INTERNATIONAL BACCALAUREATE
BACCALAURÉAT INTERNATIONAL
BACHILLERATO INTERNACIONAL

M99/410/H(1)

BIOLOGY

Higher Level

Tuesday 11 May 1999 (afternoon)

Paper 1 | 1 hour

This examination paper consists of 40 questions.

Each question offers 4 suggested answers.

The maximum mark for this paper is 40.

INSTRUCTIONS TO CANDIDATES

Do NOT open this examination paper until instructed to do so.

Answer ALL questions.

For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet provided.

Calculators are NOT permitted for this examination paper.

EXAMINATION MATERIALS

Required:
Optically Mark Read (OMR) answer sheet.

Allowed:
A simple translating dictionary for candidates not working in their own language

1. What is a difference between the cell surface membrane and the nuclear membrane?

   A. The cell surface membrane is found only in plant cells.

   B. The cell surface membrane is found only in animal cells.

   C. The cell surface membrane is a double membrane while the nuclear membrane is single.

   D. The cell surface membrane is single while the nuclear membrane is double.

2. What is needed for active transport of glucose into a cell?

	Energy	**Glucose concentration outside the cell**
A.	Energy needed	Higher concentration than inside
B.	Energy needed	Any concentration
C.	Energy not needed	Higher concentration than inside
D.	Energy not needed	Any concentration

3. What are the **three** most common elements in living organisms?

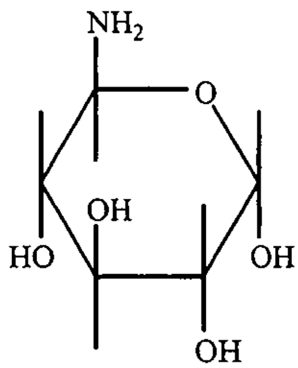
   A. Nitrogen, hydrogen and oxygen

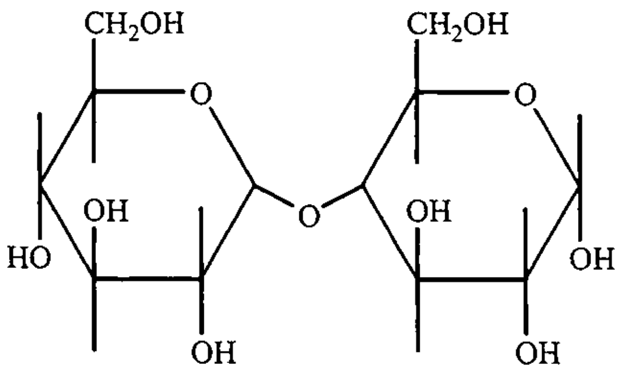
   B. Carbon, nitrogen and oxygen

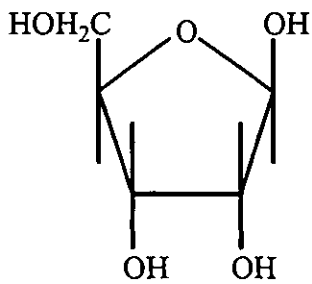
   C. Carbon, nitrogen and hydrogen

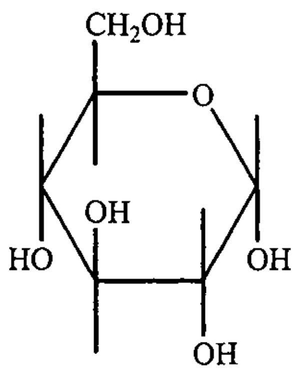
   D. Carbon, oxygen and hydrogen

4. Which is the ring structure of alpha-D-glucose?

A. 

B. 

C. 

D. 

