| Name: | | Index Number: | | Class: | |
|---|---|---|---|---|---|

# DUNMAN HIGH SCHOOL
# Promotional Examination
# Year 5

## H2 BIOLOGY

**9744/01**

Paper 1 Multiple Choice Questions

**27 September 2022**

Additional Materials: Multiple Choice Answer Sheet

**30 minutes**

**READ THESE INSTRUCTIONS FIRST:**

Write your class, index number and name at the top of this page.

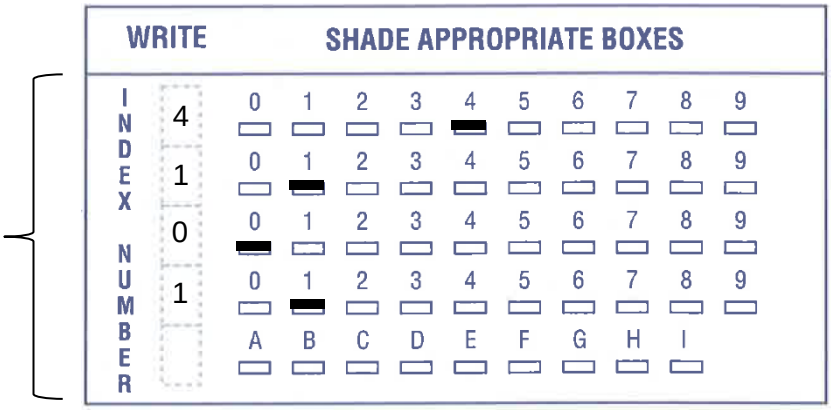
There are **fifteen** questions in this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

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.

Write your name and class on the Multiple Choice Answer Sheet. Write and shade the Index Number as follows.

