Diploma Programme
Programme du diplôme
Programa del Diploma

Biology
Standard level
Paper 1

22 October 2024

Zone A afternoon | **Zone B** afternoon | **Zone C** afternoon

45 minutes

Instructions to candidates

- Do not open this examination paper until instructed to do so.
- Answer all the questions.
- For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet provided.
- The maximum mark for this examination paper is **[30 marks]**.

8824 – 6010

1. Which process is required for development of specialized tissues in a multicellular organism?

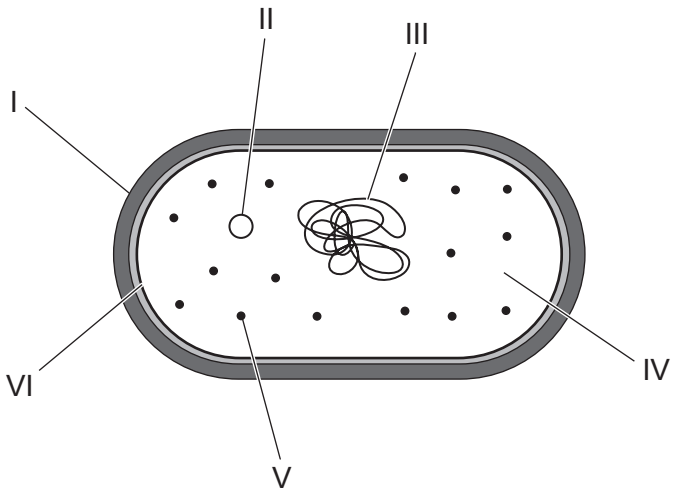
A. Expression of some genes in the genome but not others

B. Production of memory cells

C. Signals either from nerves or from hormones

D. Cell replacement

2. The diagram shows a prokaryotic cell.



Which two structures are correctly identified?

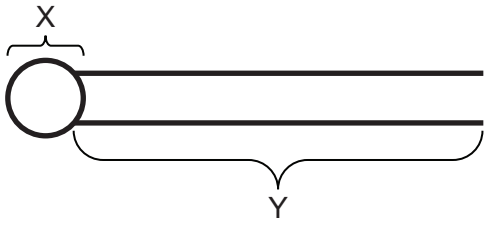
A. I is the cell wall and II is a vesicle.

B. III is a chromosome and IV is the matrix.

C. V is a ribosome and VI is the plasma membrane.

D. III is the nucleus and V is a vesicle.

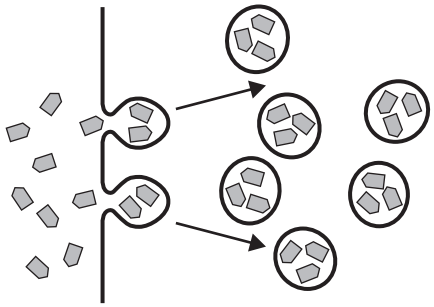
3. The diagram shows a phospholipid molecule.



What are properties of X and Y?

	X	Y
A.	hydrophilic	negatively charged
B.	hydrophilic	non-polar
C.	hydrophobic	non-polar
D.	hydrophobic	negatively charged

4. The diagram shows a membrane transport process.



What is the process and how could it be used by a cell?

	Process	Use
A.	exocytosis	synaptic transmission
B.	exocytosis	feeding in *Paramecium*
C.	endocytosis	synaptic transmission
D.	endocytosis	feeding in *Paramecium*

5. Leaf cells in spinach (*Spinacia oleracea*) have ribosomes in their cytoplasm with a relative molecular mass of 3 847 000 and smaller ribosomes inside their chloroplasts with a relative molecular mass of 2 448 000. What is an explanation for spinach leaf cells having ribosomes of two different sizes?