5. Which type of replication does DNA have?

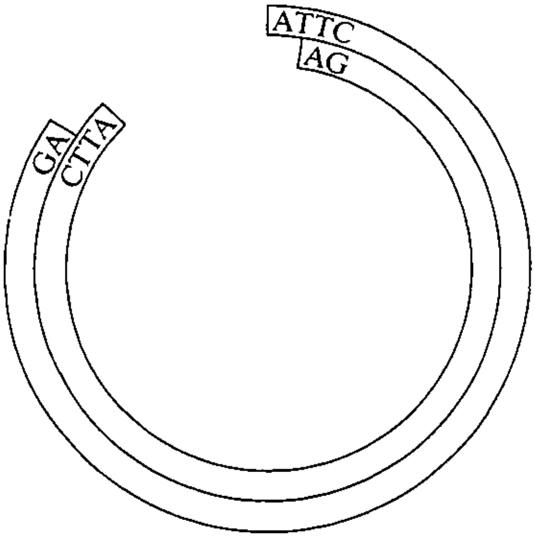
A. Semi-conservative because mutations may change part of the base sequence

B. Semi-conservative because DNA formed by replication has one old strand and one new strand

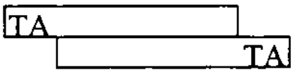
C. Conservative because the base sequence remains unchanged

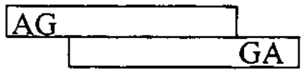
D. Conservative because DNA formed by replication contains one strand conserved from the parent DNA molecule

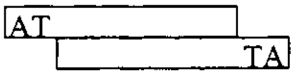
6. A bacterial plasmid (circular DNA) was cleaved with a restriction enzyme leaving the following DNA:

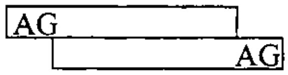


What DNA can be used as a donor in making recombinant DNA?

A. 

B. 

C. 

D. 

7. How is the PCR (polymerase chain reaction) used?

A. To make many copies of a DNA molecule

B. To cut DNA at specific base sequences

C. To splice fragments of DNA together into a plasmid

D. To separate fragmented pieces of DNA based on their charge and size

8. What is the chemical composition of eukaryotic chromosomes?

A. DNA only

B. DNA and RNA

C. DNA and phospholipid

D. DNA and protein

9. What is produced by mutation and essential for evolution to occur?

A. Improvements in organisms

B. Additional DNA

C. A struggle for existence

D. Variation

10. Compared to a diploid cell, how much genetic material would the nucleus of a haploid cell of the same organism contain?

A. One quarter

B. Double

C. Half

D. The same amount

11. What is a clone?

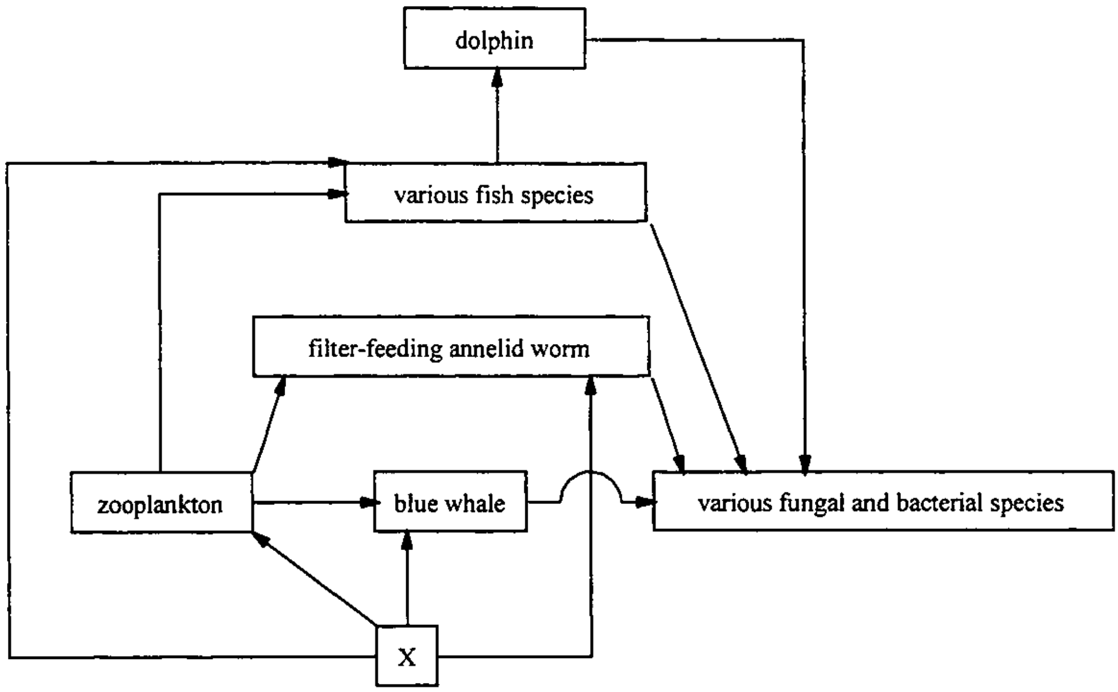
A. Two or more organisms with an identical genotype

