Cambridge International AS & A Level

**Cambridge International Examinations**
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

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*3163187213*

**BIOLOGY** **9700/23**

Paper 2 AS Level Structured Questions **October/November 2016**

**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.
You may lose marks if you do not show your working or if you do not use appropriate units.

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 **14** printed pages and **2** blank pages.

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Answer **all** the questions.

**1** **(a)** Table 1.1 shows some features of four biological molecules that are all polymers.

Complete Table 1.1 by using a tick (✓) to indicate the features that apply to each polymer.

**Table 1.1**

| feature | amylopectin | cellulose | RNA | polypeptide |
|---|---|---|---|---|
| synthesised from amino acid monomers | | | | |
| contains glycosidic bonds | | | | |
| polymer is branched | | | | |
| contains nitrogen | | | | |
| can be found in both animal and plant cells | | | | |

[4]

**(b)** Fig. 1.1 is a simple diagram of a phospholipid molecule.

Explain how the structure of a phospholipid molecule makes it suitable for its function in cell membranes. You may label and annotate Fig. 1.1 as part of your answer.



**Fig. 1.1**

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.....[3]

**(c)** State two components of a cell surface membrane **other than** phospholipid molecules and describe their function.

*component 1* .....

*function* .....

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*component 2* .....

*function* .....

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.....[4]

[Total: 11]

**2** **(a)** Explain how enzymes lower the activation energy needed to allow reactions to proceed.

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.....[2]

**(b)** Folic acid is a molecule used by all cells for growth. Bacteria cannot absorb folic acid from their surroundings. Bacteria use an enzyme to make a molecule called PABA. PABA is used to make folic acid.

An investigation was carried out to determine the effect on the production of PABA when the concentration of an enzyme inhibitor is increased. Four different concentrations (1 μM to 30 μM) of the inhibitor were used, together with a control with no inhibitor.

The concentration of PABA produced in each reaction mixture was determined at 10 minute intervals.

The results are shown in Fig. 2.1.

