PEARSON EDEXCEL IGCSE BIOLOGY · 4BI1

# BIOLOGY



## EXAM QUESTION PACK

### SECTION 1: THE NATURE AND VARIETY OF LIVING ORGANISMS (PACK 1)

| SCORE | PERCENTAGE |
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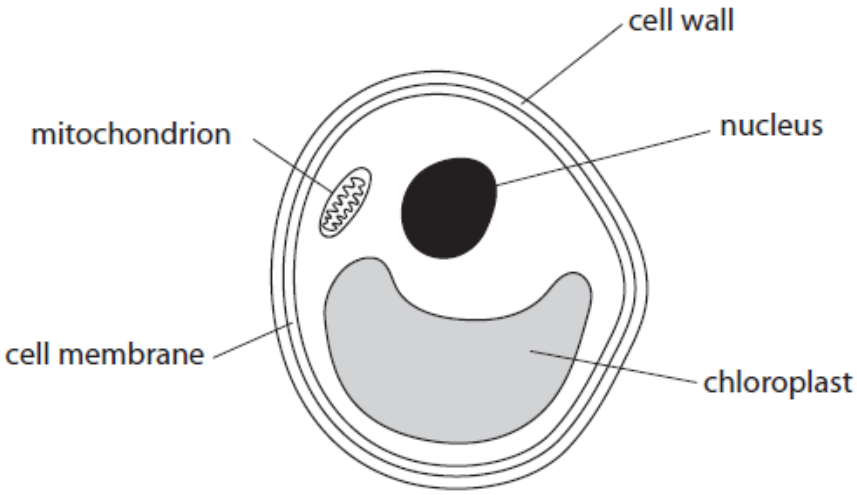
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Q1.

The diagram shows a single-celled organism called *Chlorella* that lives in fresh water.

*Chlorella* has a chloroplast and can photosynthesise.




(a) (i) Which of these groups of organisms contains *Chlorella*?

**(1)**

☒ **A** animals

☒ **B** bacteria

☒ **C** plants

☒ **D** protoctists

(ii) Which of these labelled structures would also be present in an animal cell?