B. An organism that is homozygous for all of its genes

C. An organism that is heterozygous for all of its genes

D. A group of cells of one type with similar structure and function

The diagram below shows a food web. It refers to question 12.



12. What is species X in the ecosystem?

A. A detritivore

B. An autotroph

C. A heterotroph

D. A saprotroph

13. A scientist counted the number of water fleas (*Daphnia*) that grew in small containers of the same size and environmental conditions. He noticed that the maximum number of individuals that could be grown was 60. What does this number represent?

A. The population density

B. The carrying capacity

C. The mean population

D. The median population

14. An increase in the greenhouse effect will have many effects on the Earth. Which effects are most probable?

A. Less ozone, a warmer atmosphere, more UV irradiation

B. A warmer atmosphere, lower sea level, increased cloudiness, more stratospheric ozone

C. A warmer lower atmosphere, change in weather patterns, higher sea level

D. Drier conditions worldwide, higher sea level, greater likelihood of cancer

15. Woodlice are terrestrial crustaceans that live under logs and stones in damp soil. To assess the population of woodlice in an area, students collected as many of the animals as they could find, and marked each with a drop of fluorescent paint. A total of 303 were marked. 24 hours later, woodlice were collected again in the same place. This time 297 were found, of which 99 were seen to be already marked from the first time. What, approximately, is the estimated population of woodlice in this area?

A. 30 000

B. 900

C. 9000

D. 100

16. Why are vitamins required in the human diet?

A. They are amino acids which the body cannot synthesise but which are required for making proteins.

B. They ensure a sufficiently high intake of fresh fruit and vegetables.

C. They can be made in small amounts by the body but, because they are a type of enzyme, they are continually used up.

D. They are essential for many biochemical reactions but cannot be made by the body.

17. What type of blood do the four chambers of the heart collect and pump?

	left atrium	right atrium	left ventricle	right ventricle
A.	oxygenated	oxygenated	deoxygenated	deoxygenated
B.	deoxygenated	deoxygenated	oxygenated	oxygenated
C.	oxygenated	deoxygenated	oxygenated	deoxygenated
D.	deoxygenated	oxygenated	deoxygenated	oxygenated

