

INTERNATIONAL BACCALAUREATE

BIOLOGY

Higher Level

Thursday 9 May 1991 (morning)

Paper 3

2 hours

INSTRUCTIONS

Answer TWO questions. Credit will be given for clear, labelled diagrams.

Each question carries the same number of marks. The number of marks awarded for each part of each answer are indicated thus: [italic number] e.g. [6]. The total marks awarded for each question is [20].

1. Insulin is a protein synthesised and secreted by the islets of Langerhans cells in the pancreas.
 - (a) Where in the pancreas cell is genetic information relating to insulin stored? Describe briefly how it is stored. [5]
 - (b) Where and how does insulin synthesis take place in these cells? Use diagrams in your answer. [10]
 - (c) What is the role of insulin in metabolism? [3]
 - (d) State the name and describe the nature of the condition where a person has a mutant gene which makes insulin ineffective. [2]

2. Give detailed information about the pollen of Angiosperms, showing
 - (a) how it is produced and where it is formed, giving a drawing of the flower parts concerned. [6]
 - (b) a diagram of pollen structure. [2]
 - (c) what happens between pollination and the formation of a seed [3], giving a detailed drawing of the female flower parts concerned in seed production. [9]

3.
 - (a) Blood can be grouped according to the ABO system. What blood factors give rise to each group? You should use a table to give the principal information. [5]
 - (b) Why is it necessary to know the blood groups of people involved in a blood transfusion? Which group is the universal donor and which is the universal recipient? [5]
 - (c) Taking this ABO system as an example, define the phenomena of multiple alleles, codominance, dominance and recessiveness. [7]
 - (d) How do these phenomena influence the resultant phenotypes in Mendel's first law? [3]

4. Explain the properties of chloroplasts in vascular plants
 - (a) by describing their structure with the aid of an annotated diagram. [7]
 - (b) by giving details of the functioning of these organelles when plants are subjected to light. [11]
 - (c) showing how they function when plants are in darkness. [2]

5.
 - (a) Describe the molecular structure of cell membranes as understood today, illustrating your description with a well labelled diagram. [4]
 - (b) List the different membranes which may be found in (i) prokaryotic cells and (ii) in eukaryotic cells. [11]
 - (c) Do phagocytosis and pinocytosis take place in all types of cells? Compare the two phenomena and state the role played by primary lysosomes. [5]

6.
 - (a) What is a mutation? Briefly define the different types of mutation. [9]
 - (b) Write an essay on the role of mutations and recombinations leading to variation of individuals [6], and their role in the evolution of species. [5]

7.
 - (a) Draw a diagram of the pituitary gland and its connections, clearly showing the origin of its different parts. [4]
 - (b) State two hormones produced by **each** of the parts of the gland. [4]
 - (c) Describe the principal effects of the hormones mentioned. [12]

8.
 - (a) Give clearly annotated diagrams to compare the structures of an Amphibian blastula and a Mammalian blastocyst. [4]
 - (b) Describe the development of each until the end of gastrulation, illustrated by simple diagrams. [14]
 - (c) Can the blastula and the blastocyst be considered as strictly homologous stages? Justify your answer. [2]

9. Write an essay on the fate of a nitrogen atom in a plant from the time it is absorbed by a root until it is incorporated into a protein in the apical meristem of a shoot. Your essay should contain explanations relating to
 - (a) the general fate of nitrogen in the plant. [2]
 - (b) absorption of nitrogen by the plant. [6]
 - (c) production of amino acids. [3]
 - (d) transport of organic nitrogen compounds. [2]
 - (e) production of proteins in the meristem cell, briefly explained. [7]

10. Identify and describe the biochemical and physiological processes involved in the following statements.
 - (a) Bacteria in the stomach of the sheep convert cellulose into glucose. [4]
 - (b) Bacteria in the stomach of the sheep metabolise part of the glucose into acetate. [4]
 - (c) Sheep assimilate acetate, acetate is metabolised into acetyl coenzyme A [2], which is used as a substrate for cell respiration. [10]

 11. The first law of thermodynamics states that energy can be transformed from one form into another but it can never be created or destroyed. Explain how ecosystems obey this law [10], indicating the different sources of energy playing a part in these systems. [10]

 12. In 1959 E. P. Odum described ecology as 'the study of the structure and function of nature'. Explain this by using suitable named examples when giving definitions [4] and describing the chosen structures [8] and functions. [8]
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