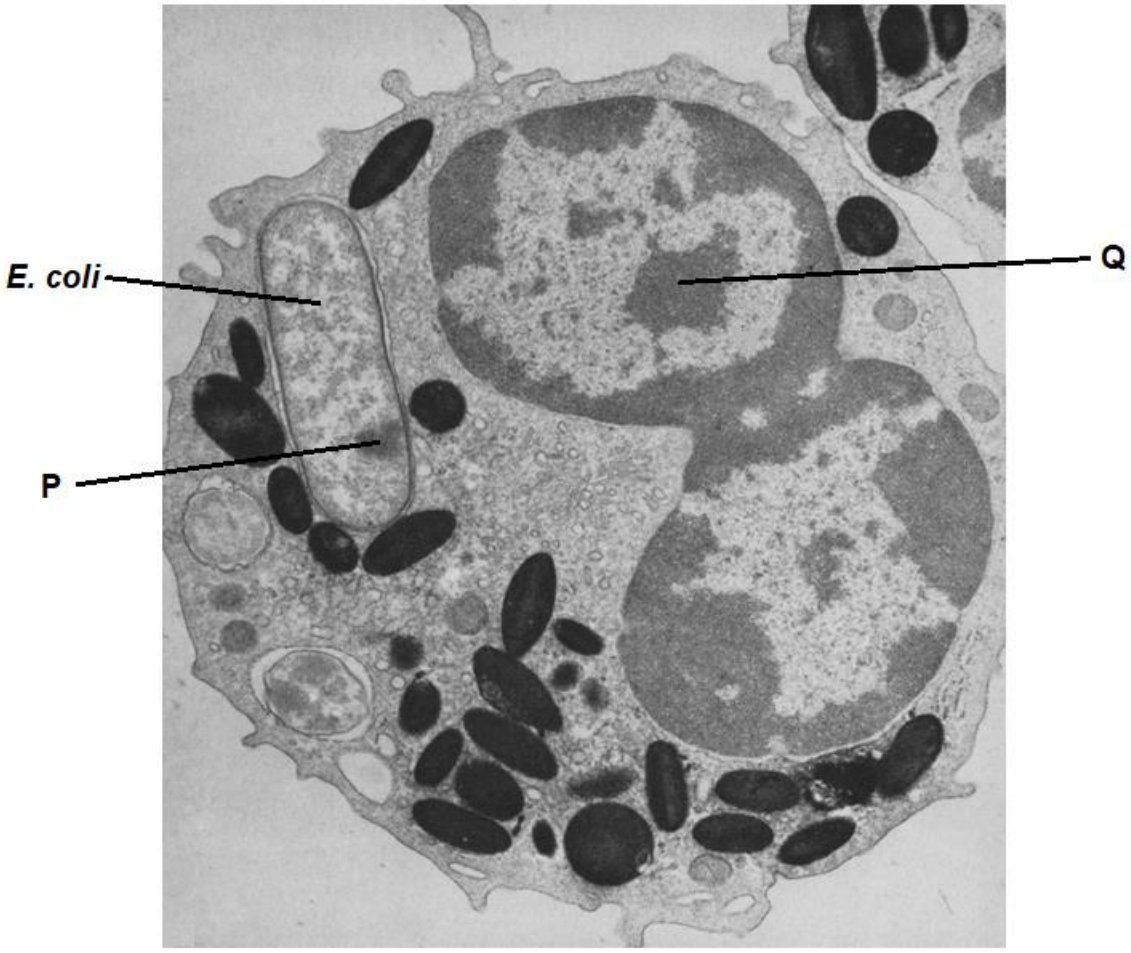
*For illustration only:*

*A student from class 5C41, with index number 01, should shade "4101".*




This document consists of **12** printed pages.

**1** The figure shows an *E. coli* engulfed by a basophil, a type of white blood cell.

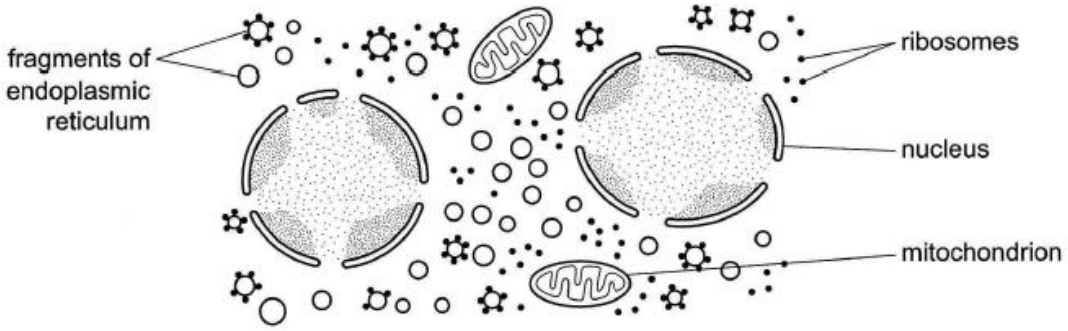



Ramzi S Cotran & Mortimer Litt, 1969

How is region **P** different from region **Q**?

| | region **P** | region **Q** |
|---|---|---|
| **A** | contains DNA loosely coiled around histone proteins | contains DNA tightly coiled around histone proteins |
| **B** | is the site of RNA and polypeptide synthesis | is the site of rRNA synthesis |
| **C** | is the site of ATP synthesis | is the site of protein synthesis |
| **D** | has circular DNA | has absence of DNA |

**2** The flow diagram shows a technique called cell fractionation used to separate cell organelles by their relative sizes. Cells are homogenised and mixed with buffer to prepare them for cell fractionation. The diagram shows the appearance of the homogenised cell mixture.




homogenised cell mixture

↓

mixture centrifuged at low speed (1000× force of gravity for 10 minutes) → sediment 1 removed

↓

liquid centrifuged at higher speed (20 000× force of gravity for 20 minutes) → sediment 2 removed

↓

liquid centrifuged at higher speed (80 000× force of gravity for 60 minutes) → sediment 3 removed

↓

liquid centrifuged at higher speed (150 000× force of gravity for 180 minutes) → sediment 4 removed

Which organelle is found in sediment 3?

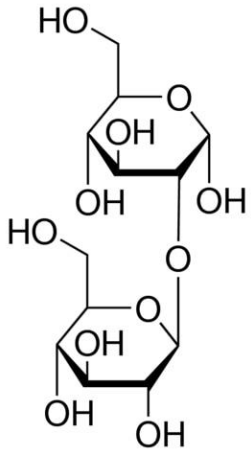
**A** Nucleus

**B** Mitochondria

**C** Endoplasmic reticulum

**D** Ribosome

**3** The figure shows the structure of sophorose which is made up of two glucose monomers.




Sigma-aldrich, 2022

Which of the following statements are correct?

1 It is a reducing sugar.

2 There is at least one beta glucose molecule present.

3 Polymerisation of sophorose forms cellulose.

4 The bond between the two monomers is a 1,6 glycosidic bond.

**A** 1 and 2

**B** 1 and 4

**C** 2 and 3

**D** 3 and 4

**4** Membrane fluidity affects membrane permeability. The more fluid a membrane is, the more permeable it is.

Which of the following change in membrane structure increases the membrane permeability?