18. Which of the following is transported by the blood?

A. Gametes

B. Glycogen

C. Heat

D. Starch

19. What is a characteristic of antigens?

A. They are produced by phagocytic leucocytes.

B. They are produced in the bone marrow.

C. They are only found in white blood cells.

D. They may stimulate the formation of antibodies.

20. Why does exercise cause the breathing rate to vary?

A. It increases the concentration of carbon dioxide in blood, which lowers its pH.

B. It increases the concentration of carbon dioxide in blood, which increases its pH.

C. It lowers the concentration of oxygen in blood, which increases the pH.

D. It increases the concentration of oxygen in blood, which lowers the pH.

21. Which characteristic must a membrane protein have in order to be intrinsic?

A. A pore in the centre of the protein

B. Non-polar hydrophobic regions

C. An associated carbohydrate

D. An associated lipid

22. How do enzymes catalyse reactions?

A. They change the activation energy.

B. They change potential energy to kinetic energy.

C. They change kinetic energy into reaction energy.

D. They decrease the reaction energy and increase the activation energy.

23. How is energy released during electron transport in the inner mitochondrial membrane?

A. The electron acceptor molecules are oxidised as they receive an electron.

B. The electron acceptor molecules are reduced when they lose a hydrogen ion.

C. Electrons pass to a lower energy level when they move from one electron acceptor to another.

D. Electrons in the electron acceptor molecules are photoactivated twice.

24. What is produced in cyclic photophosphorylation compared with non-cyclic photophosphorylation, using the same amount of light?

A. More ATP than in non-cyclic photophosphorylation, but no $NADPH+H^+$

B. Less ATP than in non-cyclic photophosphorylation, and no $NADPH+H^+$

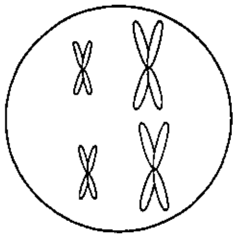
C. Less ATP than in non-cyclic photophosphorylation, but more $NADPH+H^+$

D. The same amount of ATP and $NADPH+H^+$ as in non-cyclic photophosphorylation

25. *Atriplex patula* uses only the C_3 pathway for carbon dioxide fixation whereas *Atriplex rosea* uses both C_3 and C_4 pathways. In what type of environment would you expect to find these plants?

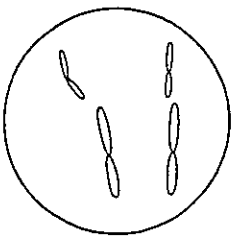
	Atriplex patula	*Atriplex rosea*
A.	damp and cool	dry and hot
B.	dry and hot	damp and cold
C.	damp and cool	damp and cold
D.	dry and cold	dry and hot

The diagram below represents the nucleus of a cell $2n = 4$ *in late Prophase of mitosis. It refers to question 26.*



26. Which diagram represents a cell of the same species in Metaphase II of meiosis?

A.



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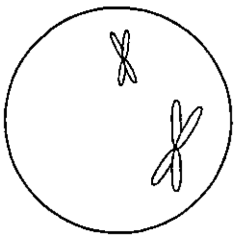

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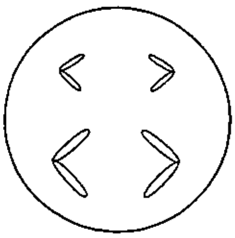
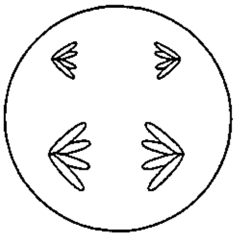


D.



27. A plant was found which was larger than the other members of the same species. When its chromosomes were studied, 4 haploid sets were present. What was the condition of the plant?

A. Inbred

B. Polyploid

C. Fertilised

D. Outbred

28. What does LH (luteinising hormone) stimulate?

A. The production of testosterone by interstitial cells

B. The production of sperms by seminiferous tubules

C. The development of primary follicles in the ovary

D. The degeneration of the corpus luteum

29. What does reverse transcriptase catalyse in cells infected with HIV?

A. The production of DNA from viral RNA

B. The production of DNA from host cell RNA

C. The production of RNA from viral DNA

D. The production of RNA from host cell DNA

30. Which class of antibody has the following characteristics?

It is the principal immunoglobulin found in blood plasma and other internal body fluids
It is formed during the period of secondary response to an infection
It neutralises bacterial toxins
It binds to micro-organisms and promotes their phagocytosis

A. IgA

B. IgD

C. IgE

D. IgG

The table below compares some characteristics of three different organisms. It refers to question 31.

