UNIVERSITY OF SWAZILAND
FACULTY OF HEALTH SCIENCES
DEPARTMENT OF ENVIRONMENTAL HEALTH SCIENCE

SUPPLENTARY EXAMINATION PAPER
JULY 2016

TITLE OF PAPER	ENVIRONMENTAL PHYSICS
COURSE CODE	EHS 106
DURATION	2 HOURS
TOTAL NUMBER OF MARKS	75
INSTRUCTIONS	1. DO NOT OPEN THIS PAPER UNTIL YOU ARE INSTRUCTED TO DO SO BY THE INVIGILATOR. 2. QUESTION ONE IS COMPULSORY. CHOOSE TWO OTHER QUESTIONS IN ADDITION TO QUESTION ONE. 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 CORRECTLY. 4. POOR HANDWRITING AND CARELESSNESS IN ENGLISH LANGUAGE GRAMMAR SHALL RESULT IN LOSS OF MARKS. 5. NECESSARY PENALTIES SHALL BE APPLIED AGAINST ANY FORM OF MISCONDUCT DURING THE COURSE OF THE EXAMINATION.

QUESTION ONE [25 MARKS]

1. Gamma rays, X rays, cosmic rays, far ultraviolet waves and near ultraviolet waves are examples of;
   (a) Low quality electromagnetic
   (b) Infrared radiation used by large predators such as anacondas to detect the movement of prey such as rodents and rabbits
   (c) Electromagnetic radiation with short wavelengths
   (d) Electromagnetic radiation with longer wavelengths
2. The severity of an earthquake is often measured by;
   (a) The extent of damage on buildings, road, bridges and other structures such as railway lines
   (b) The magnitude of its seismic waves
   (c) The concentrated power of its focal point
   (d) The number of people that are often killed by being buried under the piles of rubble that results from collapsed buildings
3. The capacity to transfer heat is;
   (a) Force
   (b) Work
   (c) Energy
   (d) Kinetic energy
4. A mining technique (in a fairly flat terrain) where a gigantic earthmover strips away the overburden, and a power shovel (which can be as tall as a 20-story building) removes the mineral deposit is;
   (a) Area strip mining
   (b) Surface strip mining
   (c) Subsurface mining
   (d) Contour strip mining
5. Flowing water, electricity, wind, etc., are all examples of;
   (a) Electricity
   (b) Kinetic energy
   (c) Potential energy
   (d) Heat
6. A mining technique where explosives, earth movers, large power shovels, and other machines with huge buckets (called draglines) are used to remove the top of a mountain and expose seams of coal, which are then removed is;
   (a) Mountainside removal
   (b) Dragline removal
   (c) Mountaintop removal
   (d) Sub-surface mining

7. The distance between successive peaks or troughs in a wave is known as;
   (a) UV radiation
   (b) Wavelength
   (c) Visible light
   (d) Gamma rays
8. A geologic process that results in material being dissolved, loosened, or worn away from one part of the earth's surface and deposited elsewhere is;
   (a) Weathering
   (b) Erosion
   (c) Deposition
   (d) Transportation
9. Without energy from the sun, the earth could be as cold as;
   (a) -270^0C
   (b) -260^0C
   (c) -250^0C
   (d) -240^0C
10. The physical, chemical, and biological processes that break down rocks into smaller particles that help to build soil are an example of;
   (a) Internal geologic processes
   (b) Asthenospheric geologic processes
   (c) External geologic processes
   (d) Lithospheric geologic processes
11. Energy quality is defined as;
   (a) As the capacity do work and transfer heat
   (b) The total kinetic energy of all moving atoms, ions or molecules within a given substance, excluding the overall motion of the whole object
   (c) The measure of an energy source's ability to do useful work
   (d) The total kinetic energy of all moving atoms, ions or molecules within a given substance, including the overall motion of the whole object
12. An earthquake classified as insignificant is one that is;
   (a) Less than 4.0 on the Richter scale
   (b) Less than 3.0 on the Richter scale
   (c) Less than 2.0 on the Richter scale
   (d) Less than 1.0 on the Richter scale
13. High quality energy;
   (a) Has high total heat content but its average temperature is low
   (b) Is disorganized but can be used to achieve high quality work
   (c) Is organized
   (d) Is concentrated with high speed molecules dispersed in the atmosphere.

