

## Biology II

# 012

27/07/2023 08:30 AM – 11:30 AM



### ADVANCED LEVEL NATIONAL EXAMINATIONS, 2022-2023

### SUBJECT: BIOLOGY II

#### PAPER II: THEORY

#### COMBINATIONS:

- BIOLOGY-CHEMISTRY-GEOGRAPHY (**BCG**)
- MATHEMATICS-CHEMISTRY-BIOLOGY (**MCB**)
- PHYSICS-CHEMISTRY-BIOLOGY (**PCB**)

#### DURATION: 3 HOURS

#### INSTRUCTIONS:

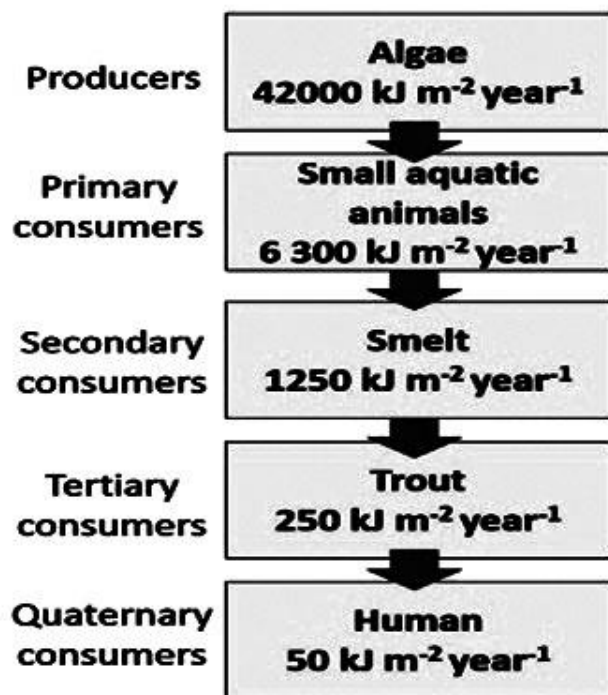
- 1) Write your names and index number on the answer booklet as written on your registration form and **DO NOT** write your names and index number on additional answer sheets if provided.
- 2) Do not open this question paper until you are told to do so.
- 3) This paper consists of **TWO** sections: **A** and **B**.  
**SECTION A:** Attempt **ALL** questions. **(70 marks)**  
**SECTION B:** Attempt only **THREE** questions. **(30 marks)**
- 4) Use only a **blue** or **black** pen.

**Section A: Attempt all Questions. (70 marks)**

- 1) Identify the following kingdoms:
- i) No nuclear membrane bound mitochondria. **(1 mark)**
  - ii) Organelles surrounded by membrane found inside thread like hyphae. **(1 mark)**
  - iii) The Organelles are either unicellular or multicellular and contain organelles with membrane. **(1 mark)**
  - iv) Multicellular organisms have autotrophic nutrition. **(1 mark)**
  - v) Multicellular organisms have heterotrophic nutrition. **(1 mark)**
- 2) a) Ribosomes are important in which process? **(1 mark)**  
b) In each of the following, name the organelle which is being referred to.
- i) Powerhouse of the cell. **(1 mark)**
  - ii) Contains chromatin. **(1 mark)**
  - iii) Synthesizes glycoproteins. **(1 mark)**
- 3) Name the chemical reagents which are used in the laboratory to test for the presence of each of the following food substances:
- i) Starch. **(1 mark)**
  - ii) Reducing sugars. **(1 mark)**
  - iii) Non- reducing sugars. **(1 mark)**
  - iv) Vitamin C (Ascorbic acid). **(1 mark)**
- 4) Explain how guard cells are adapted for stomatal opening and closure. **(3 marks)**
- 5) State four functions of the vertebrate's skeleton. **(4 marks)**
- 6) a) Define diffusion. **(1 mark)**  
b) List the factors that affect the rate of diffusion of a molecule into a cell. **(3 marks)**
- 7) Distinguish between the following terms: centrosome, centriole and centromere. **(3marks)**
- 8) Explain how a change in DNA sequence would result in production of non-functional protein. **(3 marks)**
- 9) Distinguish between:
- a) Cyclic and non-cyclic photophosphorylation. **(2 marks)**
  - b) Photophosphorylation and oxidative phosphorylation. **(2 marks)**
  - c) The roles of NAD and NADP in a plant. **(2 marks)**
- 10) a) Give the differences between complete and incomplete metamorphosis. **(2 marks)**  
b) What is the benefit of metamorphosis to insects? **(1 mark)**
- 11) With reference to endocrine and nervous system, identify the role played by feedback mechanism in homeostasis. **(3 marks)**