Feature	Organism		
	X	**Y**	**Z**
Cell wall	–	+	+
Nucleus with membrane	+	+	–
Nuclear DNA bound to histones	+	+	–
Chloroplasts	–	+	–
Ribosomes	+	+	+

Key: + feature present
– feature absent

31. Which kingdom does each organism belong to?

	X	Y	Z
A.	Plantae	Animalia	Prokaryotae
B.	Animalia	Fungi	Plantae
C.	Fungi	Plantae	Animalia
D.	Animalia	Plantae	Prokaryotae

32. *Pteridium aquilinum* is a plant with sporangia on the lower surface of its leaves. It has roots with vascular tissue. Which phylum does it belong to?

A. Coniferophytes

B. Filicinophytes

C. Bryophytes

D. Angiospermophytes

33. What causes the change in potential difference across a membrane in an 'action potential'?

A. Changes in the permeability of surface membrane to sodium and potassium

B. The high concentration of sodium outside the cell

C. The impermeability of the cell surface membrane to sodium

D. Conversion of sodium to potassium

34. What is the function of calcium ions in synaptic transmission?

A. Opening of the sodium channel

B. Closing of the sodium channel

C. Depolarisation of the postsynaptic membrane

D. Release of acetylcholine

35. What is the function of the ligaments in the human elbow joint?

A. Preventing friction between the surface of the bones