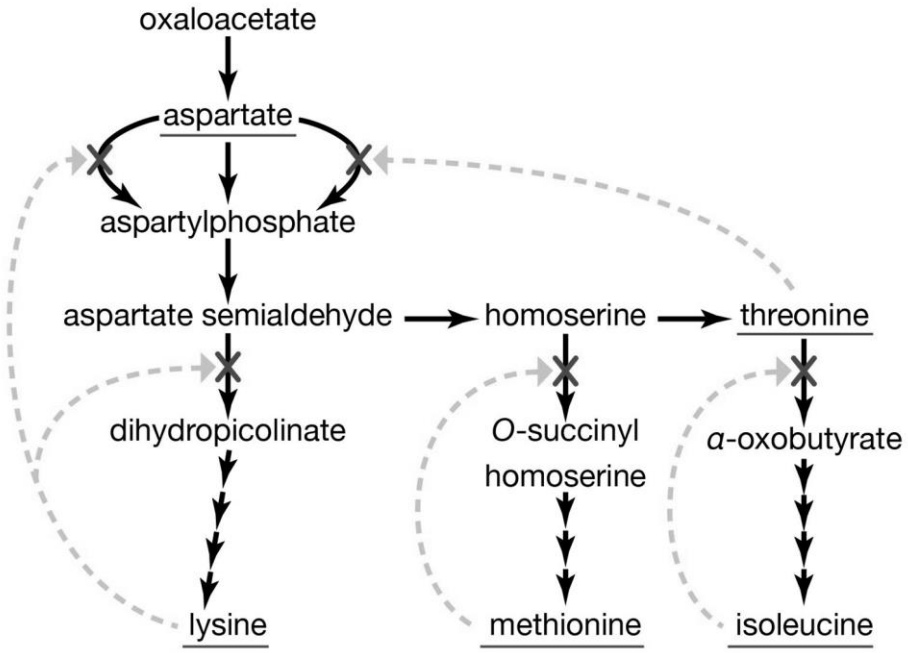
**A** Increase in cholesterol level at low temperature

**B** Decrease in cholesterol level at low temperature

**C** Increase in hydrocarbon tail saturation level

**D** Decrease in hydrocarbon tail unsaturation level

**5** The figure shows the synthesis pathway of the amino acids threonine, lysine, methionine and isoleucine, from the amino acid aspartate. The amino acids are underlined in the figure. The dotted lines and arrows represent feedback inhibition.






Which action will result in an increase in methionine concentration?

