

CANDIDATE  
NAME

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CENTRE  
NUMBER

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CANDIDATE  
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**BIOLOGY**

**9700/02**

Paper 2 AS Level Structured Questions

**For Examination from 2016**

SPECIMEN PAPER

**1 hour 15 minutes**

Candidates answer on the Question Paper.

No Additional Materials are required.

**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name on all the work you hand in.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.

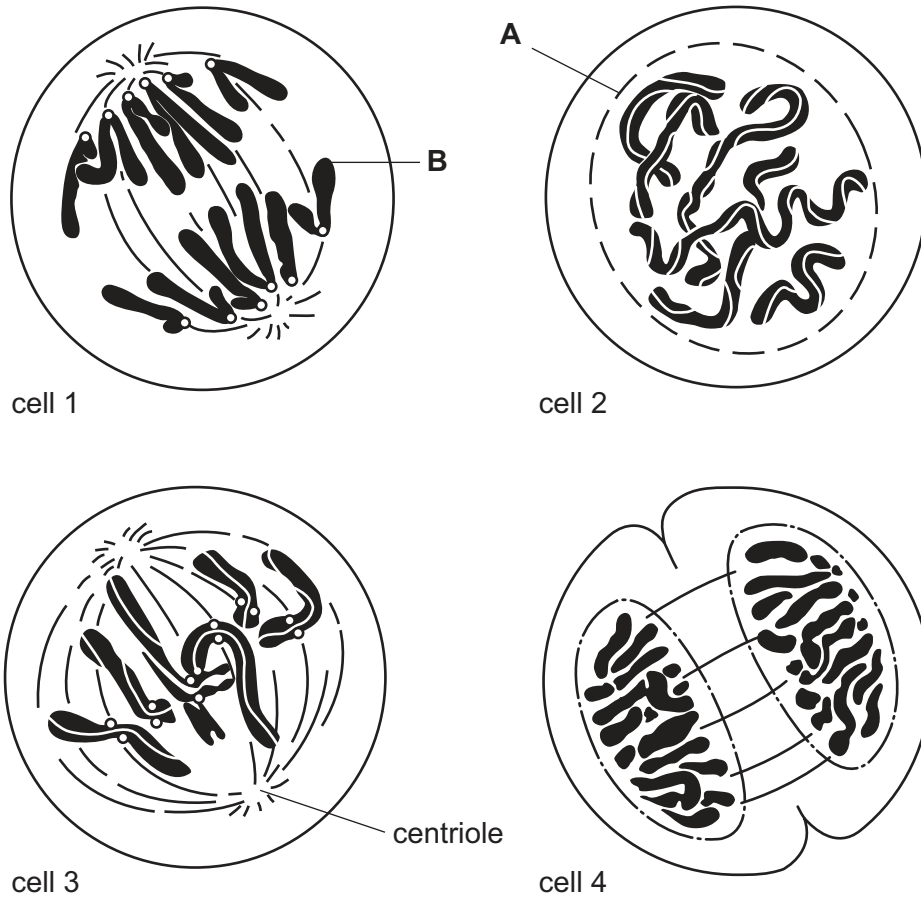
At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **13** printed pages and **1** blank page.

Answer **all** the questions.

1 Fig. 1.1 shows four animal cells in different stages of the mitotic cell cycle.



**Fig 1.1**

(a) Using the number given to each cell in Fig. 1.1, arrange the stages as they occur in the mitotic cell cycle.

..... [1]

(b) (i) State what is occurring at **A** in cell 2.

.....  
 ..... [1]

(ii) Label **B** is pointing to a region of the chromatid that contains repetitive nucleotide sequences.  
 State the name given to this region.

..... [1]

(c) The centriole labelled in Fig. 1.1 is composed of microtubules.

(i) Suggest why a student would **not** be able to see a microtubule using a good quality light microscope.

.....  
.....  
.....  
.....  
..... [2]

(ii) Outline the role of microtubules in mitosis.

.....  
.....  
.....  
.....  
.....  
.....  
..... [2]

(iii) Microtubules are composed of a globular protein known as tubulin.

Explain how the terms monomer and macromolecule can be applied to tubulin.

*monomer* .....

.....

.....

*macromolecule* .....

.....

