UNIVERSITY OF SWAZILAND

FACULTY OF HEALTH SCIENCES

DEPARTMENT OF ENVIRONMENTAL HEALTH SCIENCE

SUPPLEMENTARY EXAMINATION PAPER: JULY 2017

TITLE OF PAPER	ENVIRONMENTAL PHYSICS
COURSE CODE	EHS 106
DURATION	2 HOURS
TOTAL NUMBER OF MARKS	100
INSTRUCTIONS	1. DO NOT OPEN THIS PAPER UNTIL YOU ARE INSTRUCTED TO DO SO. 2. QUESTION ONE IS COMPULSORY. CHOOSE THREE OTHER QUESTIONS IN ADDITION TO QUESTION ONE. 3. BEGIN EACH QUESTION ON A FRESH PAGE OF THE ANSWER BOOKLET. ENSURE THAT ALL PAGES ARE NUMBERED CORRECTLY. 4. POOR HANDWRITING AND CARELESSNESS IN ENGLISH LANGUAGE GRAMMAR SHALL RESULT IN LOSS OF MARKS. 5. NECESSARY STEPS SHALL BE TAKEN AGAINST ANY FORM OF MISCONDUCT DURING THE EXAMINATION. 6. MARKS FOR EACH QUESTION (SECTION) ARE SHOWN IN BRACKETS.

QUESTION ONE [25 MARKS]

1. A new company recently started constructing a shopping mall in an area that was a flood plain for over six hundred years. When construction began, the area was quite rocky. Most likely, the rocks encountered here are;
   (a) Igneous rocks
   (b) Metamorphic rocks
   (c) Sedimentary rocks
   (d) Granite rocks
2. The bulk of the earth's crust consists of;
   (a) Metamorphic rocks
   (b) Sedimentary rocks
   (c) Igneous rocks
   (d) A combination of igneous and sedimentary rocks
3. A zone of hot, partly melted rock that flows and can be deformed like a soft plastic is known as;
   (a) Convection plane
   (b) Lithosphere
   (c) Continental sphere
   (d) Asthenosphere
4. The place where an earthquake begins, often far below the earth's surface is called the;
   (a) Transform fault site
   (b) Focal point
   (c) Seismic wave centre
   (d) Focus
5. The earthquake's epicentre is located on the earth's surface directly above the;
   (a) Central vent
   (b) Focus
   (c) Undersea thrust
   (d) Subduction zone
6. As a tsunami approaches a coast with its shallower waters, it slows down, its wave crests squeeze closer together, and their heights;
   (a) Remain the same
   (b) Grow rapidly
   (c) Are lowered
   (d) Can be the as high as a 25 storey building
7. The measure of how useful a form of matter is as a resource is
   (a) Matter quality
   (b) Entropy
   (c) Energy quality
   (d) Entropy quality
8. The measure of the disorder or randomness of a system or its environment is
   (a) Entropy
   (b) Energy quality
   (c) Matter quality
   (d) Entropy quality
9. The greater the disorder of a sample of matter;
   (a) The higher its quality
   (b) The higher its energy content
   (c) Both (b) and (d) are correct
   (d) The higher its entropy

10. The greater the order of a sample of matter;
    (a) The lower its quality
    (b) The lower its energy content
    (c) The lower its entropy
    (d) Both (b) and (c) are correct
11. About 99% of the energy required on earth by living organisms for survival comes from;
    (a) Nuclear power plants
    (b) The sun
    (c) Renewable resources
    (d) Fossil fuels
12. The direct input of solar energy from the sun produces other indirect forms of solar energy such as;
    (a) Wind
    (b) Natural gas
    (c) Crude oil
    (d) Fossil fuels
13. Organisms that live in severe environmental conditions are referred to as;
    (a) Extremophiles
    (b) Chemosynthesis
    (c) *Pyrobolus fumarii*
    (d) Heat resistant organisms
14. The process in which inorganic chemicals, such as H_2S or H_2, provide energy for synthesis of organic molecules is;
    (a) Photosynthesis
    (b) Chemosynthesis
    (c) Terrestrial synthesis
    (d) Rock synthesis
15. The concentration of naturally occurring material from the earth's crust that we can extract and process into raw materials and useful products at an affordable cost is;
    (a) A non-metallic mineral resource
    (b) An ore mineral
    (c) A mineral resource
    (d) A high-grade ore
16. A good example of metallic minerals is;
    (a) Phosphate salts
    (b) Sand
    (c) Gravel
    (d) Aluminum
17. A rock that contains a large enough concentration of a particular mineral, often a metal, to make it profitable for mining and processing is;
    (a) High-grade ore
    (b) Low-grade ore
    (c) An ore
    (d) Both (a) and (b) are correct
18. Usually, electrical and communications wiring are often manufactured using;
    (a) Manganese
    (b) Chromium
    (c) Copper
    (d) Aluminum