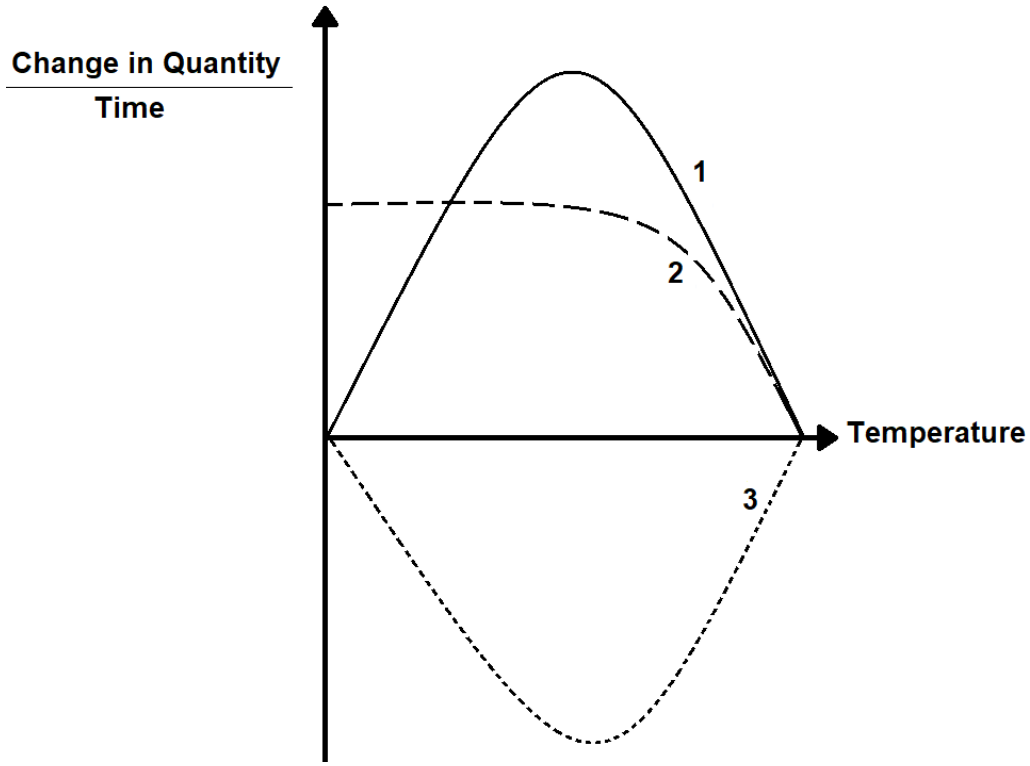
**A** Addition of lysine

**B** Addition of aspartate semialdehyde

**C** Addition of threonine

**D** Addition of isoleucine

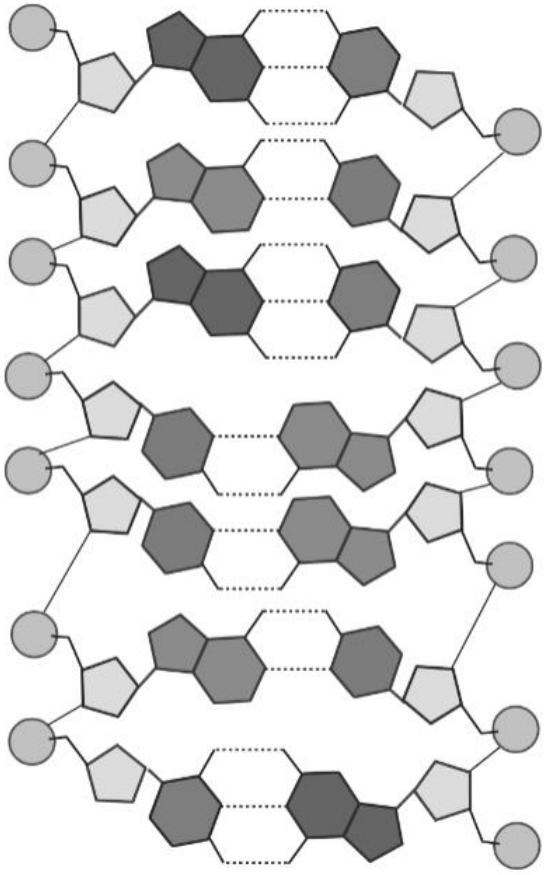
**6** The figure shows the change in quantity of components 1, 2 and 3 of an enzyme catalysed reaction within a fixed time, with varying incubation temperatures.




Which row represents the components 1, 2 and 3?

| | component 1 | component 2 | component 3 |
|---|---|---|---|
| **A** | substrate | enzyme | product |
| **B** | product | substrate | enzyme |
| **C** | product | enzyme | substrate |
| **D** | substrate | product | enzyme |

**7** The figure shows a short segment of a DNA molecule.



created using biorender.com

What is the sequence of the strand running in the 5’ to 3’ direction from top to bottom?

**A** 5’ CTCAATG 3’

**B** 5’ AGACCGT 3’

**C** 5’ TCTGGCA 3’

**D** 5’ GAGTTAC 3’

**8** To synthesize DNA molecules in the laboratory, a student isolated and purified various molecules needed for DNA replication. She added them into a mixture and successfully obtained many DNA molecules.

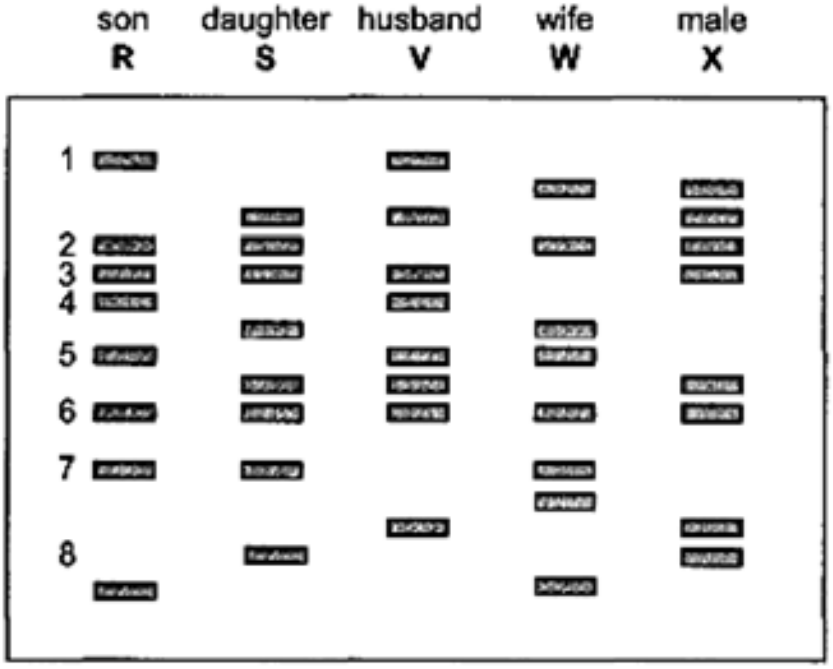
To study the role of each molecule in the process of DNA replication, the student performed a few set ups, each with one molecule removed from the mixture. She obtained the following results.