**(1)**

☒ **A** cell membrane and chloroplast

☒ **B** cell membrane and mitochondrion

☒ **C** cell wall and chloroplast

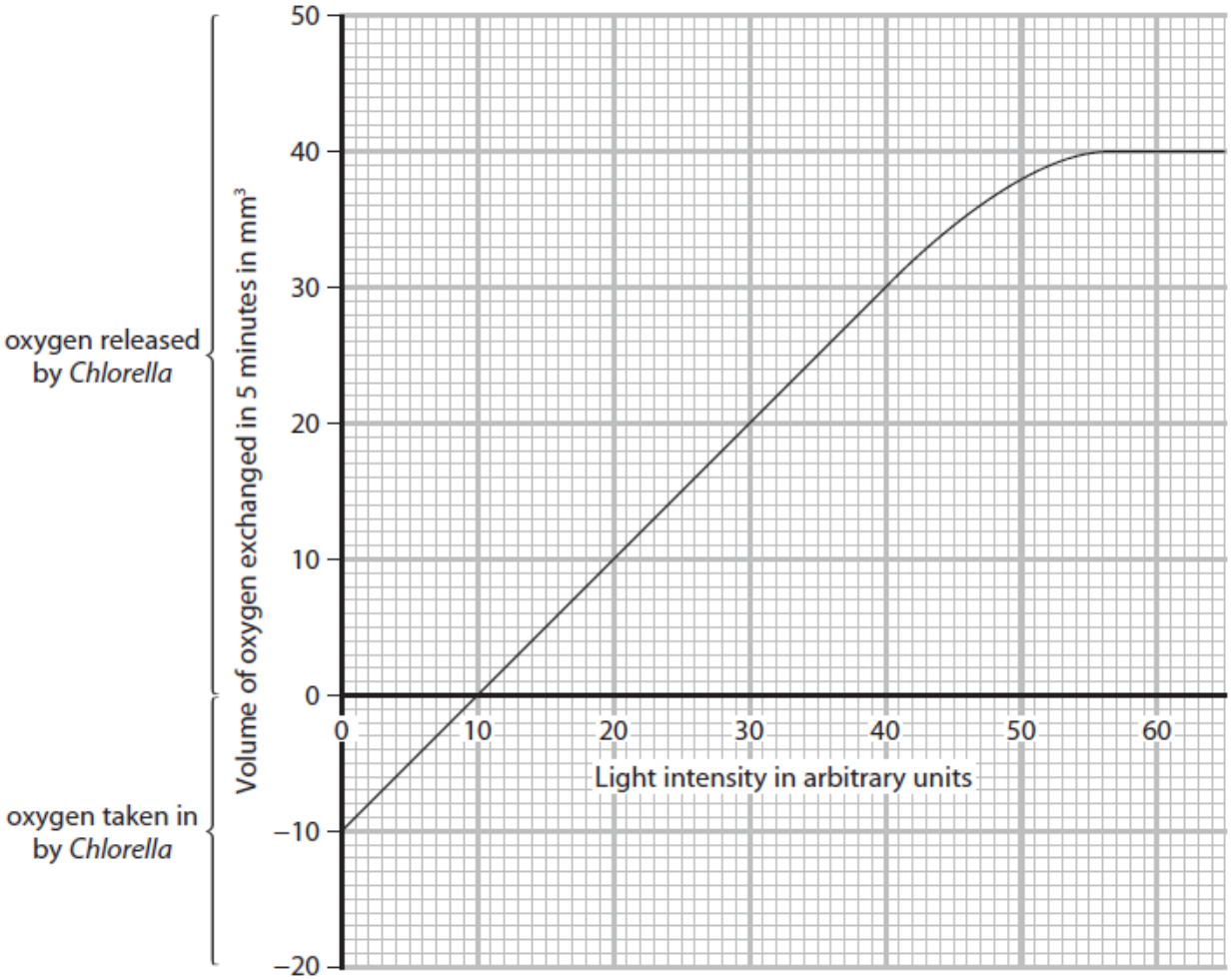
☒ **D** cell wall and mitochondrion

(b) Complete the balanced chemical symbol equation for photosynthesis.

**(2)**

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..... ⟶ ..... + $6O_2$

(c) The graph shows the effect of light intensity on gas exchange by *Chlorella*.




(i) Explain why *Chlorella* takes in oxygen at light intensities below 10 arbitrary units.

**(2)**

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(ii) Explain the changes in the volume of oxygen released as the light intensity increases from 10 arbitrary units.

**(3)**

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(iii) The volume of oxygen released by *Chlorella* is the difference between the oxygen produced by photosynthesis and the oxygen taken in.

Use the graph to calculate the volume of oxygen produced in five minutes by photosynthesis at a light intensity of 50 arbitrary units.

**(2)**

volume of oxygen = ..... $mm^3$

(d) Describe how hydrogen-carbonate indicator could be used to investigate the effect of light intensity on carbon dioxide exchange by *Chlorella*.

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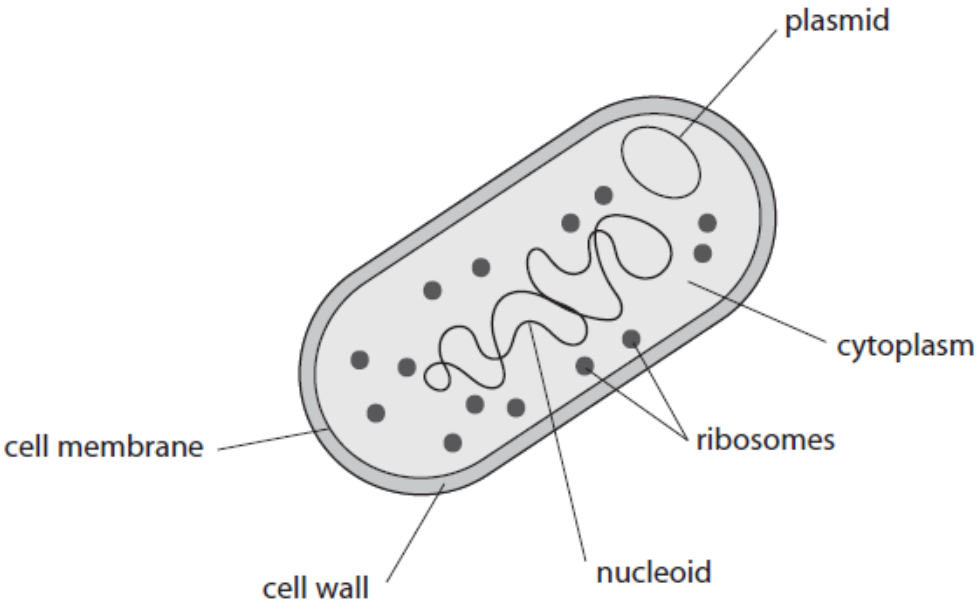
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**(Total for question = 14 marks)**

Q2.