- 12) At the end of a sprint race, a runner continues to breathe rapidly for some time. Evaluate the advantage of this. **(3 marks)**
- 13) Differentiate between grafting and cutting. Provide an example for each method. **(3 marks)**
- 14) Construct a table that compares sperm and ovum. **(4 marks)**
- 15) Bacteria maintain the balance in the environment. Justify this statement. **(3 marks)**
- 16) Classify the following variations as either caused entirely by genetic effects or caused by a combination of genetic and environmental effects:
- i) Obesity **(0.5 marks)**
  - ii) Eye colour **(0.5 marks)**
  - iii) Tallness **(0.5 marks)**
  - iv) Ability to sing **(0.5 marks)**
  - v) Maleness **(0.5 marks)**
  - vi) Masculinity **(0.5 marks)**
  - vii) Blood group **(0.5 marks)**
  - viii) Natural hair color **(0.5 marks)**
  - ix) Sickle-cell anaemia **(0.5 marks)**
  - x) Agility **(0.5 marks)**

17) Consider the food chain in Kivu Lake.

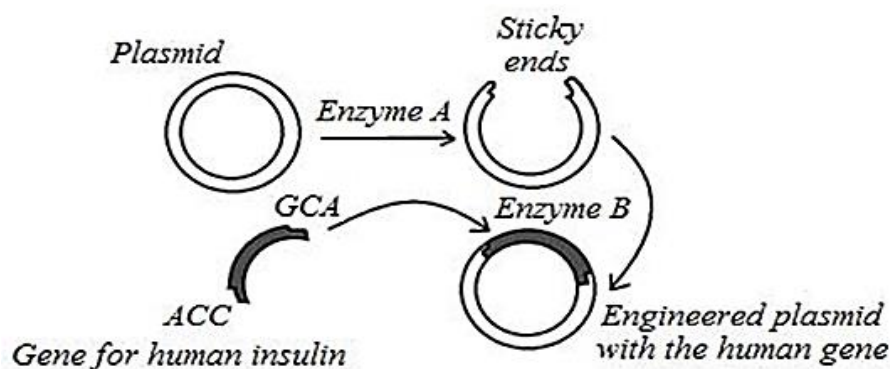


Calculate the percentage efficiency of the transfer of energy between:

- a) Primary consumers and secondary consumers. **(2 marks)**
  - b) Tertiary consumers and quaternary consumers. **(2 marks)**
  - c) Producers and quaternary consumers. **(2 marks)**
- 18) Define the following terms:
- a) Biotechnology. **(2 marks)**
  - b) Genetic engineering. **(2 marks)**

**Section B: Attempt Any Three Questions (30 marks)**

- 19) A plant with hairy stems and yellow flowers was crossed with a plant hairy stems and white flowers. Yellow flower colour is dominant over white. Seeds from F1 were sown and plants with the following characteristics were obtained:
- 28 plants with hairy stems and yellow flowers.
  - 35 plants with hairy stems and white flowers.
  - 10 plants with smooth stems and yellow flowers.
  - 11 plants with smooth stems and white flowers.
- a) Which is dominant Hairy stems or smooth stems? Why? **(2 marks)**
  - b) What is the genotype of parents? **(2 marks)**
  - c) Draw the genetic cross to show the genotype and phenotypes of F1 plants. **(4 marks)**
  - d) What is the ratio of hairy stem to smooth stems? **(1 mark)**
  - e) What is the ratio of yellow to white flower? **(1 mark)**
- 20) Make a list of different causes of evolution and write short summary in your own words on the meaning of each cause. **(10 marks)**
- 21) a) What is meant by:
- i) Greenhouse effect? **(1 mark)**
  - ii) Eutrophication? **(1 mark)**
- b) Explain how human activities have contributed to the increased greenhouse effect. **(4 marks)**
- c) Suggest practical remedies to the greenhouse problem. **(4 marks)**
- 22) Compare blood, tissue fluid and lymph. **(10 marks)**
- 23) The diagram below shows the stages in the insertion of the gene for insulin into a bacterium.



- a) Name the substance that makes up the plasmid. **(1 mark)**
- b) Identify the enzyme labelled **A**. What is its role? **(2 marks)**
- c) Identify the sticky ends of the plasmids that are complementary to those shown on the gene. **(2 marks)**
- d) Identify enzyme **B** on the diagram. What is its role? **(2 marks)**
- e) What term is given to a length of DNA formed from different sources? **(1 mark)**
- f) How is the plasmid inserted into the bacterium? **(1 mark)**
- g) How do scientists identify the bacteria which have taken the plasmid? **(1 mark)**

**-END-**