B. Holding two bones at a joint together

C. Attaching muscle to bone

D. Attaching cartilage to bone

36. Which organisms excrete ammonia (NH_3) as their principal nitrogenous waste product?

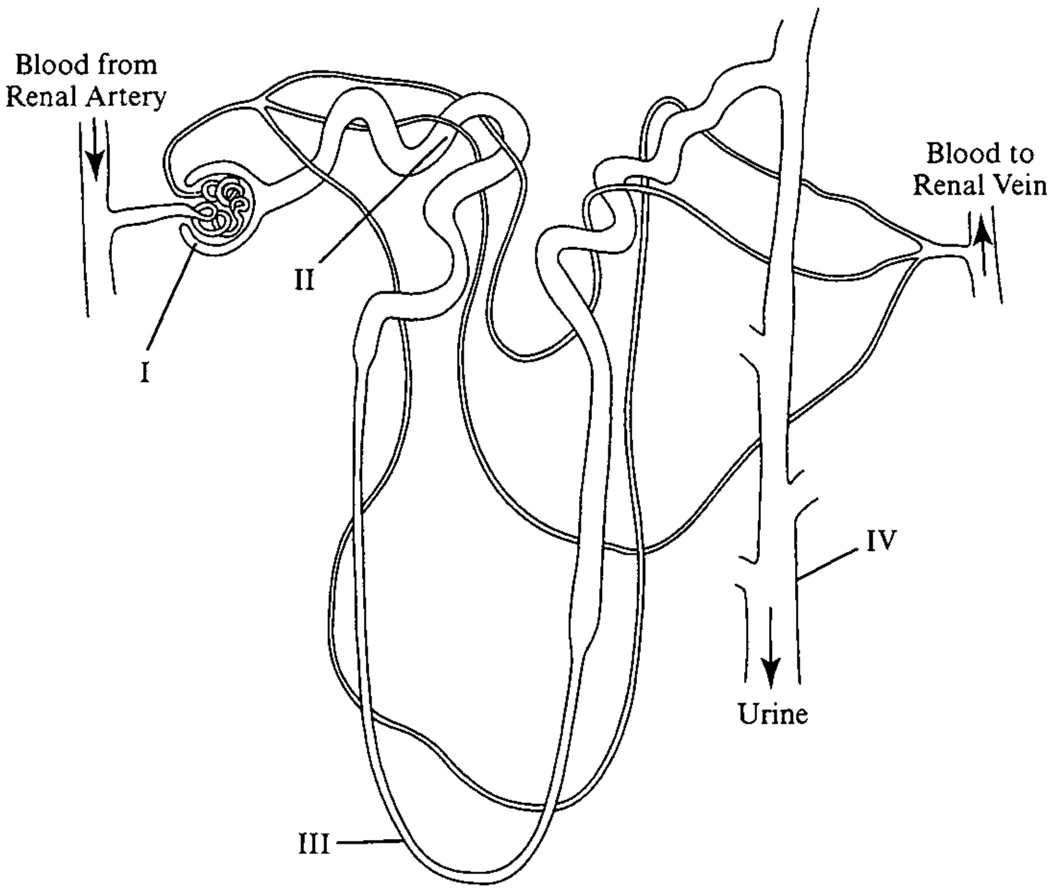
A. Adult amphibians and marine fish

B. Marine fish and amphibian larvae

C. Amphibian larvae and freshwater fish

D. Freshwater fish and adult amphibians

The diagram below shows a nephron. It refers to question 37.



37. In what labelled part does selective reabsorption occur?

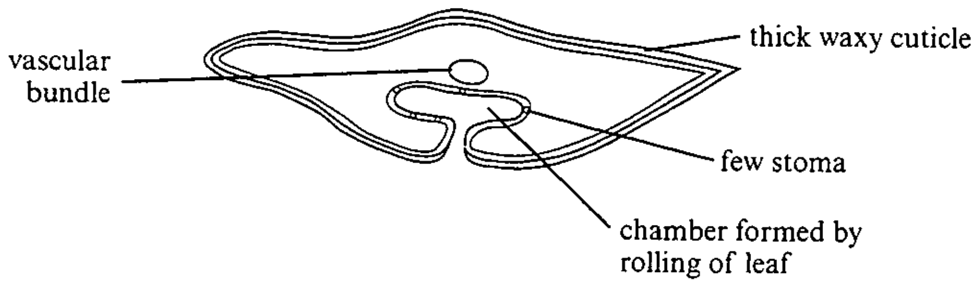
A. I

B. II

C. III

D. IV

The drawing below is of an Erica *leaf, in transverse section. It refers to question 38.*



38. What type of plant is *Erica*?

A. Hydrophyte

B. Halophyte

C. Xerophyte

D. Mesophyte

39. A fungicide dissolved in water was sprayed onto the leaves of a plant. It later appeared in the fruits. How did it reach this part of the plant?

A. Movement down a water potential gradient

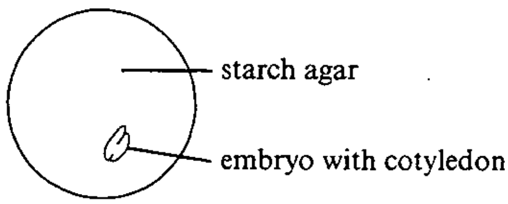
B. Transpiration pull in xylem

C. Translocation in phloem

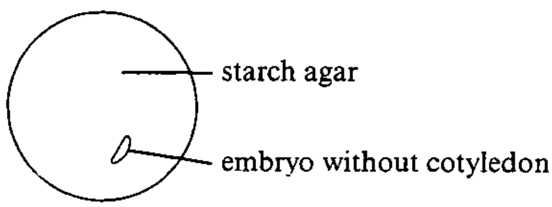
D. Diffusion through air spaces

40. Which embryo is unable to grow?

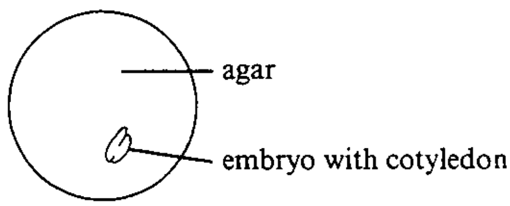
A.



B.



C.



D.