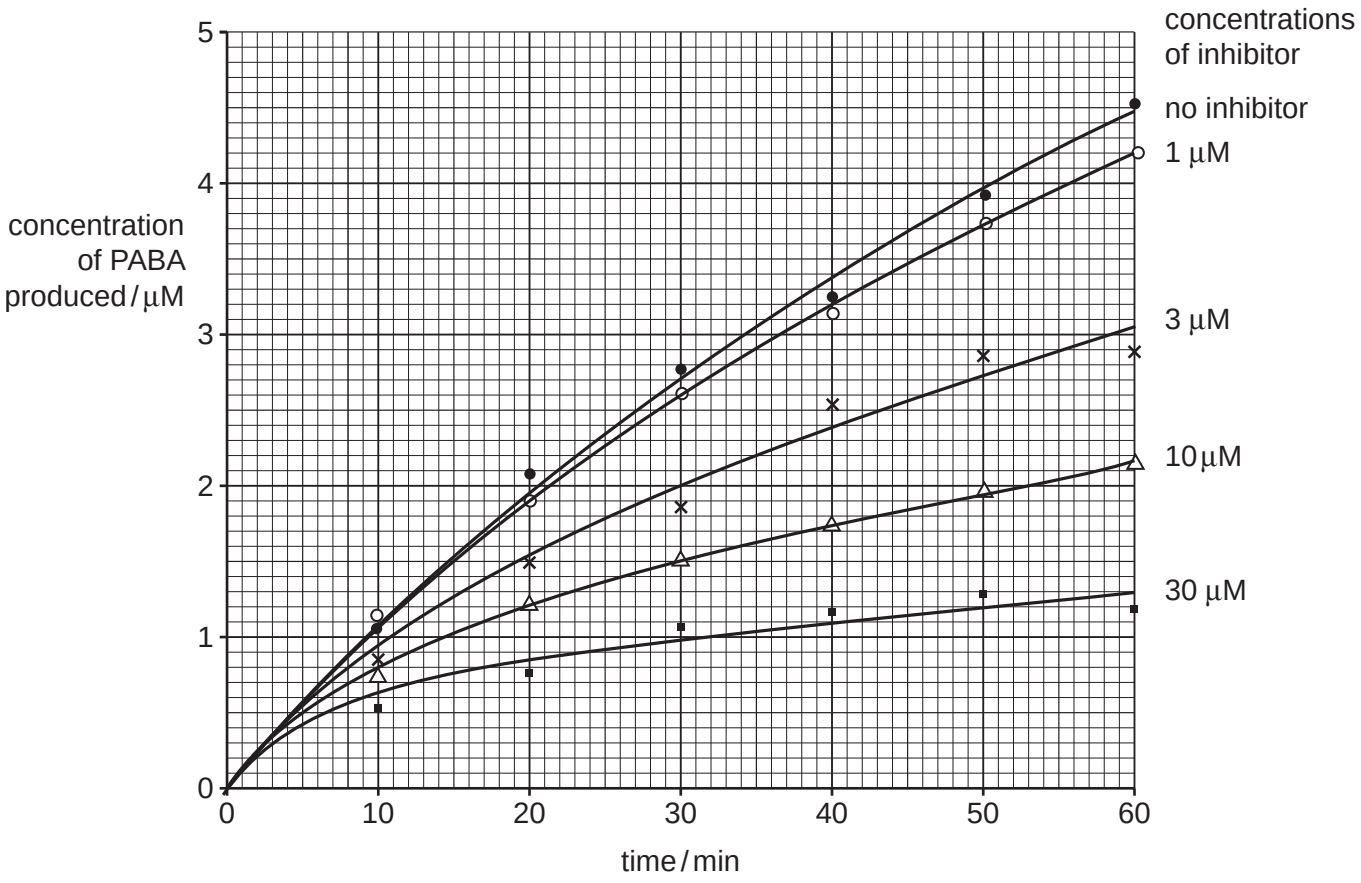



**Fig. 2.1**

**(i)** Use Fig. 2.1 to describe the results of the investigation.

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.....[4]

**(ii)** Outline an experiment that could be carried out to determine whether the inhibitor of the enzyme that catalyses the reaction to produce PABA is competitive or non-competitive.

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.....[3]

**(iii)** Folic acid from the diet is able to enter human cells, but is **not** able to cross bacterial cell walls. Human cells do **not** have an enzyme to make PABA.

Suggest why the inhibitor of this enzyme could be used as a drug to treat bacterial infections in humans.

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.....[1]

**(iv)** Suggest why there are few drugs that have any effect on viruses.

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.....[2]

**(c)** The search for new antibiotics is important because there are many strains of bacteria that are resistant to antibiotics.

Suggest two ways to reduce the spread of antibiotic resistance.

1 .....

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2 .....

.....[2]

[Total: 14]

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**3** Fig. 3.1 shows part of a transverse section of a root of *Ranunculus repens*.

