the heat, cover the flask with 20 thick blankets and leave it overnight. In accordance with the laws of energy, the following morning, the coffee will be;
- At a higher temperature
 - Hot
 - At the same temperature
 - Cold

20. The law of energy that is closely associated with your response in question 19 above is;
- The first law of thermodynamics
 - The second law of thermodynamics
 - The third law of thermodynamics
 - The fourth law of thermodynamics
21. The bulk of the earth's crust consists of;
- Metamorphic rocks
 - Igneous rocks
 - Sedimentary rocks
 - A combination of igneous and sedimentary rocks
22. The form of energy that can neither be stored for long periods nor transmitted over long distances without large losses is;
- Mechanical energy
 - Chemical energy
 - Thermal energy
 - Light energy
23. Swaziland has four major regions, and in each of these regions there are various categories of mineral resources as shown below. Using your knowledge of the definitions of these categories, chose the region where Swaziland is likely to invest in mining.
- Manzini (Identified resources)
 - Hhohho (Undiscovered resources)
 - Lubombo (Reserves)
 - Shiselweni (Identified resources and undiscovered resources)
24. You come to a fuel station and you fill your car with diesel (which is also called energy) and you drive off. Before you get to Durban, you need to fill the car again with diesel. The reason why you fill your car again is because you have lost;
- The usable amount energy
 - The quality of energy
 - The heat in diesel
 - The energy in the diesel
25. An earthquake in Manzini is recorded as category 8.0 on the Richter Scale, while another one in Nhlanguano measures 5.0. The Manzini earthquake is;
- 10 times greater than the one in Nhlanguano
 - 100 times greater than the one in Nhlanguano
 - 1000 times greater than the one in Nhlanguano
 - 10000 times greater than the one in Nhlanguano

QUESTION TWO [TOTAL NUMBER OF MARKS = 25]

1. Western Europe (e.g. Germany, UK, Ireland, Iceland, Spain, Portugal, etc) experiences equal proportions of ozone depletion as Africa. Based on this statement, answer the questions that follow below.
 - 1.1 With regard to impact on health, where are you likely to find a higher number of health impacts that are associated with ozone depletion? [2].
 - 1.2 State the disease that is likely to be a serious health problem (i.e. higher incidence rates) in the area that you have stated in question 1.1 above [1].
 - 1.3 Briefly discuss one reason for your answer in question 1.1 above [2].
2. For each of the themes given below, state one activity that lead to the emission of methane.
 - 2.1 Production of fossil fuel energy [1.5].
 - 2.2 Waste management [1.5].
 - 2.3 Agriculture [1.5].
 - 2.4 Hydroelectric dams [1.5].
3. Three mining companies are located in the Piggs Peak Mountains. Company [A] is a coal mining company using the subsurface technique, company [B] is a gold mining company using the heap leaching technique and company [C] is an aluminum mining company using the open pit technique. A number of bird conservation associations have reported significant declines in certain species of birds. Representatives of most of these associations recently visited the mining companies to complain about the observed bird declines. Based on this information, answer the following questions;
 - 3.1 Which mining company was visited by the representatives of the bird conservation associations? [2].
 - 3.2 Describe your reasons for your answer in question 3.1 above [5].
 - 3.3 Recently, all miners from the three mining companies underwent vigorous health tests at the Piggs Peak Government Hospital. Miners from one of the three companies showed more signs of respiratory problems.
 - a. Which miners do you think are more affected by respiratory problems? [2]
 - b. Describe your reasons for your answer in question 3.3 [a] above [5].

QUESTION THREE [TOTAL NUMBER OF MARKS = 25]

1. Largely due to human activities, levels of the main greenhouse gases [GHGs] have risen substantially in recent decades, and are projected to enhance the earth's natural greenhouse effect – a phenomenon called global warming. Based on this statement, answer the following questions;
 - 1.1 State the four main greenhouse gases that are released by various human activities [4].
 - 1.2 State at least two human activities that are said to have resulted in increased greenhouse gases in the atmosphere. For each activity, state also one GHG associated with it [4].
 - 1.3 Of all the GHGs, state the one that accounts for the greatest warming [2].
 - 1.4 Briefly discuss the two main human activities that contribute to the huge inputs of the GHG you have stated in question 1.3 above [4].
 - 1.5 Despite the problems that GHGs cause to the environment, some of the GHG are beneficial. Do you agree with this statement? [2]
 - a. Yes
 - b. No
 - c. I agree to some extent; however, life can still go on pretty much the same even if there are no GHGs.
 - d. I fully agree. Actually, if we did not have some of the GHGs, life on earth would probably be very different, possibly worse than it is presently.
 - 1.6 Describe your reasons for your answer in question 1.5 above [4].
2. State any three primary pollutants and any two secondary pollutants that are associated with the use of fossil fuels [5].

QUESTION FOUR [TOTAL NUMBER OF MARKS = 25]

1. What do you understand by the phrase 'external geologic processes'? [2]
2. State (and briefly describe the direction of motion) any three types of boundaries that occur between the earth's plates [3].
3. Using examples, explain what is meant by low quality energy [2].
4. For each of these two categories of organisms, state and define the processes that these organisms use to obtain their energy for life.
 - a. Plants and animals living on the earth's surface [3].
 - b. Organisms living deep in the earth's crust or at the bottom of the oceans [3].
5. Below the ocean floor, some organisms oxidize methane using sulfur to create H_2S , which is consumed by bacteria that serve as a food source for more complex organisms like tube worms. From this statement, it is clear that methane is consumed by organisms below the ocean floor. Describe one problem that the world would be facing if these organisms did not exist [3].

6. Company [A] is an aluminum ore mining company, while company [B] is an aluminum ore processing company. Based on this statement, answer the following questions;
 - 6.1 Of these two companies, which one produces a mineral? [2].
 - 6.2 In not more than three points, explain why you chose either [A] or [B] in question 6.1 above [3].
7. Describe one reason why the mantle is said to be less dense than the core [2].
8. Explain why volcanic eruptions are less likely to occur at transform fault boundaries [2].