

UNIVERSITY OF SWAZILAND
FACULTY OF HEALTH SCIENCES
DEPARTMENT OF ENVIRONMENTAL HEALTH SCIENCE
FINAL EXAMINATION [DECEMBER 2012]

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. QUESTION ONE IS COMPULSORY. CHOOSE ANY OTHER TWO QUESTIONS IN ADDITION TO QUESTION ONE.
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. Select the correct statement from below [2].
 - a. The core consists of a molten inner core surrounded by the lithosphere and the mesosphere.
 - b. The core consists of a solid inner core surrounded by a liquid core of molten material.
 - c. The core consists of a molten inner core surrounded by a solid core of molten material.
 - d. The core consists of a solid inner core surrounded by a solid core of molten material.

2. The main elements that make up the inner and outer core are [2];
 - a. Iron and nickel
 - b. Iron and oxygen
 - c. Iron and magnesium
 - d. Iron and silicon

3. With regard to density [2];
 - a. The outer core has higher density than the inner core
 - b. The density of the outer inner core and that of the outer core is the same
 - c. None of the above
 - d. The inner core has higher density than the outer core

4. One of the following statements is NOT related to what is presently known about the earth's interior. Choose the wrong statement [2];
 - a. Earthquake studies
 - b. Measurements of heat flow from the interior
 - c. Analysis of the damage on infrastructure following the occurrence of earthquakes and volcanic eruptions.
 - d. Density measurements.

5. The source of the earth's magnetic field is [2];
 - a. The mantle
 - b. The lithosphere
 - c. The core
 - d. The asthenosphere

- 6.** The focus of an earthquake is [2];
- It is the study done to predict the impact that an earthquake is likely to cause on infrastructure.
 - The point of initial movement of the stressed part of the earth, resulting in release of energy.
 - The amount of energy released during the occurrence of an earthquake.
 - Points (b) and (c) are correct.
- 7.** The epicenter is [2];
- The point on the surface directly below the focus.
 - The point where two adjoining plates move laterally along the fault line.
 - The point on the surface directly above the focus.
 - Points (b) and (c) are correct.
- 8.** The magnitude of an earthquake is [2];
- A measure of the amount of energy released in the earthquake, as indicated by the size of vibrations when they reach a recording instrument.
 - The distance between the epicenter and the focus.
 - The gradual decrease of the amount of energy released during the occurrence of an earthquake.
 - The speed at which energy released during an earthquake travels across the earth's surface.
- 9.** A damaging earthquake is one that measures (on the Richter scale) [2];
- 12.0 – 14.0
 - 5.0 – 5.9
 - 10.0 – 15.0
 - Above 20.0
- 10.** Choose the most correct statement [2];
- Primary effects of earthquakes are rockslides, urban fires, flooding caused by subsidence.
 - Primary effects of earthquakes are severe consequences on buildings, bridges, dams, pipelines, railroads, subways.
 - Primary effects of earthquakes include the shaking and sometimes permanent vertical or horizontal displacement of the ground.
 - The main primary effects of earthquakes are the displacement of people from the affected areas to avoid any further loss of lives.

11. How much work is done when a mass of 9000g is lifted through a vertical height of 2150mm. Consider the force of gravity to be 9.80m/s^2 [3].
12. What is the purpose of heating shale oil before sending it by pipeline to refining industries? [2]

QUESTION TWO [TOTAL NUMBER OF MARKS = 25]

1. The city of Cape Town has a large population of about 20 million people. In order to deal with waste generated from the countless households and industrial operations, the municipal council operates a state-of-the-art landfill and an incinerator. As a result of these two waste management facilities, Cape Town is a very clean city; no refuse on streets, no illegal dumps and waste is collected daily and dumped in the landfill or incinerator. Using your knowledge of the laws of energy, answer the following questions;
- As far as sustainable development is concerned, Cape Town is on the right track [2].
 - True
 - False
 - Describe your reasons for choosing either true or false in (a) above [5].
 - State in full the scientific law that is applicable to the scenario given in question one above [3].
2. As opposed to the city of Cape Town, Port Elizabeth does not have any waste management facility (no landfill and no incinerator). About 90% of the waste generated is recycled and the remaining 10% that cannot be easily recycled is transported to the landfill in Cape Town. With regard to general cleanliness, Port Elizabeth is also a very clean city. According to your knowledge of recycling and the laws of energy, what are the three challenges that the city of Port Elizabeth is faced with? [6].
3. Following a huge volcanic eruption in the Lubombo Mountains, which sent huge clouds of thick smoke into the atmosphere, a number of lakes that are within a 100km radius were found to be acidic. One of the causes of this acidity in these lakes is the volcanic eruption. Describe how this is possible [4].

4. What is meant by acid mine drainage? [3].
5. With regard to open pit mining, rainwater collecting in the pits is considered to be one of the greatest challenges associated with metal mines. Explain why this is a problem [2].

QUESTION THREE [TOTAL NUMBER OF MARKS = 25]

1. A recent acid deposition study in the highveld of Swaziland has concluded that the significant decline of a number of fish species and aquatic birds in many lakes is as a result of many years of acid deposition in the highveld. Explain how these species are affected.
 - a. Fish [4]
 - b. Aquatic birds [5]
2. What is coal gasification? [2]
3. One of the destructive impacts of mining is the failure of the barren landscapes to revegetate naturally. Describe two factors that contribute to the inability of natural vegetation to re-establish itself on the affected area [4].
4. Discuss any two strategies that can be employed by the construction industry in order to ensure minimal damage during the occurrence of earthquakes [4].
5. Discuss the two major ways by which exposure to ionizing radiation can damage cells in the body [4].
6. State any two examples of external geologic processes [2].

QUESTION FOUR [TOTAL NUMBER OF MARKS = 25]

1. One of the observed changes as a result of global climate change is the melting of permafrost in western Canada, eastern Russia and Alaska. Discuss three impacts of melting of permafrost under the following themes;

- a. Impacts on infrastructure [2]
 - b. Impacts on forestry [2]
 - c. Coastal villages [2]
2. Communities below mountain glaciers use water from normal glacial melting for drinking and farming, and the melt water also keeps water levels high in rivers that support hydroelectric dams. With regard to the villages below such glaciers, discuss;
- a. One momentary advantage of the rapid melting of glaciers [2]
 - b. One disadvantage of the rapid melting of glaciers [2]
3. Discuss one major impact of the acidification of the world's oceans on some marine animal and plant species [3].
4. Using your knowledge of the impacts of acid deposition, explain how a village located at the base of a forested mountain, in an area that receives up to 5m of snow each winter, may have to be abandoned [4].
5. Using your knowledge of the effects of ozone depletion, describe how the following effects may occur:
- a. Increasing UV radiation may lead to severe food shortages in certain parts of the world [4].
 - b. Increasing UV radiation may lead to significant disruption to marine food chains [4].