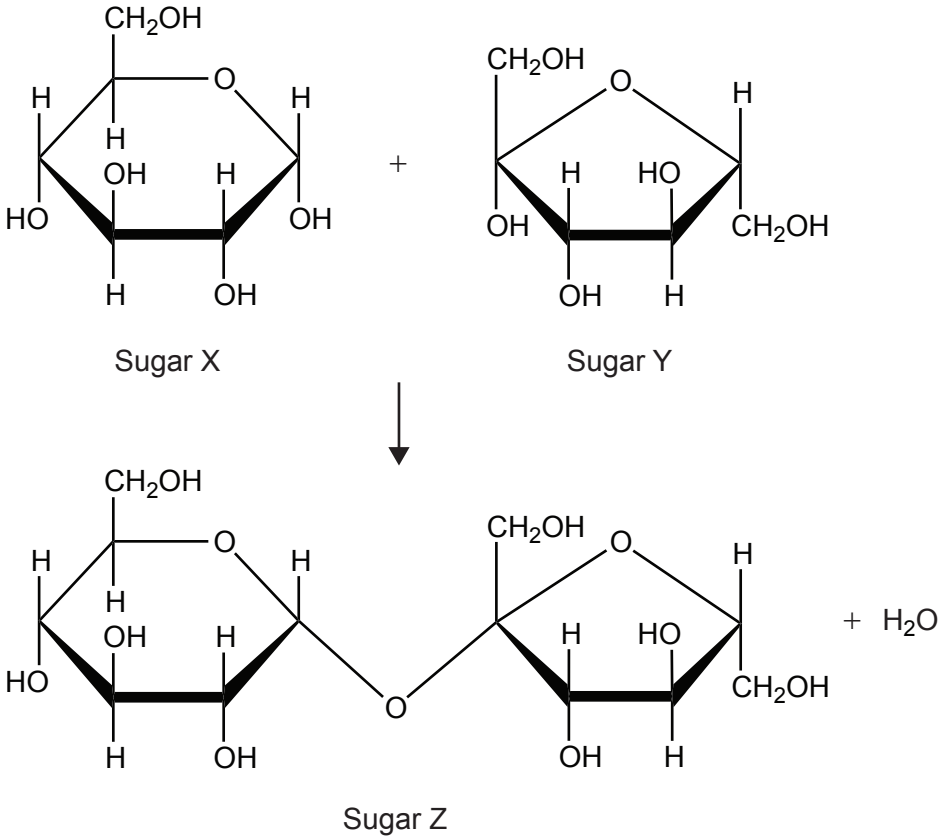
A. The chloroplasts of plant cells evolved from a photosynthetic prokaryote.

B. Proteins inside chloroplasts are all smaller than proteins in the cytoplasm.

C. Ribosomes in the cytoplasm are attached to endoplasmic reticulum, whereas ribosomes in chloroplasts are free.

D. Ribosomes in the cytoplasm synthesise proteins, whereas ribosomes in chloroplasts absorb light.

6. The equation shows a reaction that leaf cells perform.



What are features of this reaction?

A. Sugar X is alpha-D-glucose, Sugar Z is maltose, and the reaction is catabolic.

B. Sugar Y is beta-D-glucose, Sugar Z is sucrose, and the reaction is anabolic.

C. A disaccharide is produced by a condensation reaction.

D. Two monosaccharides are combined in a hydrolysis reaction.

7. What is the main reason for hemoglobin being needed in blood?

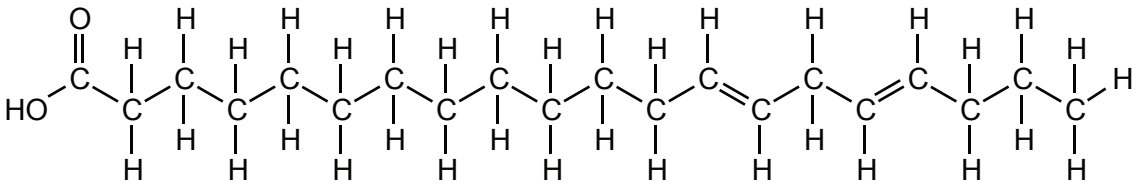
A. It ensures that blood clots rapidly when it is exposed to oxygen at a cut.

