UNIVERSITY OF SWAZILAND

Faculty of Health Science

Department of Environmental Health Sciences

Final Examination 2007

TITLE OF PAPER	:	ENVIRONMENTAL PHYSICS
COURSE CODE	:	EHS 402
DURATION	:	THREE HOURS
MARKS	:	100
INSTRUCTIONS	:	ANSWER ONLY FIVE QUESTIONS
	:	EACH QUESTION CARRIES 20 MARKS
	:	QUESTIONS ONE AND TWO ARE COMPULSORY
	:	NO QUESTION PAPER SHOULD BE BROUGHT INTO NOR OUT OF THE EXAMINATION ROOM
	:	BEGIN EACH QUESTION ON A SEPARATE SHEET OF PAPER

DO NOT OPEN THIS QUESTION PAPER UNTIL PERMISSION IS GRANTED BY THE INVIGILATOR

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QUESTION ONE

1. a distinctive building block of matter is called
    a. element
    b. mixture
    c. compound
    d. isotope

2. protons, neutrons, and electrons are all
    a. forms of energy
    b. equal in mass
    c. subatomic particles
    d. negative ions

3. isotopes differ from each other by their number of
    a. ions
    b. protons
    c. atoms
    d. neutrons

4. all of the following are examples of kinetic energy except
    a. speeding bullet
    b. a stick of dynamite
    c. a flow of electric current
    d. a falling rock

5. all of the following are examples of ionizing radiation except
    a. cosmic rays
    b. gamma rays
    c. microwaves
    d. X rays

6. all of the following are given off by natural radioactivity except
    a. alpha particles
    b. delta particles
    c. gamma rays
    d. beta particles

7. multiple nuclear fissions
    a. occur when two nuclei hit each other
    b. require isotopes with small mass numbers
    c. occur best with a small mass of isotopes
    d. may result in chain reaction

8. the matter and energy laws tell us that we can recycle
    a. both matter and energy
    b. neither matter nor energy
    c. matter but not energy
    d. energy but not matter

9. a low-through put economy would do all of the following except
    a. use energy more efficiently
    b. shift to perpetual and renewable energy sources
    c. recycle and reuse most matter that is now discarded
    d. create goods with a short life cycle to increase recycling

10. which of the following is true
    a. the common element in the center of the earth's core is iron
    b. the inner core is liquid, whereas the outer core is solid
    c. extreme pressure makes the interior of the earth liquid
    d. the core of the earth occupies most of its volume

11. the asthenosphere is
    a. the outer atmosphere
    b. the inner core of the earth
    c. a plastic region in the mantle
    d. a plastic region in the crust

12. the majority of earthquakes and volcanoes occur
    a. in the interior of continents
    b. on oceanic islands
    c. along the edge of continents
    d. in the open ocean

13. which of the following terms include the other?
    a. Nonmetallic mineral resources
    b. Energy resources
    c. Mineral resources
    d. Metallic mineral resources

14. one example of subsurface mining is
    a. dredging
    b. contour strip mining
    c. long wall mining
    d. area strip mining

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15. acid mine drainage
    a. occurs when anaerobic bacteria produce nitric acid from nitrogen oxides
    b. enhances aquatic life
    c. neutralizes the pH of surface waters
    d. may contaminate groundwater

16. the net energy ratio is
    a. the ratio of the energy it took to produce it to the new useful energy product
    b. the ratio of the useful energy produced to the useful energy used to produce it
    c. high when the net energy yield is high
    d. high when the net energy yield is low

17. a strategic disadvantage of oil is that it
    a. produces more carbon dioxide than any other fuel
    b. produces destruction of nature through oil spills
    c. can contaminate ground water supplies
    d. will be commercially depleted within 90 years

18. natural gas from wells consists of 50% to 90%
    a. methane
    b. butane
    c. propane
    d. ethane

19. the world's most abundant conventional fossil fuel is
    a. crude oil
    b. natural gas
    c. biomass
    d. coal

20. the least expensive perpetual energy resource is
    a. improving energy efficiency
    b. wind energy
    c. biomass
    d. hydrogen gas

Total 20 marks

QUESTION TWO

(a) Heat can be transferred from one point to another through conduction, convection and radiation. List six applications of heat transfer by conduction. (6 marks)

(b) List four properties of heat radiation. (4 marks)
(c) Discuss the process of heat balance in the human body under varying environmental conditions. (10 marks)

Total 20 marks

QUESTION THREE

(a) List four properties that can be used to characterize (categorize) solid materials (4 marks)

(b) Viscosity is one of the properties used to characterize liquid materials. Explain. (6 marks)

(c) Draw and label a phase diagram of water and explain what the different curves represent. (10 marks)

Total 20 marks

QUESTION FOUR

(a) Briefly describe the layers of the earth's interior (6 marks)

(b) Describe the internal and external earth's processes responsible for forming earth's landscape (4 marks)

(c) Distinguish three different tectonic plate boundaries and the geologic features often found at each (6 marks)

(d) Explain the significance of the knowledge of plate tectonics in our understanding of mineral deposits and evolution. (4 marks)

Total 20 marks)

QUESTION FIVE

(a) An acrobatic airplane flying in the skies of Maputo as it dropped bombs during the FRELIMO – RENAMO war in the 1990s flew with a velocity of 180m/s at its highest point of the loop of a vertical circle of radius 180m. What is the velocity of the airplane at the lowest point of its loop? Show all calculations. (10 marks)

(b) Name five instruments that can be used to detect radioactivity (5 marks)

(c) Explain what happens to the atomic numbers and mass numbers of an isotope when it emits (i) alpha, (ii) beta, and (iii) gamma radiations respectively (5 marks)

Total 20 marks

QUESTION SIX

(a) Radioactivity poses a great hazard to health. Mention four reasons that make you to agree that we can never avoid all kinds of radioactivity. (4 marks)

(b) Mention six ways which one can use to reduce the amount of radiation received (6 marks)

(c) The current through an X-ray tube is 3500mA when the voltage is 18500volts. Calculate

(i) The number of electrons striking the target per second. Given that, when the potential difference across the tube is in volts, the electron charge (e) is 1.6×10^{-19} Coulombs (4 marks)

(ii) The velocity of the electrons when they strike the target. Given that, the mass of the electron is 9×10^{-31}kg. (6 marks)

Total 20 marks

GOOD LUCK!!!