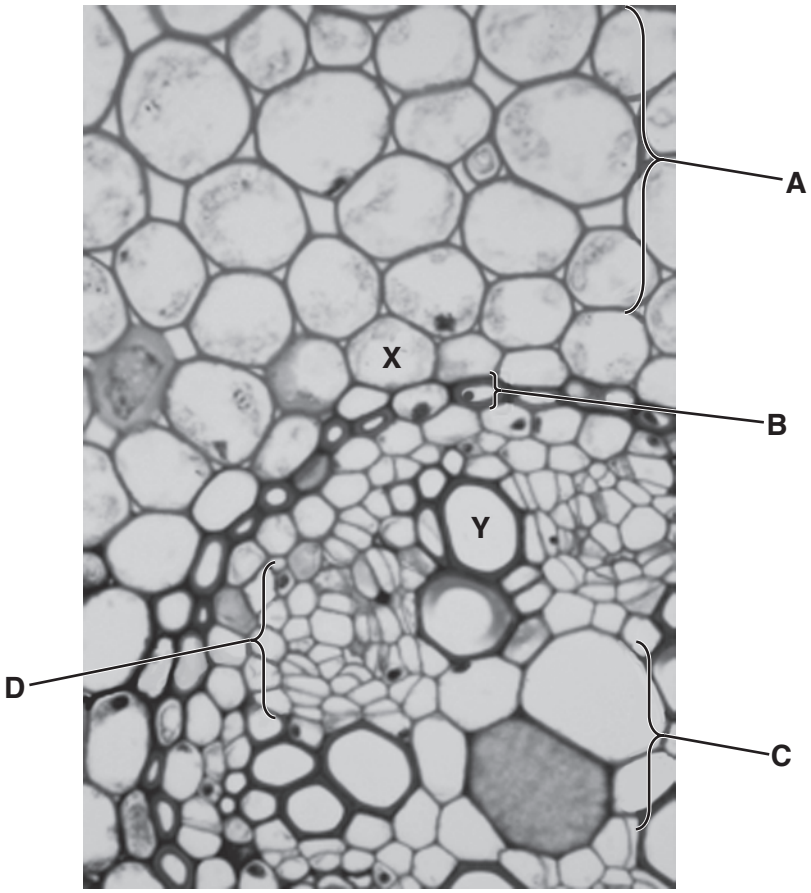



**Fig. 3.1**

**(a)** Name tissues **A** to **D**.

**A** .....

**B** .....

**C** .....

**D** .....[4]

**(b)** Explain how water moves from **X** to **Y**.

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.....[4]

[Total: 8]

**4** Protein synthesis requires ribosomes, mRNA, tRNA, amino acids and enzymes.

Fig. 4.1 is a diagram of a molecule of tRNA.

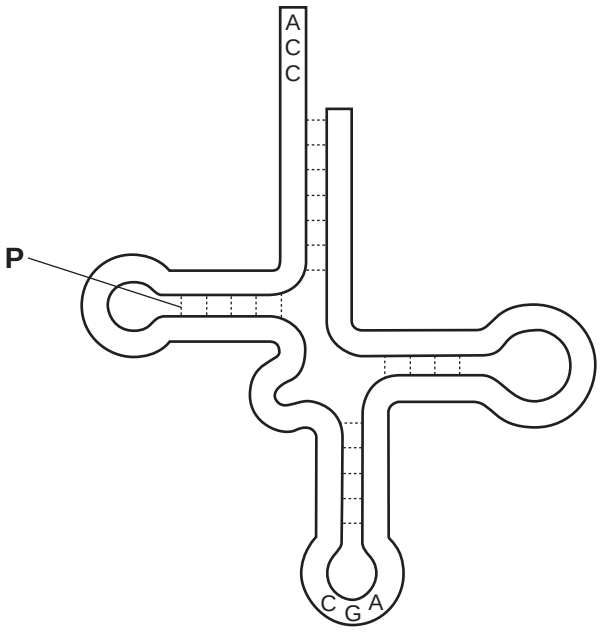



**Fig. 4.1**

**(a)** Name the bond labelled **P**.

.....[1]

**(b)** Use Fig. 4.1 to describe the role of tRNA in protein synthesis.

You may annotate Fig. 4.1 to help your answer.

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.....[3]

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**(c)** tRNA molecules are synthesised inside the nucleus of eukaryotic cells.

Outline the process by which tRNA molecules are synthesised in the nucleus.

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.....[3]

[Total: 7]

**5** In an investigation, the volume of oxygen that combined with haemoglobin at different partial pressures of oxygen was determined. The results are shown in Fig. 5.1.

