OCR
Oxford Cambridge and RSA

Monday 1 June 2015 – Afternoon

AS GCE BIOLOGY

F212/01 Molecules, Biodiversity, Food and Health

Candidates answer on the Question Paper.

OCR supplied materials:
None

Other materials required:
- Electronic calculator
- Ruler (cm/mm)

Duration: 1 hour 45 minutes

* F 2 1 2 0 1 *

* 4 8 3 7 0 1 9 1 2 9 *

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined pages at the end of this booklet. The question number(s) must be clearly shown.
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **100**.
-  Where you see this icon you will be awarded marks for the quality of written communication in your answer.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.
- This document consists of **24** pages. Any blank pages are indicated.

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Answer **all** the questions.

1 Pepsin is an enzyme that digests protein foods in the mammalian stomach.

(a) Protein molecules are made from chains of amino acids.

(i) Name the covalent bond between two adjacent amino acids in a chain of amino acids.

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

(ii) Name the type of reaction involved in breaking this bond **and** describe what happens in this reaction.

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

(b) Describe how an enzyme, such as pepsin, breaks down a substrate.

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..... **[5]**

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(c) A student investigated how changing the pH affected the activity of pepsin.

- He used a blender to make a suspension of egg white (protein) in water.
- At the start of the investigation the suspension was cloudy.
- He prepared fixed concentrations of egg white suspension, acid and pepsin to add to each of six test-tubes.
- He removed 0.1 cm^3 of the mixture from each test-tube and used universal indicator to measure the pH of each mixture.
- He incubated each test-tube in a water bath at 35 °C and timed how long it took for the egg white suspension in each tube to clear.
- He prepared a table in which he recorded his results (Table 1.1).

Tube	Volume of egg white suspension	Volume of acid added (cm^3)	Amount of pepsin added (cm^3)	Measured pH	Time for suspension to clear (m)
1	5	2.0	3.0	1	
2	5	1.5	3.0	2	
3	5	1.0	3.0	3	
4	5	0.5	3.0	4	
5	5	0.0	3.0	5	
6	5	2.0	0.0	1	

Table 1.1

(i) Identify **three** errors the student made in the preparation of his **table** before he recorded his results.

1 .....

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2 .....

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3 .....

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[3]

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(ii) Identify a change the student could make to his procedure that would increase the **validity** of the investigation.

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

(iii) State the term that best describes the purpose of **tube 6**.

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

(iv) Another student suggested that he should repeat the investigation at least twice.

How would this have improved the investigation?

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

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(d) Fig. 1.1 shows the effect of increasing the substrate concentration on the rate of activity of pepsin.