B. Oxygen molecules are non-polar, so blood plasma cannot transport enough of them.

C. Hemoglobin determines the blood group of a person.

D. Hemoglobin in the blood prevents sickle cell anemia.

8. The diagram shows a fatty acid molecule.



What type of fatty acid is this?

A. Saturated

B. Monounsaturated

C. Cis unsaturated

D. Trans unsaturated

9. Insulin is a protein. In human insulin, there are a total of 51 amino acids, in two polypeptides. How many peptide bonds are there in a molecule of human insulin?

A. 48

B. 49

C. 50

D. 51

10. Which of the following complementary base pairs is/are found in a DNA double helix?

I. Cytosine – guanine

II. Thymine – adenine

III. Adenine – uracil

A. I only

B. I and II only

C. II and III only

D. I, II and III

11. In which processes are RNA polymerase and DNA polymerase used?

	RNA polymerase	**DNA polymerase**
A.	translation	transcription
B.	transcription	translation
C.	transcription	replication
D.	replication	transcription

12. How is a new allele produced?

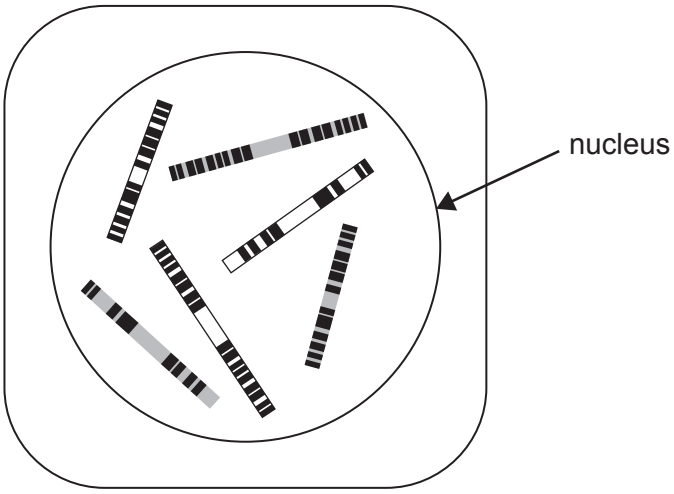
A. Cloning

B. Mutation

C. Differentiation

D. Natural selection

13. What type of cell is represented in the diagram?



A. Haploid gamete

B. Haploid somatic cell

C. Diploid gamete

D. Diploid somatic cell

14. There is no evidence that rates of non-disjunction in meiosis increase as the age of the father increases from 30 to 45, yet the frequency of Down syndrome in offspring increases. What could explain this?

A. Down syndrome is not caused by non-disjunction.

B. Meiosis rates decrease in males between the ages of 30 and 45.

C. Down syndrome is sex-linked, so non-disjunction can only take place in the mother.

D. Rates of non-disjunction increase as the age of the mother increases, and parents of a child tend to be similar in age.

15. The Cancer Council of New South Wales has stated that one in five cancer deaths are caused by smoking. How can smoking cause cancer?

A. 20 % of smokers get cancer.

B. Cigarette smoke contains mutagenic chemicals.

C. Smoking reduces the rate of mitosis in cells.

D. Smoking is addictive.

16. What causes DNA to move during gel electrophoresis?

A. DNA is negatively charged, so it is attracted towards the positive electrode.

B. DNA is positively charged, so it is repelled by the positive electrode.

C. DNA is negatively charged, so it is attracted towards positive charges in the gel.

D. DNA is positively charged, so it is attracted towards negative charges in the gel.

17. What is the difference between a detritivore and a saprotroph?

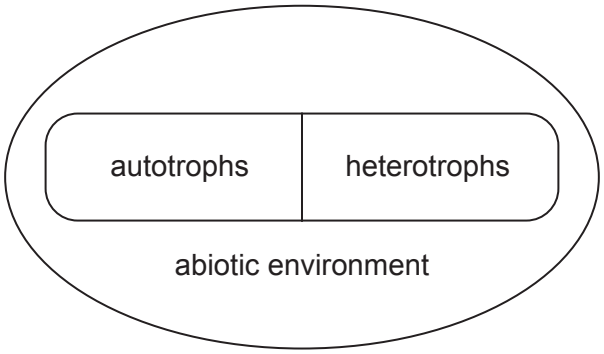
A. Detritivores are animals, and saprotrophs are plants.