..... [2]

[Total: 9]

2 Fig. 2.1 shows the central region of a transverse section of the root of a dicotyledonous plant.

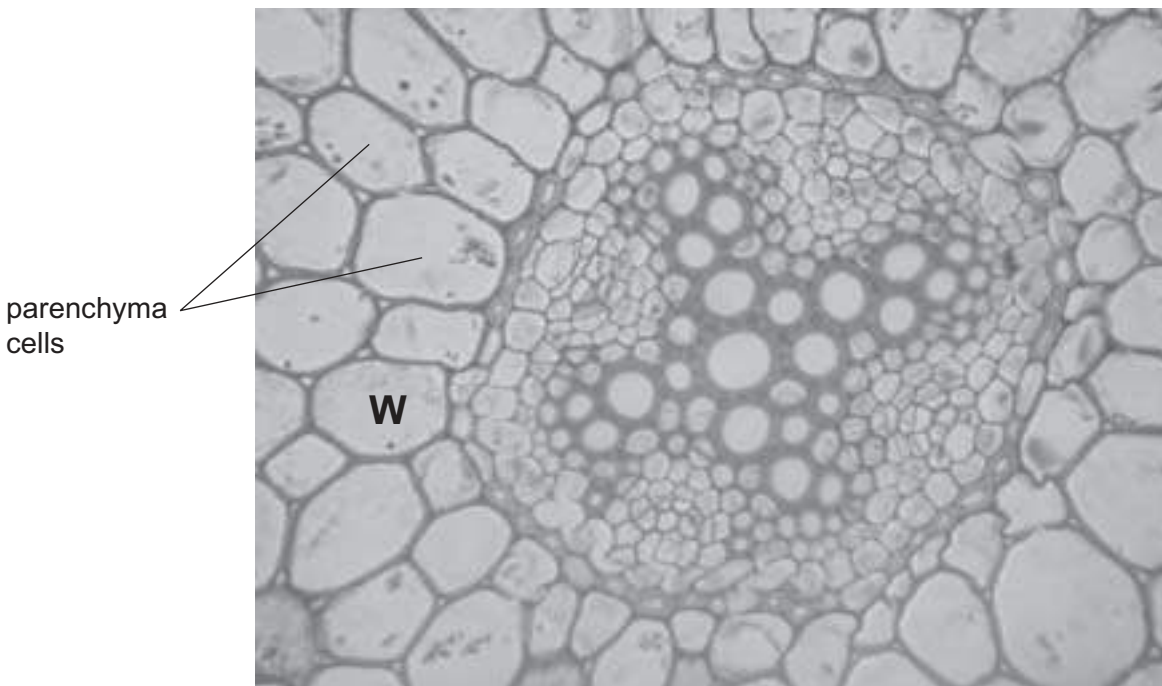


Fig. 2.1

- (a) Draw an arrow on Fig. 2.1, beginning at point **W** and ending in a xylem vessel element, to show the direction of water movement in this region of the root. [1]
- (b) Describe the pathway that water takes from point **W** to reach a xylem vessel element **and** explain why water moves in this direction.

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..... [4]

(c) The parenchyma cells in Fig. 2.1 are packed with starch granules, which are used as energy stores for the plant. The starch granules are not clearly visible in the section shown.

(i) Name the solution that can be used:

- to make the starch granules more visible
- to confirm that the granules are composed of starch.

..... [1]

(ii) Describe how the structure of starch makes it suitable for its function.

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.....  
.....  
.....  
..... [4]

[Total: 10]

- 3 Fig. 3.1 is a vertical section of the heart. The regions concerned with initiating and conducting impulses are shown.

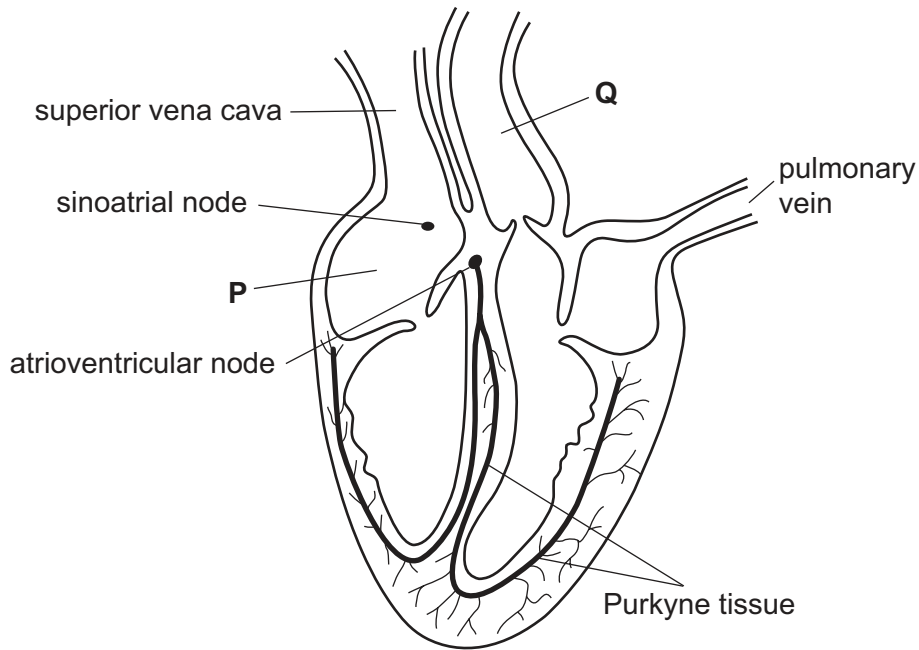


Fig. 3.1

- (a) Name chamber P and blood vessel Q.