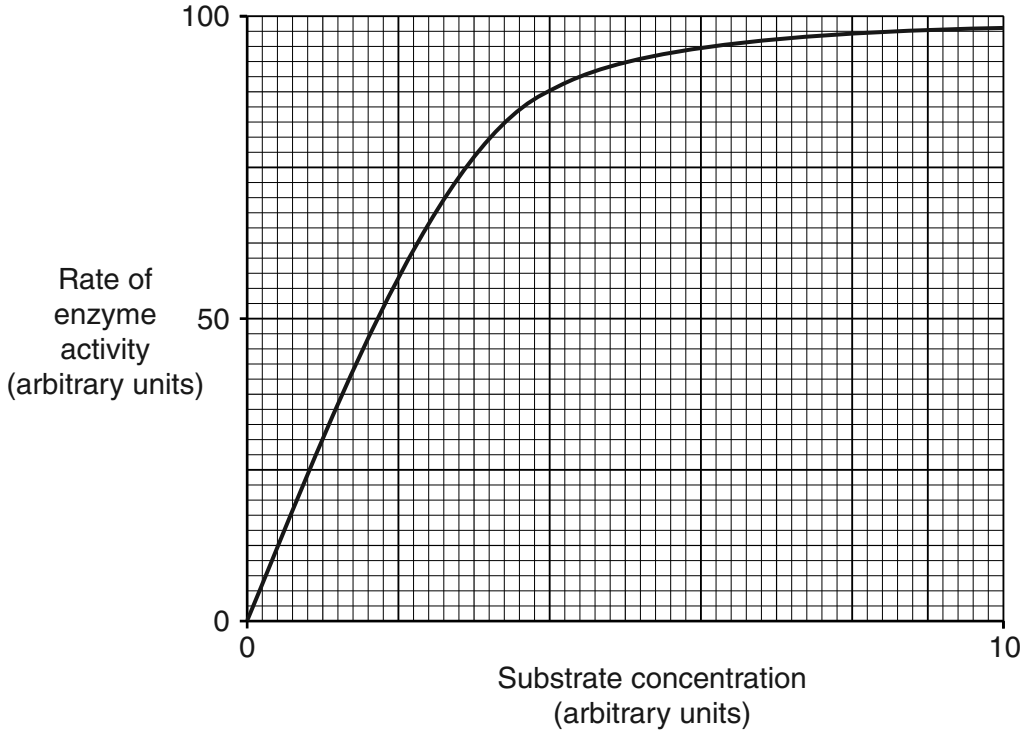


Fig. 1.1

(i) Pepstatin is a competitive inhibitor of pepsin.

On Fig. 1.1, draw a line to represent the effect of adding a fixed concentration of pepstatin on the rate of pepsin activity over the whole range of substrate concentrations.

..... *This should be answered on Fig. 1.1* .....**[2]**

(ii) Pepstatin acts as a competitive inhibitor of pepsin.

What can you conclude about the structure of pepstatin?

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

[Total: 19]

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2 Malaria is a disease that is estimated to kill around 80 people every hour worldwide.

(a) The symptoms of malaria are caused by a single-celled organism belonging to the genus *Plasmodium*.

(i) *Plasmodium* is described as a parasite.

Define the term *parasite*.

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

(ii) Explain why the human body's primary defences do **not** prevent the entry of *Plasmodium* into the body.

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

(iii) Suggest why malaria is much more common in tropical areas than in other parts of the world.

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

(iv) Suggest **two** reasons why governments in parts of the world other than tropical areas, are also becoming increasingly concerned about malaria.

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

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(b) People with the disease known as iron-deficient anaemia (IDA) are resistant to malaria. This resistance is not well understood but is thought to involve phagocytosis.

Fig. 2.1 shows the process of phagocytosis of a pathogen by a phagocyte.

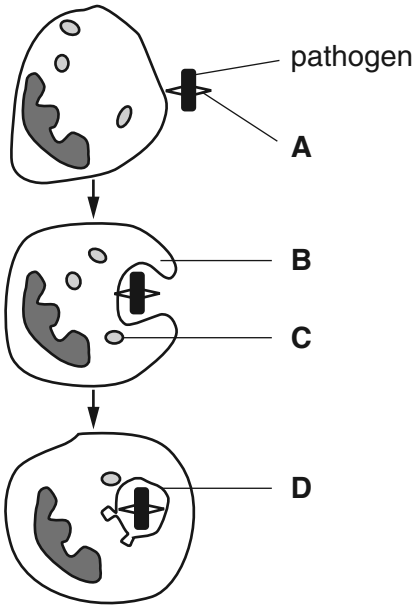


Fig. 2.1

(i) Identify the structures represented by the letters **A**, **B**, **C** and **D**.

A .....

B .....

C .....

D .....

[4]

(ii) In patients with IDA, anaemia is caused by the destruction of erythrocytes (red blood cells) by phagocytosis.

Suggest why erythrocytes that contain *Plasmodium* are more likely to be destroyed by phagocytosis than healthy erythrocytes.

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

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(c) Erythrocytes contain haemoglobin, which is a globular protein.

Blood vessel walls contain collagen, which is a fibrous protein.

Describe the differences between globular and fibrous proteins using haemoglobin and collagen as examples.

In your answer you should refer to collagen and haemoglobin.

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..... **[8]**

[Total: 21]

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3 Roe deer, *Capreolus capreolus*, is the most common species of native deer in the UK.