B. Detritivores feed on dead organic matter, and saprotrophs feed on living organisms.

C. Detritivores digest food internally, and saprotrophs digest it externally.

D. Detritivores are autotrophic, and saprotrophs are heterotrophic.

18. What is represented by everything inside the oval area in the diagram?



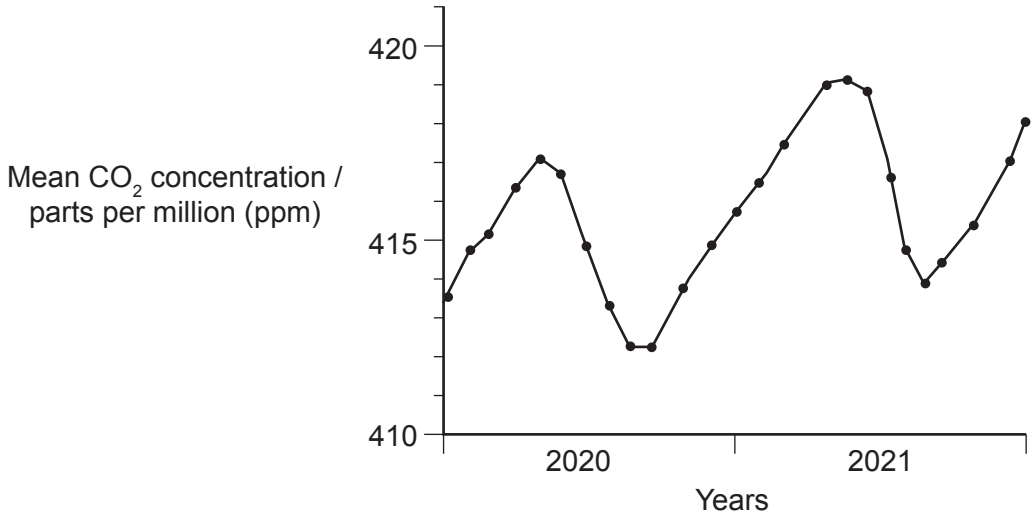
A. A community

B. An ecosystem

C. A food web

D. A habitat

19. The graph shows monthly mean atmospheric carbon dioxide concentrations measured at Mauna Loa Observatory, Hawaii in 2020 and 2021.



Which processes contribute to changes in monthly mean atmospheric carbon dioxide concentrations?

A. Combustion of coal, forest fires, ozone depletion

B. Photosynthesis, respiration and burning of fossil fuels

C. Emissions of carbon dioxide, methane and nitrogen oxides

D. Peat formation, drainage of wetlands and loss of coral reefs

20. What type of radiation is absorbed by carbon dioxide and methane in the Earth's atmosphere?

A. Heat emitted by greenhouse gases

B. Ultraviolet light emitted by the Sun

C. Short wave radiation emitted by the Sun

D. Long wave radiation emitted by the surface of the Earth

21. What is evolution?

A. Change in the heritable characteristics of a species

B. Change in the phenotype of a species

C. Speciation due to geographical separation

D. Survival of the fittest

22. Some plant species reproduce by cloning instead of sexual reproduction. Are these species likely to adapt rapidly or slowly to environmental change, and what is a reason for this?

A. Rapidly, as mutation rates are high during cloning

B. Rapidly, as combinations of genes are reassorted by meiosis

C. Slowly, as offspring produced by cloning are genetically identical

D. Slowly, as fewer offspring are produced than with sexual reproduction

23. *Aurelia aurita* are multicellular organisms that have stinging cells and a single opening to their digestive system.

To which phylum does *Aurelia aurita* belong?

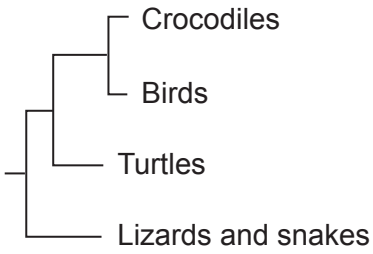
A. Animals

B. Cnidaria

C. Mollusca

D. Porifera

24. The cladogram shows four clades.



What conclusion can be drawn from the cladogram?