P .....

Q ..... [2]

- (b) Describe how the sinoatrial node (SAN) and Purkyne tissue, shown on Fig. 3.1, are involved in the initiation and co-ordination of the contraction of the heart.

SAN .....

.....

.....

.....

.....

Purkyne tissue .....

.....

.....

.....

..... [4]

(c) The heart forms part of a closed double circulation in mammals.

Explain what is meant by a closed double circulation.

.....

.....

.....

.....

.....

.....

..... [2]

(d) The blood in the pulmonary vein has travelled through the capillary network in the lungs, where gas exchange has taken place.

(i) Describe the process of oxygen transfer between the alveolus and the blood in the surrounding capillary.

.....

.....

.....

.....

.....

.....

.....

..... [3]

(ii) When a person starts to smoke cigarettes, one immediate effect is a decrease in the oxygen that is taken up in the lungs.

Explain why this is so.

.....

.....

.....

.....

..... [2]

[Total: 13]

- 4 Phosphate ions have a number of uses in organisms. These include:
- involvement in cell signalling responses
  - involvement in energy transfer processes
  - component of phospholipids
  - component of nucleotides.

Phosphatase enzymes remove phosphate groups from organic compounds, while kinase enzymes add phosphate groups.

(a) Read the following passage:

Some hormones circulating in the blood are able to trigger transcription within a cell, even though they are unable to enter the cell. Phosphatases and kinases then take part in cell activities that eventually result in genes switching on and transcription beginning.

(i) Suggest why the hormones, referred to in the passage, are unable to enter the cell.

.....  
.....  
.....  
.....  
..... [2]

(ii) Use the information in the passage to outline the process of cell signalling.

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
..... [3]



(b) The activity of a phosphatase enzyme was measured at different values of pH by using nine different buffer solutions. The temperature was kept constant at 30 °C.

The results are shown in Fig. 4.1.

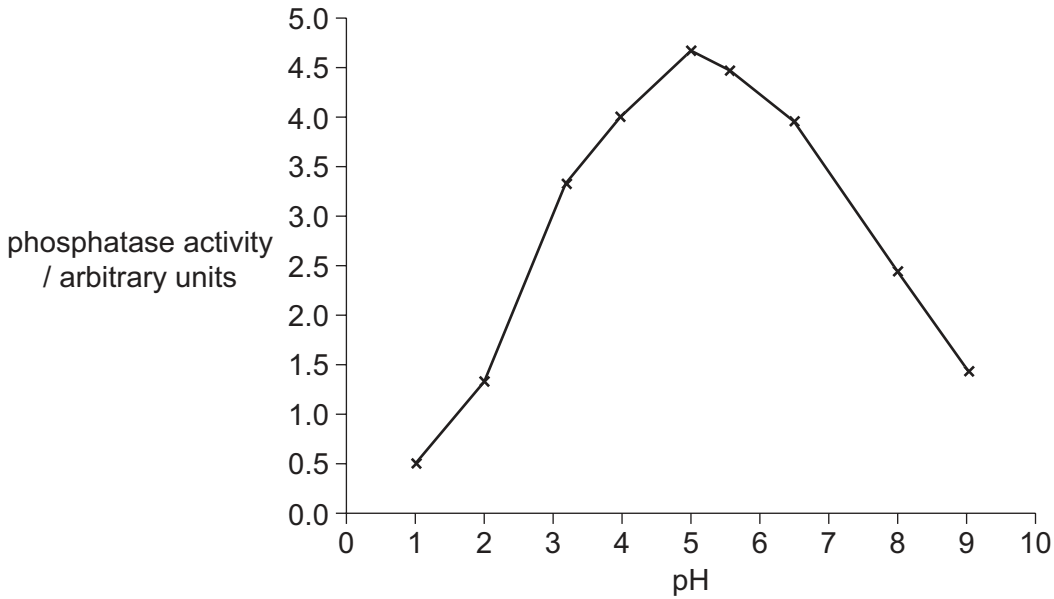


Fig. 4.1

(i) With reference to Fig. 4.1, describe the effect of pH on the activity of phosphatase.