Fig. 3.1 shows the distribution of roe deer in the UK in 1972 and 2007. It also shows the location of the sites that were studied in 2007.

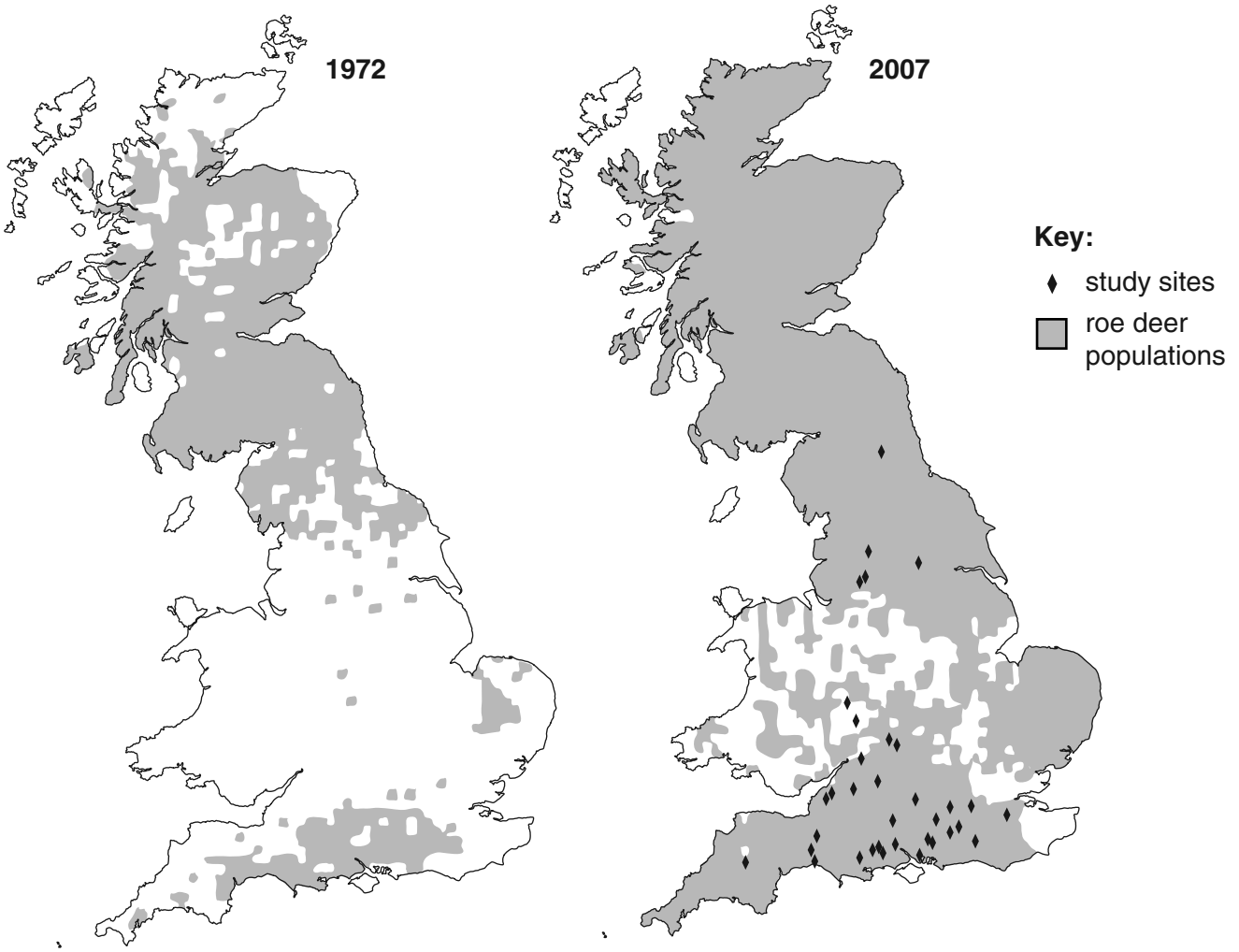


Fig. 3.1

(a) How has the distribution of roe deer changed between 1972 and 2007?