14. In order to extract mineral deposits that lie in large horizontal beds close to the earth's surface, mining companies normally use the;
    (a) Surface mining
    (b) Open-pit mining
    (c) Strip mining
    (d) Surface strip mining
15. A magnitude 5.0 earthquake would result in;
    (a) 4 times more ground shaking than a magnitude 4.0 earthquake
    (b) 6 times more ground shaking than a magnitude 4.0 earthquake
    (c) 8 times more ground shaking than a magnitude 4.0 earthquake
    (d) 10 times more ground shaking than a magnitude 4.0 earthquake
16. The five nations that supply most of the world's non-renewable mineral resources are;
    (a) USA, South Africa, China, Canada and Brazil
    (b) Brazil, USA, China, Japan and North Korea
    (c) North Korea, Iraq, USA, Canada and China
    (d) United States of America (USA), Canada, Russia, South Africa and Australia
17. Geologic processes that typically build up the earth's surface by pushing up the continental and oceanic crusts, forming mountains and volcanoes are;
    (a) External geologic processes
    (b) Internal geologic processes
    (c) Asthenospheric geologic processes
    (d) Lithospheric geologic processes
18. The type of energy that travels in form of a wave is known as;
    (a) Kinetic energy
    (b) Electronic energy
    (c) Electromagnetic energy
    (d) Magnetic energy
19. Geologic processes that tend to wear down the earth's surface and move matter from one place to another are;
    (a) Internal geologic processes
    (b) Asthenospheric geologic processes
    (c) External geologic processes
    (d) Lithospheric geologic processes
20. A series of large waves generated when part of the ocean floor suddenly rises or drops are known as a;
    (a) Oceanic crust subsidence
    (b) Oceanic subduction
    (c) Tsunami
    (d) Abyssal plane release

21. Earthquakes that cause tsunamis often occur offshore in subduction zones where;
    (a) An oceanic tectonic plate slips under a continental plate
    (b) A continental plate slips under an oceanic plate
    (c) A transform fault slips under a tectonic fault
    (d) Magma is subducted into the inner core
22. As a tsunami approaches a coast with its shallower waters, it slows down, its wave crests squeeze closer together, and their heights;
    (a) Grow rapidly
    (b) Remain the same
    (c) Are lowered
    (d) Can be the as high as a 25 story building
23. Since energy can neither be created nor destroyed, when one fills a car tank with diesel and drive off, the only thing that is lost is;
    (a) Battery power
    (b) Diesel energy
    (c) Kinetic energy
    (d) Energy quality
24. The energy of the earth's tremendous internal stress is released in the form of;
    (a) Seismic (shock) waves
    (b) Underground thrusts
    (c) Tidal waves
    (d) Intertidal plane waves
25. A mining technique where gigantic power shovels and bulldozers cut a series of terraces into the side of a hill to extract minerals (like coal) is;
    (a) Area strip mining
    (b) Strip mining
    (c) Mountainside removal
    (d) Contour strip mining

QUESTION TWO [25 MARKS]

1. The main zones of the earth are shown in **Figure 1**. Study the diagram carefully and answer the questions that follow.

1.1 As the primitive earth cooled over many ages ago, its interior separated into three concentric zones. State the names of the zones represented by A–D **[4]**.