*P. multocida* is a bacterium that causes cholera in chickens.

The diagram shows the bacterium.




(a) Give two structures in this bacterium that are also found in all eukaryotic cells.

**(2)**

1 .....

2 .....

(b) Scientists investigated the survival of chickens injected with normal *P. multocida* or with weakened *P. multocida*.

The table shows the scientists' results.

| Type of injection | Result |
|---|---|
| normal *P. multocida* | chickens die |
| weakened *P. multocida* | chickens stay alive |

(i) What is a correct conclusion about *P. multocida* from these results?

**(1)**

☒ **A** they are decomposers

☒ **B** they are pathogens

☒ **C** they are microscopic

☒ **D** they are non-living

(ii) The scientists took the living chickens that had been injected with weakened *P. multocida* and then injected them with normal *P. multocida*.

The chickens did not die, as they were now immune.

Explain why these chickens did not die.

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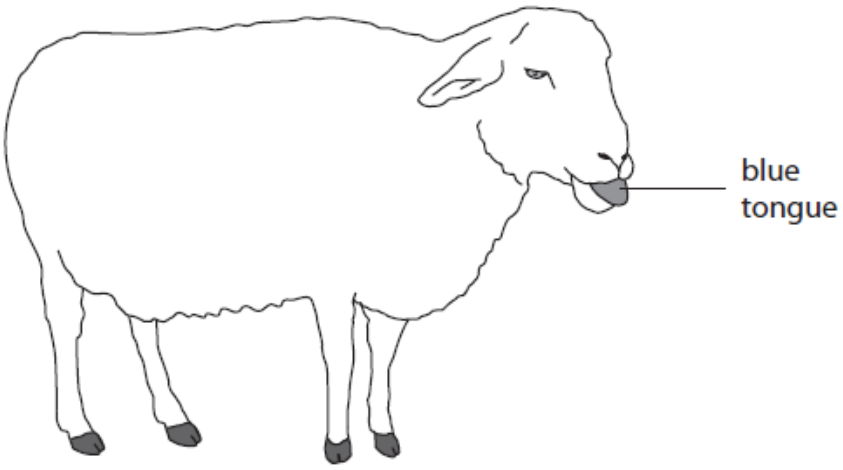
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**(Total for question = 7 marks)**

Q3.

Read the passage below. Use the information in the passage and your own knowledge to answer the questions that follow.

**Bluetongue disease in sheep**



Global warming can lead to biological consequences. Some insects are vectors for disease. These insects can move to habitats that were previously too cold for their survival. These insects spread diseases, such as malaria, when they feed on the blood of animals that they bite. Warmer air temperatures increase the rate at which insects reproduce, as well as increasing the number of times that the insects bite animals to feed on their blood.

Bluetongue is a disease that affects sheep. It is common in countries in southern Europe, but was not found in the UK until 2007. The disease has been found in sheep further north in the UK since 2007. Bluetongue is caused by a virus that is spread by a small insect, called a midge. Although there are about 995 species of midge, only 20 species are vectors for the bluetongue virus.

One symptom of bluetongue is fever. When a sheep has a fever, its body temperature rises. If the sheep's temperature becomes very high, it can affect enzymes in sheep cells, which can lead to the death of the sheep. Sheep do not sweat, but can lower their body temperature by panting. Panting involves blowing air out of the lungs over the tongue. Another symptom is swelling of the lips and the tongue, which change colour from pink to blue. The blue colour is caused by reduced blood circulation, and it gives the disease its name.

Bluetongue is difficult to treat. It is possible to prevent the disease by vaccination or by controlling the midge vector. The disease can also be controlled by quarantining infected sheep. This involves keeping the infected sheep indoors, away from other sheep.

The cabins of aircraft arriving from other countries are often sprayed with insecticide to kill any insects that may have been present.

(a) The spread of bluetongue may be one consequence of global warming (line 1).