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

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(b) In 2007, scientists studied the effect of roe deer on the biodiversity of the habitat at a number of sites, shown on Fig. 3.1.

At each study site, the scientists sampled plants and animals in unfenced areas where roe deer were present and in fenced areas where roe deer could not go.

(i) Explain the importance of sampling in measuring the biodiversity of a habitat.

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

(ii) Why was it important to take samples in fenced and unfenced areas?

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

(iii) The scientists needed to measure species richness and species evenness to calculate Simpson's Index of Diversity.

Explain the difference between species richness and species evenness and why both measurements are needed to assess biodiversity.

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

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(iv) In areas where the population of roe deer was high, the Simpson's Index of Diversity was low for shrubs (medium-height plants) and was also low for woodland birds.

Roe deer eat plants. Most woodland birds do not eat plants.

Suggest **one** reason why a large roe deer population might decrease the diversity of woodland birds.

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

(v) Outline the significance of a low value of Simpson's Index of Diversity.

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

(c) In the past, the roe deer's main natural predator in Britain was a large carnivore of the cat family, the Eurasian lynx, *Lynx lynx*. The lynx became extinct in Britain around 1000 years ago.

Populations of Eurasian lynx still survive in parts of mainland Europe.

Plans are being considered to re-introduce the Eurasian lynx from these European populations to the wild parts of Britain to improve biodiversity.

(i) Suggest **one** reason why some people might object to this re-introduction.

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

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(ii) A small population of Iberian lynx, *Lynx pardinus*, exists in parts of Spain. The Iberian lynx is critically endangered and, with around 100 individuals left, it is the world's most endangered species of cat.

The Iberian lynx and Eurasian lynx were once classified within the same species, based on their observable features.

In the last 10 years, the Iberian lynx has been re-classified as a separate species within the genus *Lynx*, on the basis of its phylogeny.

Define the term *phylogeny* and explain how phylogeny is related to classification. Use the two lynx species as examples.

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

(iii) Suggest why it is only in the last 10 years that the Iberian lynx has been classified as a separate species.

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

(iv) Outline **three** reasons why it is important to conserve the Iberian lynx.

1 .....

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2 .....

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3 .....

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[3]

[Total: 19]

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4 Wheat is an important food crop in many European countries. Developments in farming allowed the yield of wheat produced by farms in the UK to increase rapidly in the second half of the 20th century.

Fig. 4.1 shows the increase in the yield of wheat from 1947 to 1992. The graph also shows the increase that is thought to be as a result of the development of new varieties through selective breeding.