19. The major difference between high-grade and low-grade ores is mainly with regards to;
    (a) The concentration of the desired mineral
    (b) The type of rock in which they are found
    (c) The quality of the mineral that can be extracted from the ores
    (d) Profits that can be made
20. Identified resources from which minerals can be extracted profitably at current prices are referred to as;
    (a) Reserves
    (b) High-grade ores
    (c) Deposits
    (d) Renewable mineral deposits
21. In non-renewable mineral terminology, economic depletion is closely related with;
    (a) The economic down-turn that results in shut down of mining firms
    (b) economic logic in continuing to extract minerals
    (c) The combination of lack of sophisticated mining technologies and lower prices of mineral resources
    (d) The time when it costs more than it is worth to find, extract, transport and process mineral resources
22. Nations that supply most of non-renewable mineral resources do not include;
    (a) South Africa
    (b) Australia
    (c) Russia
    (d) United Kingdom
23. Depletion time is the time it takes to use up a certain proportion of the reserves of a mineral at a given rate of use. This proportion is usually;
    (a) 65%
    (b) 70%
    (c) 90%
    (d) 80%
24. The theory explaining the movement of the plates and the process that occur at their boundaries is called;
    (a) Plate tectonics
    (b) Plate motion
    (c) Plate boundaries
    (d) Plate movement
25. The type of plate movement that is likely to result in minimal destruction or no destruction at all is;
    (a) Divergent plate boundary
    (b) Transform fault boundary
    (c) Convergent boundary
    (d) Subduction boundary

QUESTION TWO [25 MARKS]

1. One of the disadvantages of wind turbines is the killing of birds. However, there are ways of reducing these impacts. Describe any two such measures **[6]**.
2. Wood is a renewable resource, but it can also be a non-renewable resource. Explain how this is possible **[2]**.
3. What do you understand by the following statement: "there is no net CO_2 increase in burning biomass" **[2]**

4. State any three examples of agricultural wastes that can be burned to generate electricity or converted to biofuels [3]
5. Briefly describe the main difference between large-scale hydropower projects and small-scale hydropower projects [2].
6. Although the generation of electricity in hydropower plants is not associated with high CO_2 emissions, hydropower infrastructure can lead to production of more greenhouse gases than coal-fired power plants. Explain how this might happen [3]
7. In the absence of the protective ozone layer, state any four diseases/health problems that could be experienced by humans on earth [4].
8. State any three examples of wet deposition [3]

QUESTION THREE [25 MARKS]

1. From the following words and phrases, pick any three that describe low quality matter and any three that describe high quality matter [6]. In each case, write T or F against the statement.
   (a) Usually has little potential for use as matter resource
   (b) Usually found near the earth's surface
   (c) Disorganized
   (d) Has great potential for use as a matter resource
   (e) Dilute
   (f) Concentrated
   (g) Often deep underground or dispersed in the ocean or atmosphere
   (h) Organized
2. State any two examples of planetary sinks [2].
3. State any three examples of severe environmental conditions from which living organisms have been discovered in recent years [3].
4. State any three things that might happen when prices of scarce mineral resources are increased [3]
5. State any three uses of aluminum [3].
6. State any two examples of metamorphic rock [2].
7. State any two types of rock [2].
8. State any two processes that are responsible for recycling rocks [2].
9. State any two types of plate boundaries [2].

QUESTION FOUR [25 MARKS]

1. Study each of the following statements carefully and determine whether they are true (T) or false (F) [20]

(a) The core has a solid inner part, surrounded by a thick layer of molten rock, or hot liquid rock, and semisolid material
(b) The core an inner part that consists of molten rock or hot liquid rock, surrounded by a thick layer of solid rock
(c) The mantle is the thin zone that surrounds the core.
(d) The outermost part of the mantle is solid rock, and under that part is a zone called lithosphere.
(e) The asthenosphere is a volume of hot, partly melted rock that flows.
(f) The combination of the crust and the asthenosphere is called lithosphere.
(g) When a continental crust moves against the oceanic crust, the continental crust is often subducted (pushed) under the oceanic crust.
(h) The oceanic crust makes up 71% of the earth's crust.
(i) The earth's crust, mantle and core are not static.

(j) Much of the geological activity at the earth's surface takes place at the boundaries between tectonic plates.
(k) The zone of the earth where minerals are found is the core, from where the intense heat purifies minerals.
(l) One example of external geologic processes is erosion.
(m) External geologic processes tend to wear down the earth's surface.
(n) Internal geologic processes generally build up the earth's surface.
(o) Mechanical weathering cannot occur without reactions involving oxygen, carbon dioxide and moisture in the atmosphere.
(p) High-throughput societies are advanced industrialized countries that attempt to sustain ever increasing economic growth by increasing the throughput of matter and energy in their economic systems.
(q) Planetary sinks into which waste and pollutants end up do not include living organisms.
(r) Individual resource use automatically adds some waste heat and waste matter to the environment.
(s) The above statement is governed by the law of conservation of matter and the first law of thermodynamics
(t) The goal of a matter recycling society is to allow economic growth to continue without depleting matter resources or producing excessive pollution and environmental degradation.

2. The use of matter and energy resource is associated with serious environmental problems according to the law of conservation of matter and the second law of conservation of energy. State any five solutions that can be adopted to control such problems [**5**].

QUESTION FIVE [25 MARKS]

1. Briefly summarize the main findings of Sherwood Rowland and Mario Molina's ground-breaking research that led to a call for an immediate ban of CFCs in spray cans [**5**].
2. One of the serious threats from ozone depletion is that the resulting increase in UV radiation could impair or destroy phytoplankton. Discuss some of the environmental problems linked with the destruction of phytoplankton [**4**].
3. In the absence of the protective ozone layer, state any three diseases that could be experienced by humans on earth [**3**].
4. Prior to their prohibition, CFCs were used in many industrial processes. State any three such uses [**3**].
5. 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 returns after the dark Antarctic winter. Using your knowledge of the processes that make Antarctica vulnerable to ozone destruction, describe;

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

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