Explain one other biological consequence of global warming.

**(2)**

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(b) Suggest how the midge acts as a vector (line 1).

**(1)**

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(c) Explain why sheep with bluetongue need to pant (line 14).

**(2)**

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(d) Give **one** reason why bluetongue was not found in the UK before 2007 (line 7).

**(1)**

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(e) Calculate the percentage of midge species that are vectors of the bluetongue virus (line 10).

**(2)**

percentage = ..... %

(f) Explain why the lips of sheep with bluetongue turn blue (line 16).

**(2)**

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(g) Explain how vaccination could protect a sheep from bluetongue (line 19).

**(3)**

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(h) Explain how quarantine could protect sheep from bluetongue (line 20).

**(2)**

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**(Total for question = 15 marks)**

Q4.

Bags made from starch are better for the environment than plastic bags made from fossil fuels.

Bags made from starch are decomposed by microorganisms such as soil fungi.

(a) (i) Which of these is a feature of fungi?

**(1)**

☒ **A** chloroplasts in the cytoplasm

☒ **B** starch stored in the cytoplasm

☒ **C** thread-like hyphae

☒ **D** walls made of cellulose

(ii) The soil fungi release an enzyme called amylase that digests the bag.

What is the product of this digestion?

**(1)**

☒ **A** amino acids

☒ **B** fatty acids

☒ **C** glycerol

☒

**D** maltose

(iii) Amylase is a protein.

Describe how protein is made in a cell.

**(5)**

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(b) A student investigates the effect of soil pH on the decomposition of bags made from starch.

She uses this method.

- cut two small squares from a bag
- measure the mass of each small square
- place one square in a beaker of soil with a pH of 7.0
- place the other square in a beaker of soil with a pH of 9.0
- after 10 days, remove the squares and measure their mass again

The table shows the student's results.

| pH of soil | Mass of square in g | | Percentage loss in mass (%) |
|---|---|---|---|
| | at start | after 10 days | |
| 7.0 | 2.00 | 1.00 | 50.0 |
| 9.0 | 2.10 | 0.62 | |

(i) Calculate the percentage loss in mass shown by the square in pH 9.0 soil.

**(1)**

percentage = .....

(ii) Calculate the difference between the percentage loss in mass for the two squares.

**(1)**

difference = .....

(iii) Explain how the student could improve her method so that she can obtain more accurate results.

**(4)**

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**(Total for question = 13 marks)**

Q5.

Food items can often be spoiled if saprotrophic microorganisms such as mould fungi grow on them.

(a) Describe how a saprotrophic fungus such as mould obtains its food.

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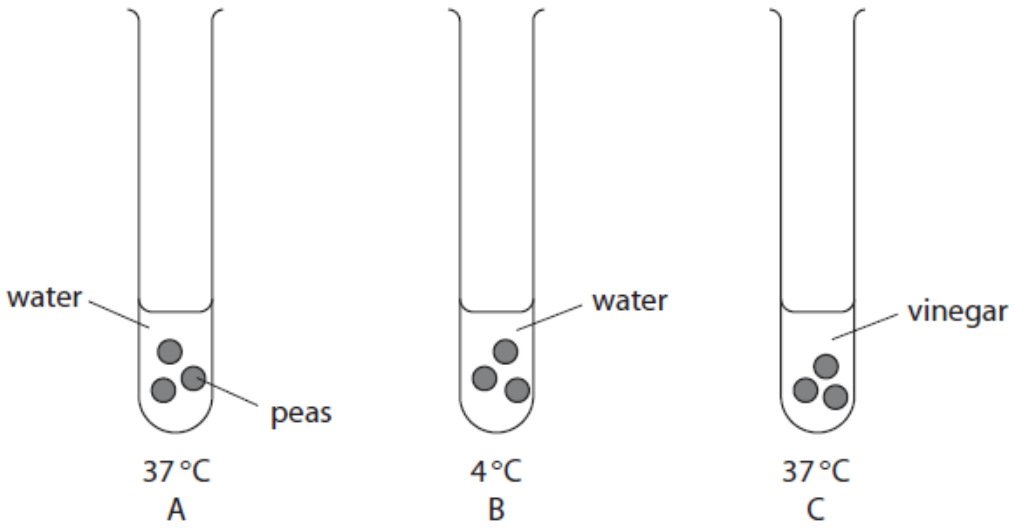
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(b) A student uses this method to investigate ways of preventing peas from being spoiled.

