KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR

FOURTH YEAR SECOND SEMESTER
SPECIAL/SUPP EXAMINATIONS

FOR THE DEGREE OF B. ED(SCIENCE)

COURSE CODE: **SPH 427***

COURSE TITLE: **ENVIRONMENTAL & RENEWABLE ENERGY PHYSICS**

DURATION: **2HRS**

DATE: 24/11/2022 **TIME: 8:00AM-10:00AM**

INSTRUCTIONS TO CANDIDATES

- Answer question ONE (compulsory) and any TWO of the remaining questions.
  - Attempted questions must be indicated on front cover of answer booklet.
  - Every question should be started on new page and question indicated respectively.

Question One (30Marks)

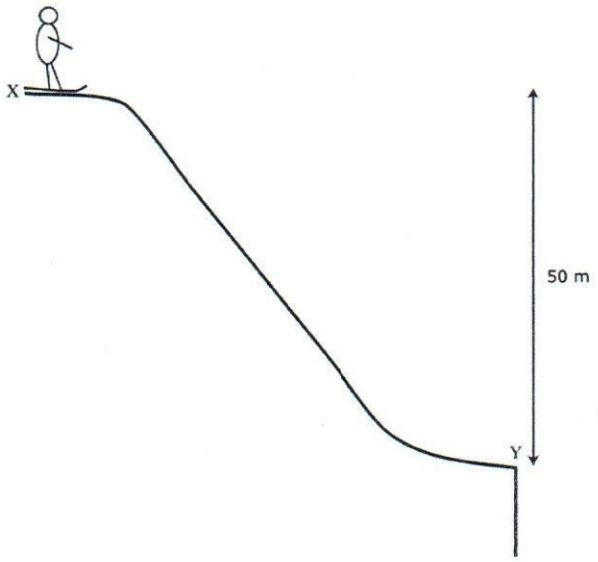
a. What is green energy and why is green technology replacing other energy sources. (3 Marks)

b. What's the difference between renewable and non-renewable? (2 Marks)

c. A student suggests replacing a coal power station with solar panels on the same site. **Give** two reasons why this might not be good idea. (2 marks)

d. A group of factories requires 50 MW to operate. Calculate the number of wind turbines needed to meet the needs of the group of factories. (3 marks)

e. A ski jumper with a mass of 70 kg is held at rest at the top of a 50 m high ramp. The ski jumper is then released. The gravitational field strength is 9.8 N/kg.



i. Calculate the change in gravitational potential energy of the ski jumper between points X and Y. How much kinetic energy does the ski jumper have at point Y. (4mks)

ii. A motorised lift is used to take the ski jumper back up to the top of the ramp. It takes 50 seconds to lift the ski jumper to the top from a point level with Y. Calculate the power of the motor. (3 Marks)

f. Calculate the efficiency of an engine that transforms 2000 J of chemical potential energy into 700 J of kinetic energy, and 1300 J into wasted heat and sound energy. (3 Marks)

g. What is radio-frequency energy (2 Marks)

h. Differentiate between energy conservation and energy efficiency. (4Marks)

i. What is the role of science, technology and innovation in promoting renewable energy by 2030? (4 Marks)

Question Two (20 Marks)

a. The blades of a wind turbine are 42 m in length and rotate at a maximum rotation rate of 14 rev/min. If the blades are 5,700 kg each and the rotor assembly has three blades, calculate the angular momentum (in $kg \cdot m^2/s$) of the turbine at this rotation rate. Assume the turbine blades can be approximated as rods rotating about one end. What is the torque (in Nm) required to rotate the blades up to the maximum rotation rate in 5 minutes? (Assume the blades start from rest) (8 Marks)

b. Discuss any three forms of non-renewable energy outlining their effects on the environment. (6 Marks)

c. **Discuss different types of renewable energy and outline how they benefit the environment. (6 Marks)**

Question Three (20 Marks)

a. Discuss four levels of safe exposure to radio frequency energy. (8 Marks)

b. What are the health effects of ionising radiation exposure and how does it affect human tissue? (6 Marks)

c. Differentiate between ionizing and non-ionizing radiations. Discuss any three examples in each case stating their effects to human health. (6 Marks)

Question Four (20 Marks)

a. The world is facing an adverse challenge of environmental pollution that poses a great challenge on health. Outline six major pollution problems and further outline their remedies. (8 Marks)

b. Discuss the advantages and disadvantages of tidal energy as a form of renewable energy. (6 Marks)

c. Discuss the term clean energy and give reasons why Kenya is moving towards clean energy by 2030 (6 Marks)