A. Crocodiles are more closely related to birds than to other reptiles.

B. Birds are not reptiles.

C. Turtles are more closely related to lizards than to crocodiles.

D. Snakes evolved from lizards.

25. The pancreas secretes a fluid that passes to the small intestine via the pancreatic duct. What does the fluid contain?

A. Amylase

B. Bile

C. Insulin

D. Mucus

26. What route does deoxygenated blood follow from the heart to the lungs?

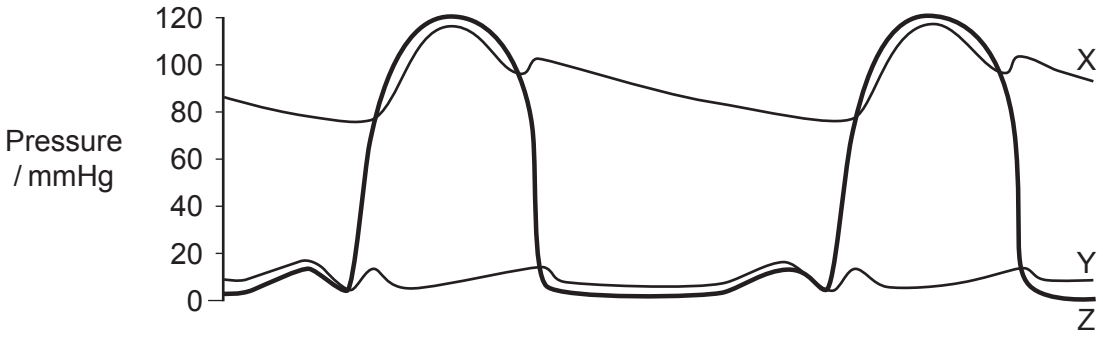
A. Left atrium → left ventricle → pulmonary vein

B. Right atrium → right ventricle → pulmonary vein

C. Left atrium → left ventricle → pulmonary artery

D. Right atrium → right ventricle → pulmonary artery

27. The graph shows pressure changes during the cardiac cycle.



Which structures are represented by lines X, Y and Z?

	X	Y	Z
A.	left ventricle	left atrium	aorta
B.	left ventricle	aorta	left atrium
C.	aorta	left atrium	left ventricle
D.	aorta	left ventricle	left atrium

28. What causes blood clots to form?

A. Adhesion between blood cells

B. Cohesion between blood cells and the rough surfaces of a cut

C. Secretion of fibrinogen by platelets

D. Trapping of blood cells in fibrin

29. Which changes in a country are most likely to reduce the incidence of emphysema?

A. Banning emissions of air pollutants and reducing consumption of saturated fats

B. Raising the price of cigarettes and banning emissions of air pollutants

C. Banning trans fats from foods and raising the price of cigarettes

D. Reducing passive smoking and banning trans fats from foods

30. A person is feeling sleepy and has low appetite for food, due to secretion of two hormones. Which hormones are most likely to have been secreted?

A. Thyroxin and glucagon

B. Glucagon and leptin

C. Leptin and melatonin

D. Melatonin and thyroxin

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References:

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15. Cancer Council NSW, n.d. *Smoking*. [online] Available at: https://www.cancercouncil.com.au/cancer-prevention/smoking/ [Accessed 22 January 2024]. Source adapted.

19. NOAA Global Monitoring Laboratory, n.d. *Trends in Atmospheric Carbon Dioxide Mauna Loa, Hawaii*. [graph online] Available at: https://gml.noaa.gov/ccgg/trends/ [Accessed 2 January 2024]. Source adapted.

23. Viatour, L., 2010. *Aurelia aurita*. [image online] Available at: https://commons.wikimedia.org/wiki/File:Aurelia_aurita_(Cnidaria)_Luc_Viatour.jpg [Accessed 2 January 2024]. Source adapted.