1.2 The formation of the lithosphere involves the combination of which two zones? **[2]**

1.3 What is the estimated thickness of zones C and D combined? **[2]**

1.4 In which zone is the earth's magnetic field generated? **[2]**

1.5 State the two hottest zones of the earth **[2]**.

1.6 State the youngest zone of the earth **[1]**.

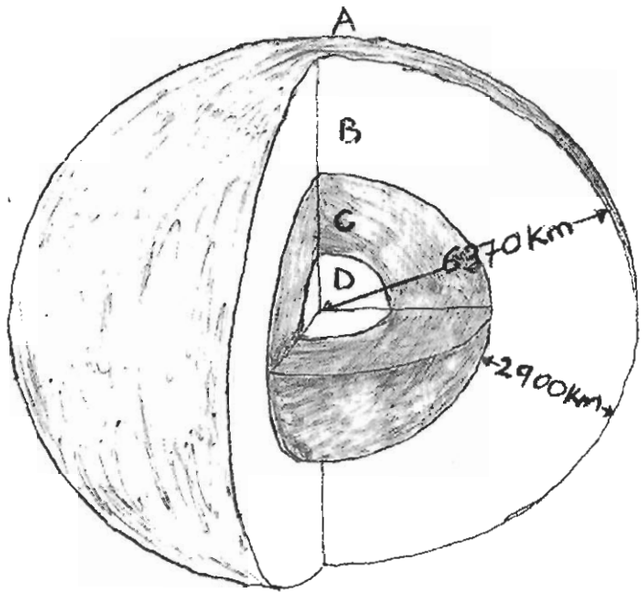

Figure 1: The earth's cross section.

1.7 In what zone are the following elements found; oxygen (46.6%), silicon (27.7%), aluminium (8.1%), iron (5.0%), calcium (3.6%), sodium (2.8%), potassium (2.6%) and magnesium (2.1%)? **[2]**

2. While volcanic eruptions are destructive, they may provide some benefits. In what ways can volcanic eruptions be beneficial? **[2]**
3. Describe any means by which tsunamis can be detected **[2]**.
4. Ore extracted by mining typically has two components. What are these two components? **[2]**
5. In mining and mineral processing, what are tailings? **[2]**
6. The loss of human life and some of the property damage caused by volcanic eruptions can be reduced in several ways. Discuss any two strategies that can be used to achieve this **[2]**.

QUESTION THREE [25 MARKS]

1. State any two sources of the most commonly used (which is also the most easily stored and the most easily transported) type of energy in the planet **[2]**.
2. State any two uses of electromagnetic radiation **[2]**.
3. State any two examples of ionizing radiation **[2]**.
4. State any two strategies that can be adopted in order to achieve a sustainable low-waste society **[2]**.
5. State any two chemical elements that make up the earth's crust **[2]**.
6. State any two types of boundaries that are found between the earth's plates **[2]**.
7. State any two examples of external geologic processes **[2]**.

8. State any two techniques that are commonly used in surface mining operations [2]
9. State any two examples of the primary effects of earthquakes [2].
10. State any two gases that may be released during a volcanic eruption [2].
11. State one example of low quality energy [1].
12. State any two external processes that are involved in the rock cycle [2].
13. State any two anthropogenic activities that may result in increased occurrence of landslides [2].

QUESTION FOUR [25 MARKS]

1. The main greenhouse gases include CH_4, CO_2, CFCs, N_2O and O_3. Arrange these gases in order of their warming potential (from the most potent to the least potent) [2].
2. The main greenhouse gases include CH_4, CO_2, CFCs, N_2O and O_3. Arrange these gases in order of their residence times in the troposphere (from the one with the longest residence time to the one with the shortest residence time) [2].
3. 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].
4. 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? [2].
5. State any two human activities that contribute to increased methane emissions [2].
6. Because of the second law of thermodynamics, the use of carbon-containing fossil fuels packs a double punch. What do you understand by this statement? [4]
7. Climate change has made it possible for pests, such as mountain pine beetle, to damage large expanses of pine trees. Briefly explain how this happens [2].
8. Climate change studies have shown that the world's oceans absorb CO_2 from the atmosphere as part of the carbon cycle and thus help to moderate the earth's average surface temperature and its climate. The oceans also absorb heat from the lower atmosphere. Then, partly driven by this heat, ocean currents slowly transfer some CO_2 to the deep ocean where it is buried in carbon compounds in bottom sediments for several hundred million years. Based on this brief information, answer the questions below.

8.1 What is the impact of the absorbed heat on absorbed CO_2? [2]

8.2 What is the impact of the absorbed CO_2 on the chemistry of ocean water? [2]

8.3 It has been shown that your response in **question 8.2** above may cause problems to corals, organisms that have shells and organisms whose body structures are composed of calcium carbonate. Describe any two such problems [4].