| set up | result |
|---|---|
| 1 | A few DNA strands, with some short double stranded regions of DNA-RNA hybrid. |
| 2 | A few DNA molecules. |
| 3 | Many DNA strands with long stretches of double-stranded DNA regions. |

What molecule is removed in each set up?

| | set up 1 | set up 2 | set up 3 |
|---|---|---|---|
| **A** | ligase | DNA polymerase | helicase |
| **B** | ligase | helicase | DNA polymerase |
| **C** | DNA polymerase | ligase | helicase |
| **D** | DNA polymerase | helicase | ligase |

**9** The diagram shows the results of the electrophoresis of DNA fragments from four members of a family, **R**, **S**, **V**, **W** and another male, **X**, who claims that he is the father of one of the child.




Which bands indicate that **R** and **S** do not have the same set of parents?

**A** 2 and 3

**B** 2 and 6

**C** 4 and 5

**D** 4 and 8

**10** The statements describe the process of conjugation between two bacteria cells.

1 F plasmid replicates semi-conservatively in donor cell

2 replication of F plasmid occurs to form double-stranded DNA in recipient cell

3 conjugation tube breaks and retracts

4 donor cell forms sex pilus

5 conjugation tube forms between two bacterial cells

6 single-stranded copy of F plasmid transferred into recipient cell

Which order of events describe conjugation?

**A** 4 → 5 → 1 → 6 → 2 → 3

**B** 4 → 5 → 6 → 1 → 2 → 3

**C** 5 → 4 → 1 → 6 → 2 → 3

**D** 5 → 4 → 6 → 2 → 1 → 3

**11** The arginine (*arg*) operon is present in some bacteria to regulate the synthesis of the essential amino acid arginine. The operon consists of structural genes which code for the enzymes that synthesise arginine. The operon is switched off when arginine is in excess.

Which statements are correct?

1 Excess arginine acts as the co-repressor which binds to the repressor.

2 The *arg* operon is negatively regulated.

3 The regulation of the *arg* operon is similar to that of the *lac* operon.

4 The synthesis of arginine is an anabolic process.

**A** 1 and 3

**B** 2 and 4

**C** 1, 2 and 4

**D** 1, 2, 3 and 4

**12** Which stage of the cell cycle will a diploid cell contain twice the amount of DNA found in a gamete?

**A** entire G1 phase

**B** entire S phase

**C** entire G2 phase

**D** prophase

**13** An actively dividing cell in a root tip was found to be arrested in its cell cycle with an intact nucleus. Which are the likely causes of this?

1 damaged DNA or incompletely replicated DNA

2 inability of homologous chromosomes to pair up with each other

3 incomplete formation of the mitotic spindle, resulting in some chromosomes not attached to fibres

4 failure of centrioles to separate

**A** 1, 2 and 3

**B** 2, 3 and 4

**C** 1 and 2

**D** 1

**14** The template DNA strand for a segment of polypeptide is shown:

3’ ---------- GTA ACC GCA TCT CAG ATT ---------- 5’

Which outcome is most likely to occur if a mutagenic agent is added to the DNA strand and replaces cytosine bases with uracil bases?

**A** No polypeptide will be synthesised.

**B** A truncated polypeptide will be synthesised.

**C** Four new amino acids with different chemical properties will be found in the polypeptide.

**D** A polypeptide of original length but with a few new amino acids of different side chains will be synthesised.

**15** The sex chromosome combination XXY is found in a small proportion of men. Which abnormal gamete, when fused with a normal one, can produce this combination?

**A** an egg produced by non-disjunction at meiosis I

**B** an egg containing an X and a Y chromosome

**C** a sperm produced by non-disjunction at meiosis II

**D** a sperm produced by a father whose cells lack an X chromosome