- place three peas in each of three test tubes as shown in the diagram
- cover the peas in test tube A with water and keep at 37 °C
- cover the peas in test tube B with water and keep at 4 °C
- cover the peas in test tube C with vinegar, which is a weak acid, and keep at 37 °C
- leave the peas for 24 hours




The student observes the level of cloudiness of the solution to determine how spoiled the peas have become.
The level of cloudiness can be used as a measure of fungal growth.

The table shows the student's results.

| Test tube | Conditions peas are kept in | Level of cloudiness |
|---|---|---|
| A | water at 37 °C | very cloudy |
| B | water at 4 °C | slightly cloudy |
| C | vinegar at 37 °C | no cloudiness |

(i) Suggest a problem with using the level of cloudiness of the solution to determine how spoiled the peas have become.

**(1)**

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(ii) Explain the appearance of the peas in water at 4 °C.

**(2)**

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(iii) Explain the appearance of the peas in vinegar at 37 °C.

**(2)**

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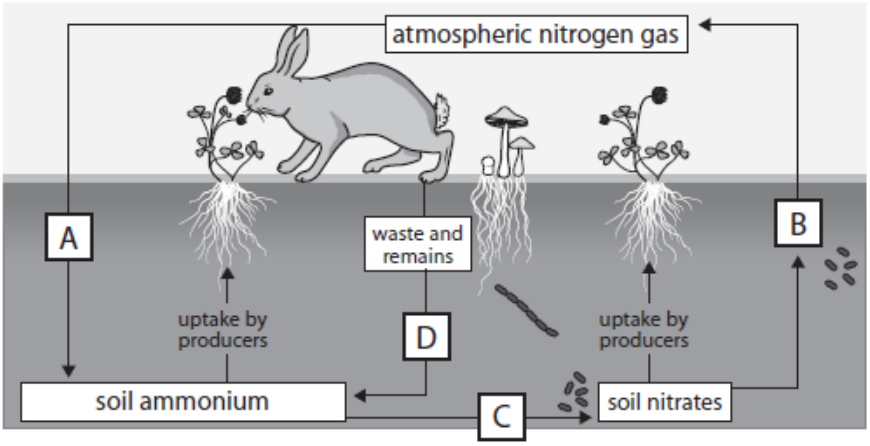
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**(Total for question = 8 marks)**

Q6.

(a) The diagram shows the nitrogen cycle with four processes labelled A, B, C and D.




(Source: https://www.shutterstock.com/image-vector/diagram-nitrogen-cycle-process-by-which-1400843660)

(i) Which process is nitrogen fixation?

**(1)**

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(ii) Which process is decomposition?

**(1)**

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(iii) Which process is nitrification?

**(1)**

☒ **A**

☒ **B**

☒ **C**

☒

**D**

(iv) Name a type of organism that carries out process C.

**(1)**

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(b) A student does an investigation to determine if nitrate ions are required for plant growth.

He uses this method.

Step 1 Use a measuring cylinder to add 10 $cm^3$ of the control solution containing all the minerals a plant requires
to a test tube

Step 2 Cover the top of the tube with foil

Step 3 Make a small hole in the foil

Step 4 Push the root of a germinated bean seedling through the hole so it is in the solution

Step 5 Rinse the measuring cylinder with distilled water

Step 6 Repeat Steps 1 to 4 using a test solution containing all the mineral a plant requires apart from nitrate ions

Step 7 Wrap both tubes in black paper

Step 8 Place both tubes in a test tube rack in bright sunlight

(i) Explain why the control solution contains all the mineral ions the plant requires but the test solution contains all the mineral ions the plant requires except nitrate.

**(2)**

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(ii) State the purpose of Step 5.

**(1)**

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(iii) Explain the purpose of Step 7.

**(2)**

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(iv) Explain the measurements that the student could make to determine if nitrate ions are required for plant growth.

**(2)**

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**(Total for question = 11 marks)**

Q7.

Human populations are at risk from infectious disease.

(a) Describe the different types of pathogen.

Refer to a disease that each type of pathogen causes in your answer.

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(b) Explain how vaccination protects humans from pathogens.

**(3)**

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**(Total for question = 9 marks)**