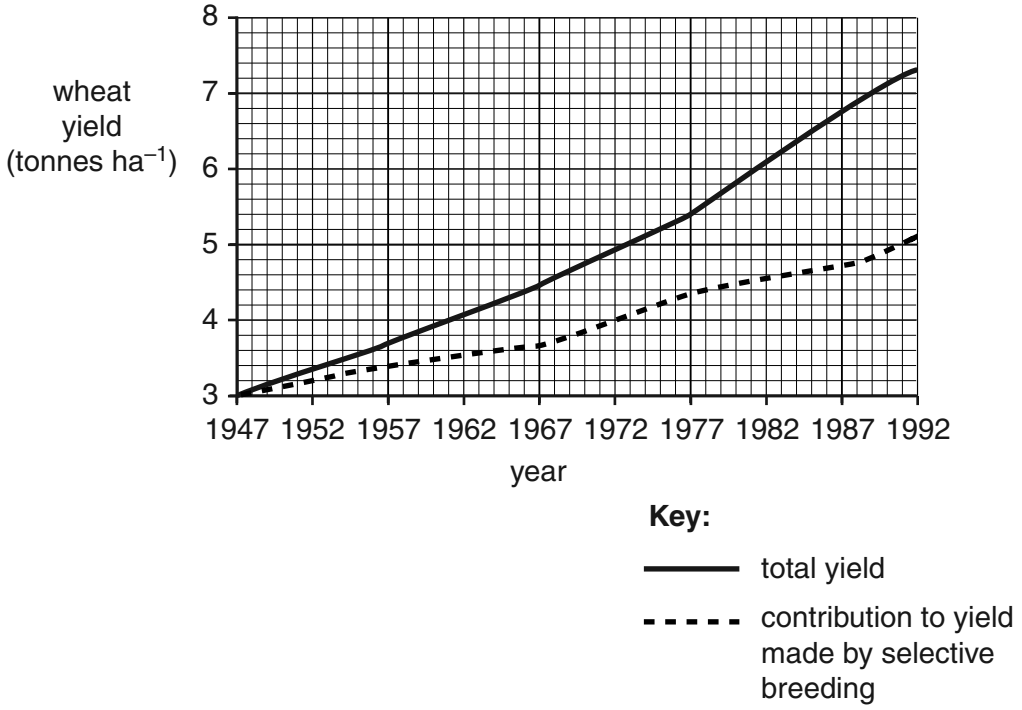


Fig. 4.1

(a) Use the graph to calculate the mean annual increase in total wheat yield between 1947 and 1992. Give your answer to **three decimal places**.

Show your working and include units with your answer.

Answer = ...

Units ..... **[3]**

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(b) Explain how the selective breeding that led to this increased yield could have been done.

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

(c) State **two** developments, other than selective breeding, that could account for the total increase in wheat yield per hectare.

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[2]

[Total: 9]

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5 Fig. 5.1 shows part of a DNA strand.



Fig. 5.1

(a) (i) Name the base represented by the letter **T**.

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

(ii) On Fig. 5.1, draw a section of the mRNA strand that is complementary to the section of the DNA strand shown.

..... *This should be answered on Fig. 5.1* .....**[2]**

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(b) Table 5.1 contains a list of statements about DNA replication. Some of these statements are incorrect.

Put a cross (**X**) in the box next to each **incorrect** statement.

DNA replication	**Incorrect statement**
The DNA molecule unwinds	
Hydrogen bonds between the base pairs break	
Free RNA nucleotides join to bases on the exposed DNA strands	
Both polypeptide strands act as a template	
Hydrogen bonds form between complementary bases	
Three hydrogen bonds form between bases A and T	
DNA polymerase links the new nucleotides	
Covalent bonds form between the phosphate of one nucleotide and the pentose sugar of the next nucleotide	

[3]

Table 5.1

(c) Complete the following passage by using the most appropriate terms.

Variation can be described as the differences in characteristics between ..... . The type of variation that is caused by differences in DNA is known as ..... variation. Variation can also be caused by the ..... . Variation between members of the same species is known as ..... variation. Evolution depends on variation and ..... of the best adapted individuals. **[5]**

[Total: 11]

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6 Antibodies are important biological molecules.

(a) Describe how the structure of antibodies allows them to perform their function.



In your answer you should clearly link structure to function.

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..... **[7]**

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(b) Antibodies can defend the body against pathogens in a number of ways.

Outline the mode of action of antibodies in defending the body against pathogens by describing the processes of **neutralisation** and **agglutination**.

neutralisation .....

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agglutination .....

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[4]

[Total: 11]

Question 7 begins on page 20

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7 Lipids are a group of fatty or waxy compounds.

Triglyceride, phospholipid and cholesterol are examples of lipid compounds that are important in living organisms.

(a) Table 7.1 lists a number of statements that could apply to these compounds.

Complete the table by indicating with a tick (✓) which of the compounds applies to each statement.

You may use more than one tick in a row.

Statement	Triglyceride	Phospholipid	Cholesterol
Contains only the elements carbon, hydrogen and oxygen			
Insoluble in water			
Contains glycerol			
Contains ester bonds			
Important in membrane structure			
Contains fatty acids			

[6]

Table 7.1

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(b) Describe how to do the emulsion test for lipids and how a positive result would be identified.

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

(c) Lipids form an essential part of a balanced diet. Some food, such as mycoprotein, is produced by microorganisms.

How might the **lipid** content of mycoprotein differ from food that comes from animals?

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

[Total: 10]

END OF QUESTION PAPER

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ADDITIONAL ANSWER SPACE

If additional answer space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margins.

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