.....  
.....  
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.....  
..... [2]

(ii) Explain why the activity of phosphatase at pH 1 is very low.

.....  
.....  
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.....  
.....  
..... [3]

(c) DNA can be produced commercially for use in genetic engineering. Sometimes dephosphorylated DNA is required. This involves removal of the terminal phosphate groups using immobilised phosphatases.

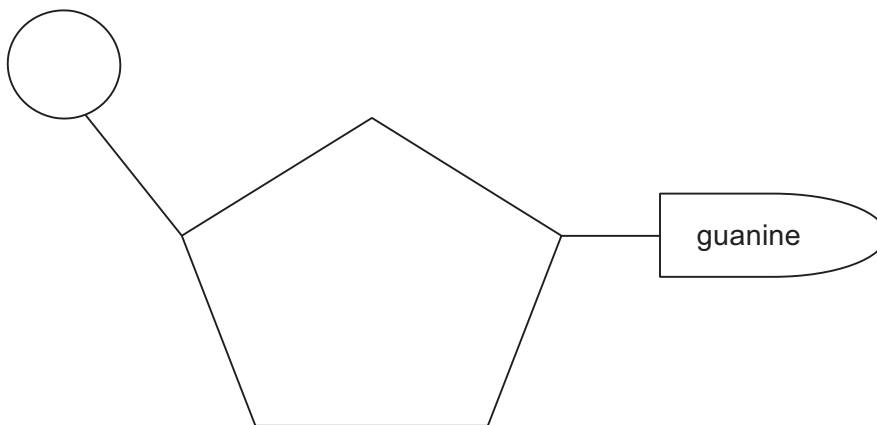
(i) State **one** way of immobilising an enzyme.

.....  
 ..... [1]

(ii) Apart from a cost benefit, suggest **one** advantage of using immobilised phosphatase to produce dephosphorylated DNA.

.....  
 ..... [1]

(d) Fig. 4.2 represents a DNA nucleotide.



**Fig. 4.2**

Compare the structure of an ATP molecule with the DNA nucleotide shown in Fig. 4.2.

.....  
 .....  
 .....  
 .....  
 .....  
 .....  
 .....  
 .....  
 ..... [4]

[Total: 16]

- 5 (a) Complete Table 5.1 to show which of the four statements apply to each of the infectious diseases shown.

Fill in each box, using a tick (✓) to show that the statement applies or a cross (✗) if not.

**Table 5.1**

statement	measles	smallpox	malaria
caused by a virus			
caused by <i>Plasmodium</i>			
eradicated by vaccination			
transmitted by contaminated water			

[4]

- (b) Explain why antibiotics are not prescribed for viral diseases.

.....

.....

.....

..... [1]

[Total: 5]

6 Fig. 6.1 shows the origin and development of a B-lymphocyte and its subsequent role in an immune response following an infection by a pathogen.