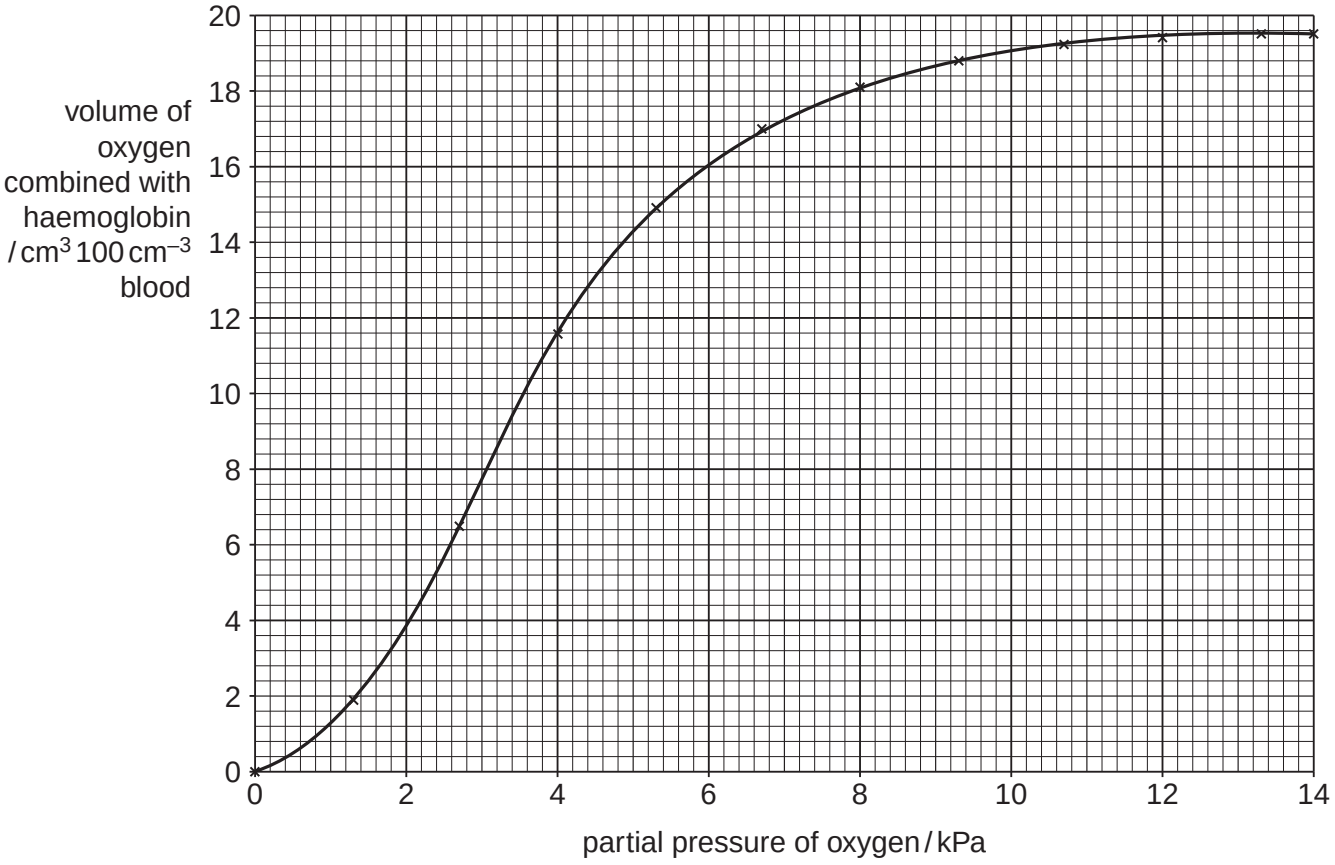



**Fig. 5.1**

**(a)** The partial pressure of oxygen in the alveoli is 13.3 kPa. At this partial pressure of oxygen the **total volume of oxygen** that is carried by 100 $cm^3$ blood is 19.78 $cm^3$ at pH 7.4 and 37 °C.

The volume of oxygen that combines with haemoglobin at 13.3 kPa is 19.48 $cm^3$ 100 $cm^{-3}$ blood.

**(i)** Calculate the percentage of oxygen that is combined with haemoglobin in 100 $cm^3$ blood.

answer .....% [1]

**(ii)** Suggest how the oxygen that is **not** combined with haemoglobin is transported in the blood.

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.....[1]

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**(iii)** Explain why a long-term smoker would have a lower volume of oxygen combined with haemoglobin in the alveoli at 13.3 kPa.

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.....[2]

**(b)** Describe the role of carbonic anhydrase in the transport of carbon dioxide.

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**(c)** The investigation was repeated in the presence of carbon dioxide. The volumes of oxygen combined with haemoglobin at partial pressures of oxygen below 8.0 kPa were less than shown in Fig. 5.1.

Name this effect **and** explain the advantage of this decrease at partial pressures of oxygen below 8.0 kPa.

*name* .....

*advantage* .....

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.....[3]

[Total: 10]

**6** Measles is a highly infectious disease.

**(a)** Name the pathogen that causes measles.

.....[1]

The number of cases of measles is reported to the World Health Organization (WHO) by countries throughout the world so that global data are collected.

