UNIVERSITY OF ESWATINI

Faculty of Health Sciences

Department of Environmental Health Science

DEGREES IN ENVIRONMENTAL HEALTH SCIENCE AND NURSING SCIENCE

MAIN EXAMINATION PAPER FEBRUARY 2021

TITLE OF PAPER	:	PHYSICS FOR HEALTH SCIENCES
(ENVIRONMENTAL HEALTH SCIENCE AND NURSING SCIENCE STUDENTS)		
COURSE CODE	:	EHS103
DURATION	:	2 HOURS
MARKS	:	100
INSTRUCTIONS	:	READ THE QUESTIONS & INSTRUCTIONS CAREFULLY
	:	ANSWER **ANY FOUR** QUESTIONS
	:	EACH QUESTION **CARRIES 25** MARKS.
	:	WRITE NEATLY & CLEARLY
	:	CALCULATOR, GRAPH PAPERS, RULAR AND A SET OF MATHEMATICAL INSTRUMENTS ARE ALLOWED FOR THIS EXAM PAPER
	:	NO OTHER PAPER SHOULD BE BROUGHT INTO THE EXAMINATION ROOM.
	:	STUDENTS ARE ALLOWED TO USE GRAPH PAPERS AND SCIENTIFIC CALCULATORS
	:	BEGIN EACH QUESTION ON A SEPARATE SHEET OF PAPER.

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

QUESTION ONE

A. State the laws of reflection as it concerns a plane mirror. [4 marks]

B. What is meant by **lateral inversion** and **lateral displacement** in the study of optics? [4 marks]

C. Give two examples of the application of plane mirrors. [4 marks]

D. Name three applications of curved mirrors in hospitals. [3 marks]

E. During ultrasound imaging on a patient at the Mbabane hospital, ultra sound is incident at an angle of 10^0 in soft tissue, onto a plane soft tissue-bone boundary. If the angle of refraction in the bone is 27.4^0, calculate the following:

   I. The speed of ultrasound in the bone given that it is 1.54 km/s in the soft tissue. [6 marks]

   II. The refractive index when the ultrasound is traveling from the bone to the soft tissue. [4 marks]

Total 25 marks

QUESTION TWO

A. Draw the structure of a human eye and label the following parts: lens, pupil, cornea, retina, iris, vitreous humour, ciliary muscle and the optic nerve. Then, answer the following questions: [8 marks]

   I. What is presbyopia? Explain how a person can get such a condition. [5 marks]

   II. How can an ophthalmologist correct this condition? [1 marks]

B. You examine make Nolwazi who has a problem with her vision. You find that she has a near point of 1.5 m. Given that the near point of a normal eye is 25 cm from the eye,

   I. What sight condition is make Nolwazi having? [1 mark]

   II. How are you going to correct this condition of make Nolwazi? [1 marks]

   III. Calculate the focal length of the lenses you are going to prescribe for make Nolwazi'seyeglassesso that she can read a book held at 25 cm. [5 marks]

   IV. Calculate the power of the lens. [4 marks]

Total 25 marks

QUESTION THREE

A. State the following laws:

   I. Boyle's law [2 marks]

   II. Charles's law [2 marks]

III. Pressure law [2 marks]

B. The density of argon is 1.60 kgm^{-3} at 27^0 C and a pressure of 750 mmHg. What is the mass of argon in an argon-filled electric lamp bulb of volume 100 cm^3 if the pressure inside is 750 mmHg when the average temperature of the gas is 120^0 C? [8 marks]

C. Why do we say humans are **homoeothermic** and fish are **poikilothermic**? [2 marks]

D. What do you understand by the terms **endothermy** and **hyperthermia**? [2 marks]

E. Explain how a person can get the condition of hyperthermia and describe how would you help such a person who is suffering from hyperthermia to recover? [7 marks]

Total 25 marks

QUESTION FOUR

A. Define radioactivity. [2 marks]

B. Name the three types of emissions that result from radioactivity [3 marks]

C. Make a table as shown below for the three types of emissions you have named in (B) above and in the table list three properties of each emission in the appropriate columns. [9 marks]

Emission 1 (you must give the name of the emission here)	**Emission 2** (you must give the name of the emission here)	**Emission 3** (you must give the name of the emission here)
1.	1.	1.
2.	2.	2.
3.	3.	3.

D. List five medical applications of radioactivity. [5 marks]

E. Calculate the energy released when 1 kg of $^{235}_{92}U$ undergoes nuclear fission. Assume energy per fission is 200 MeV and Avogadro's number = 6.02×10^{23} mol^{-1}. [6 marks]

Total 25 marks

QUESTION FIVE

A. Differentiate between a **scalar quantity** and a **vector quantity** and give an example of each. [4 marks]

B. State Newton's law of inertia. What are the two clauses or parts contained in the statement of this law? [4 marks]

C. Two blocks of masses 4 kg and 6 kg are joined by a string and rest on a frictionless horizontal table. If a force of 100 N is applied on the 6 kg block to move them, find the acceleration of each block and the tension in the string. [6 marks]

D. When a 10 Ω resister is connected across the terminal of a cell of electromagnetic force, E, and internal resistance, r, a current of 0.1 A flows through the resistor. When the 10 Ω resistor is replaced by a 3 Ω resistor, the current increases to 0.24 A. find the values of E and r. [9 marks]

E. Static electricity is associated with dangers in hospitals especially in the operating theatres or where oxygen is being used. Name two of these dangers. [2 marks]

Total 25 marks

End of examination