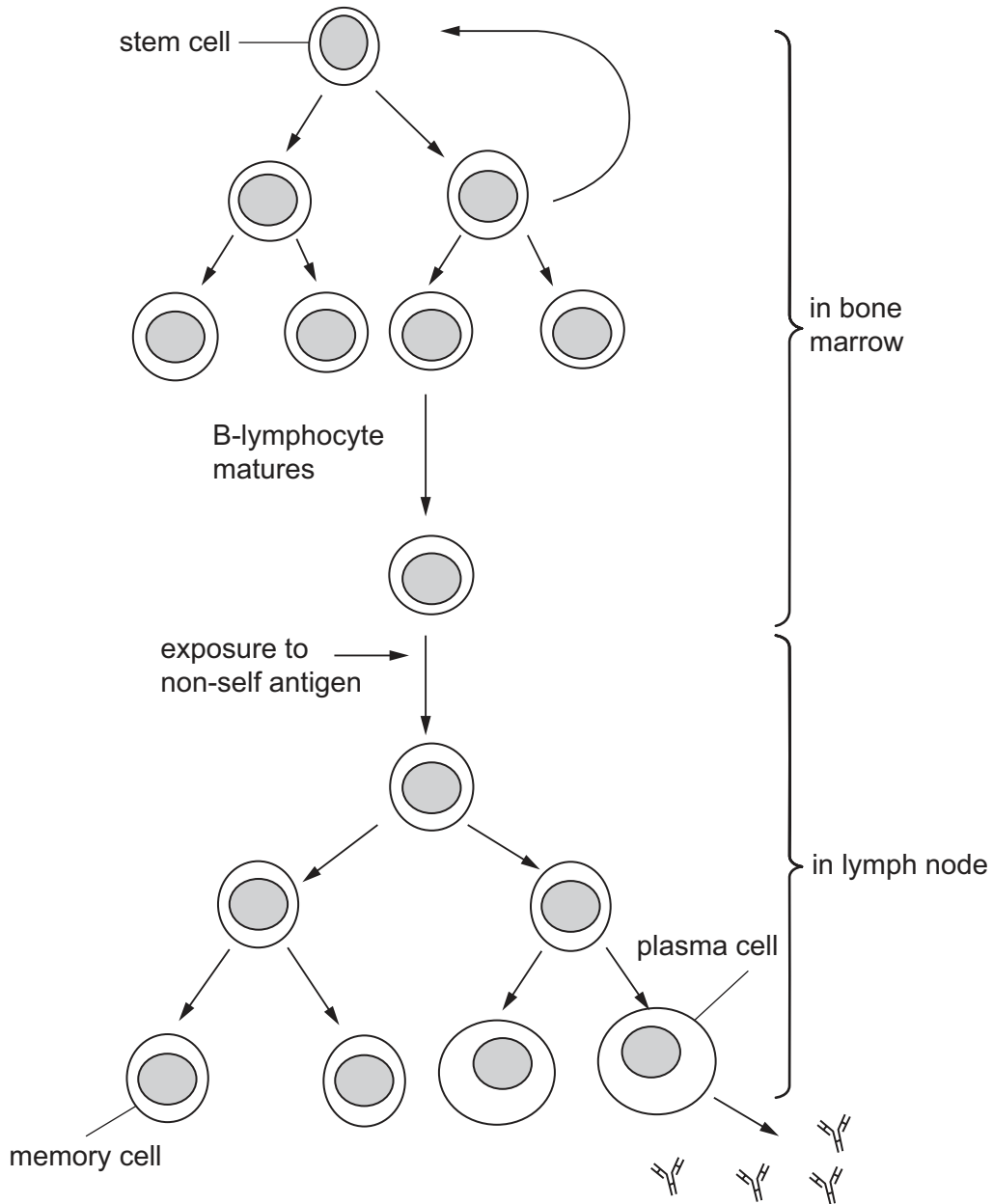


Fig. 6.1

(a) B-lymphocyte activation can occur as a result of direct contact with a specific antigen on the invading pathogen.

State **two** other ways for the B-lymphocyte to become exposed to the antigen.

.....

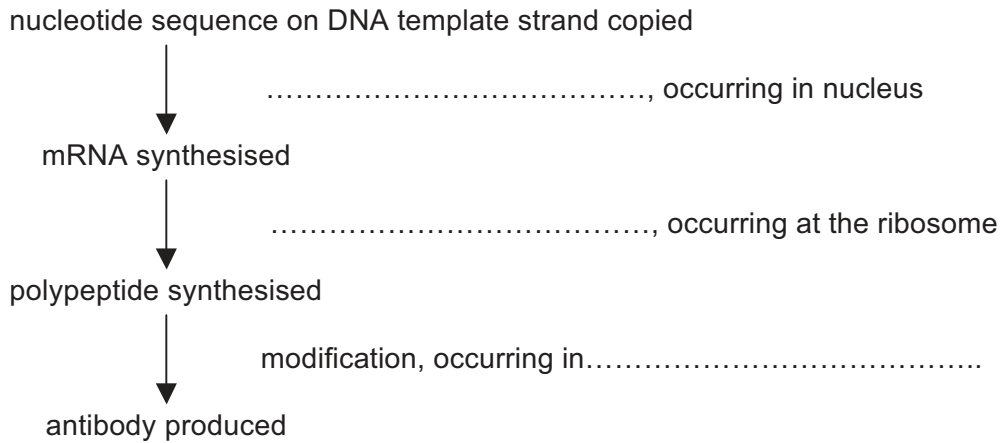
.....

.....

..... [2]

(b) The function of the plasma cell is to produce and secrete specific antibody.

Complete Fig. 6.2 to summarise the sequence of events occurring in the plasma cell.



[1]

Fig. 6.2

(c) Antibodies are globular proteins with quaternary structure.

(i) Suggest why antibodies need to be globular proteins.

.....  
..... [1]

(ii) With reference to antibody structure, explain what is meant by quaternary protein structure.

.....  
.....  
.....  
..... [2]

(d) Monoclonal antibody can be produced commercially for use in the diagnosis of infectious disease.

Name the type of cell used to produce monoclonal antibody.

..... [1]

[Total: 7]

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