

H1 BIOLOGY

Section A Multiple Choice

8876 Friday, 22 September 2023 2 hours and 10 minutes

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Do not open this booklet until you are told to do so.

Write your name, civics group and index number on the Multiple Choice Answer Sheet (MCAS). Write in soft pencil. Do **NOT** use staples, paper clips, glue or correction fluid.

There are **fifteen** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.

Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer. Any rough working should be done in this booklet. The use of an approved scientific calculator is expected, where appropriate.

Note: The OMS will be <u>collected after 30 minutes</u> during the examination.

Section A

Answer **all** the questions in this section.

1 The table provides the description of four membranous structures in a cell. Which structure is correctly matched with its function?

	Structure	Function
Α	An extensive network of tubes and sacs; each tube and sac bounded by a single membrane	Lipid synthesis
В	A spherical sac bounded by a single membrane	Protein synthesis
С	A sac bounded by two membranes, the inner membrane is highly folded	Packaging of proteins
D	A stack of elongated, curved sacs; each sac bounded by a single membrane	Photosynthesis

2 Which of the following curves best represent the movement of substances into a cell by simple diffusion and facilitated diffusion?



outside cell

	Simple diffusion Facilitated diffusion	
Α	W	Y
в	W	Х
С	Х	Z
D	Х	W

3 Some organisms change the composition of their membranes to maintain membrane fluidity when the temperature changes.

Which changes occur in the composition of the membranes following a change to low temperature?

- A Increase phospholipids, decrease cholesterol.
- **B** Increase saturated fatty acids, increase cholesterol.
- **C** Increase saturated fatty acids, decrease cholesterol.
- D Increase unsaturated fatty acids, increase cholesterol.
- 4 The figure below shows part of the molecular structure of cellulose.



Which of the following statements are true?

- 1. The chains are unbranched.
- 2. Each chain is made up of alternating α -glucose molecules that are rotated 180° to each other.
- 3. The hydrogen bonds are possible due to the straight chains of the molecule.
- 4. Water is needed in the formation of bonds between the chains of the molecule.
- A 1 and 3
- **B** 2 and 4
- **C** 1, 2 and 3
- **D** 1, 2, 3 and 4

5 A sugar that is composed of three condensed monosaccharides is hydrolysed by two different enzymes. The products are shown in the table below.

Enzyme used	Products
Galactosidase	Galactose and sucrose
Sucrase	Melibiose and fructose

What information about the structure of melibiose can be deduced from these results?

- A It is a hexose sugar.
- **B** It is composed of fructose and galactose.
- **C** It is composed of glucose and galactose.
- **D** It is composed of sucrose and a monosaccharide.
- 6 How many different polypeptides, each consisting of x amino acids, can be made if the number of different amino acids available is y?
 - A y^x
 - B x^y
 - **C** yx
 - **D** y
- 7 If x units of DNA are present in the nucleus of a cell which has just divided, what is the relative amount present in this cell during prophase of the next mitosis?



8 Lactose is a disaccharide present in milk. The enzyme β galactosidase catalyses the conversion of lactose to glucose and galactose.

10 cm³ of a 1% β galactosidase solution was added to 10 cm³ of milk. The graph shows the total amount of glucose produced over the next ten minutes.



In a separate experiment, 10 cm³ of a 2% β galactosidase solution was added to 10 cm³ milk.

Which graph shows the results that would be obtained?



9 A chromatid consists of DNA coiled around protein molecules.

What is the form of DNA in a duplicated chromosome?

- A One molecule of single-stranded DNA
- **B** Two molecules of single-stranded DNA
- **C** One molecule of double-stranded DNA
- **D** Two molecules of double-stranded DNA
- 10 Which of the following are true regarding zygotic stem cells and blood stem cells?
 - 1. Both undergo continuous self-renewal throughout the lifetime of the organism.
 - 2. Both are multipotent.
 - 3. Blood stem cells are derived from zygotic stem cells.
 - 4. Zygotic stem cells can differentiate into any cell type, but blood stem cells can only differentiate to form blood cells.
 - A 1 and 3
 - **B** 3 and 4
 - **C** 1, 2 and 3
 - **D** 2, 3 and 4
- 11 Research has shown that the liver is one of the very few organs that can regenerate itself completely after surgery. For example, in liver transplant, two-thirds of the liver can be removed, and the remaining one-third will grow in size to replace the lost portion.

Which of the following best explains the information given above?

- **A** The remaining liver cells grow in size, giving rise to a liver the size of a normal one.
- **B** Compounds secreted by remaining liver cells trigger the conversion of blood cells that pass through the liver, into liver cells.
- **C** Pluripotent embryonic stem cells found in the circulating blood will divide and differentiate to produce liver cells that replace the lost portion.
- **D** Multipotent adult stem cells found in the liver will proliferate and differentiate to produce liver cells that replace the lost portion.

12 Bacteria were cultured in a medium containing heavy nitrogen (¹⁵N) until all the DNA was labelled. These bacteria (generation 1) were then grown in a medium containing only normal nitrogen (¹⁴N) for two more generations (generations 2 and 3). The percentage of cells containing ¹⁵N in each generation was estimated.

What will be the percentage of cells containing ¹⁵N in generations 2 and 3?

	percentage of cells containing ¹⁵ N			
	generation 2	generation 3		
Α	100	100		
В	100	50		
С	50	50		
D	50	25		

13 Given below are the mRNA codons for three amino acids:

Tryptophan UGG	Lysine AAG AAA	Isole	ucine AUU AUC AUA
×	Ŷ	Z	Amino acid
r-+			tRNA
Translation			
<u> </u>		<u> </u>	mRNA
Transcription			
тт	C A C C	TAG	
<u> </u>			DNA

Identify the three amino acids, X, Y and Z in the diagram.

	Х	Y	Z
Α	lysine	isoleucine	tryptophan
в	lysine	tryptophan	isoleucine
С	isoleucine	tryptophan	isoleucine
D	tryptophan	lysine	isoleucine

14 A point mutation (the replacement of a single nucleotide) can occur anywhere on a chromosome.

Which statements are true?

- 1 Point mutation in an exon can alter the codon resulting in a different amino acid sequence
- 2 Point mutation in an exon can produce a shorter protein as a stop codon is produced
- 3 Point mutation in an intron can alter the binding site of a splicing enzyme.
- **A** 1 and 2
- **B** 1 and 3
- **C** 2 and 3
- **D** 1, 2 and 3
- **15** Which of the following shows the possible effects of a single nucleotide substitution in each of the following locations in a gene on the production of the protein product of that gene?

	Promoter	Terminator	Start Codon	Stop Codon	Middle of an intron
A	No protein product is formed	Protein product is shorter than normal	Protein product is longer than normal	Protein product is normal	Too much protein product is produced
в	Too much protein product is produced	Protein product is normal	No protein product is formed	Protein product is longer than normal	Protein product is normal
с	Protein product is normal	Protein product is longer than normal	Protein product is shorter than normal	Too much protein product is produced	Protein product is longer than normal
D	Protein product is longer than normal	Too much protein product is produced	Protein product is normal	Protein product is shorter than normal	No protein product is formed