Fig. 6.1 shows the global data collected between January 2008 and December 2012.

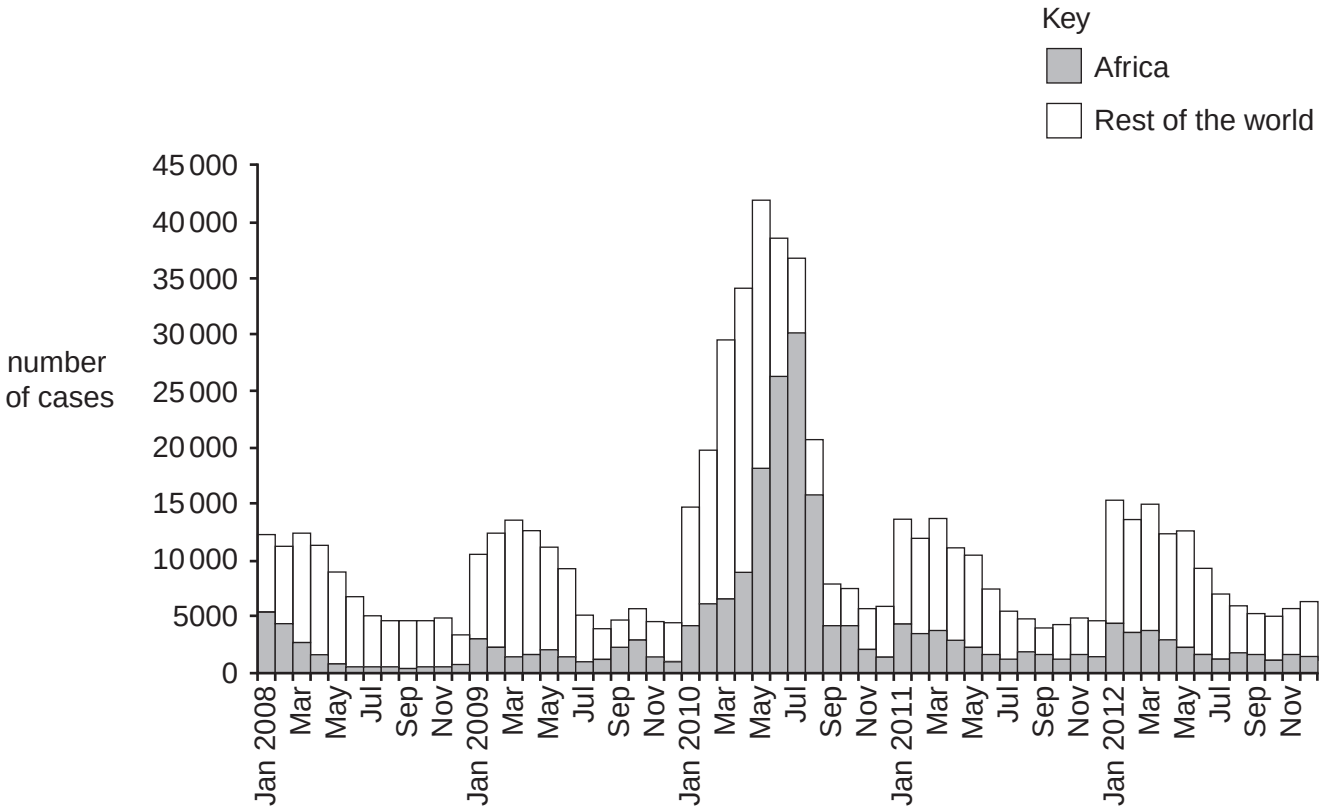



**Fig. 6.1**

**(b)** Use the data in Fig. 6.1 to describe the pattern shown in the number of cases of measles reported to the WHO between January 2008 and December 2012.

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.....[3]

**(c)** The WHO is coordinating a vaccination campaign to reduce the number of cases of measles. Between seven to ten days after receiving the vaccination for measles the concentration of antibodies in the blood begins to increase.

Describe what happens in the body after the injection of a measles vaccine until the concentration of antibodies in the blood begins to increase.

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**(d)** Explain why countries that have established vaccination programmes still have cases of measles.

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[Total: 10]

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