



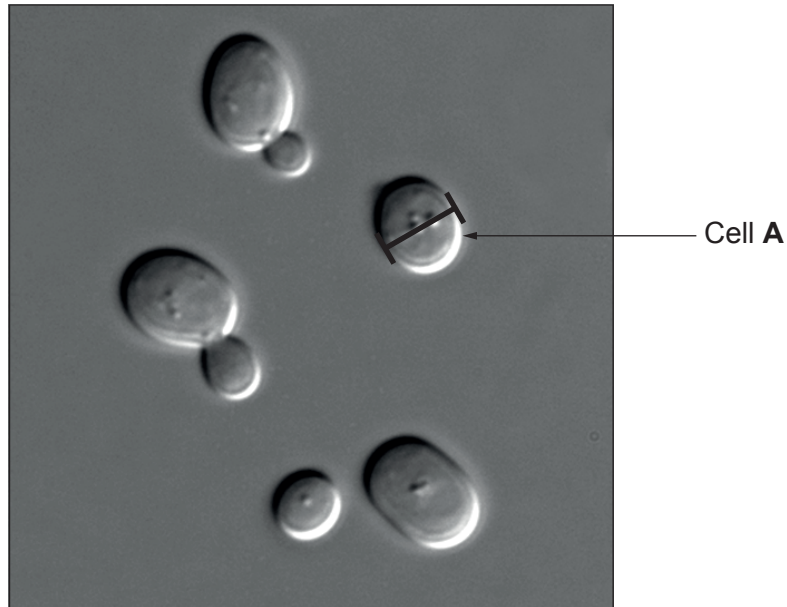
GCE Biology

S21-A400U10-1

Assessment Resource 4

Energy of Life Resource D

1. Yeast (*Saccharomyces cerevisiae*) is a eukaryotic organism which undergoes sexual reproduction when under environmental stress, forming resistant spores, but under normal conditions reproduces asexually by budding, as shown in the photograph below.



Magnification $\times 1000$

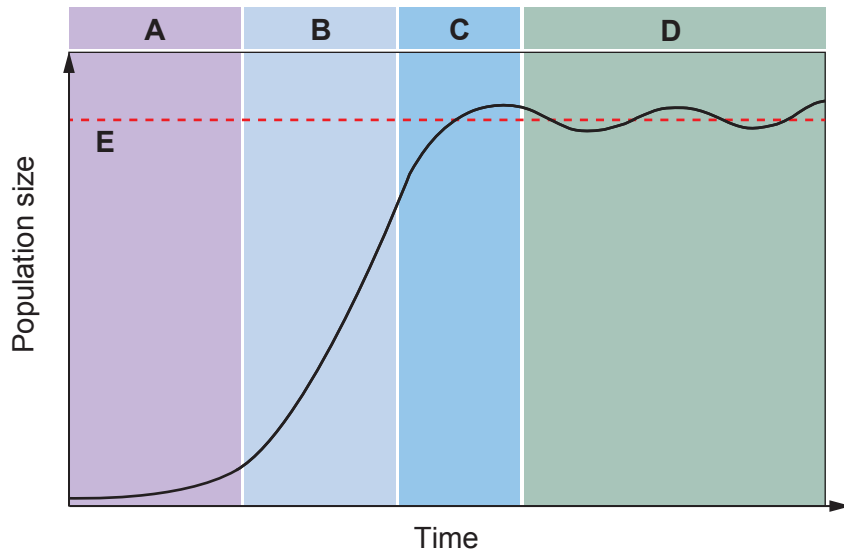
- (a) (i) Calculate the actual size of yeast cell **A** shown above. [2]

Actual size = μm

- (ii) Give **two** reasons why yeast would be classified as a eukaryotic organism. [1]

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Population growth curves can be modelled using simple organisms such as yeast. One such growth curve using yeast is shown below. Dried yeast cells were placed in a nutrient solution in an anaerobic fermenter with excess glucose as a respiratory substrate. Samples were taken at intervals and the number of cells determined. The results of this work are shown below.



(b) (i) Suggest a unit for time on the x -axis. [1]

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(ii) State what is represented by line **E**. [1]

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(c) (i) Identify phases **A**, **B** and **D** labelled on the graph and explain what is happening to the yeast population in each phase. [3]

A

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B

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D

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- (ii) Suggest **one** factor that has caused the change in the shape of the graph in phase **C** and suggest what you would expect to have happened to the population at the end of phase **D**. [2]

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- (d) Identify the phases during which you would expect sexual reproduction of the yeast cells to be occurring. Explain why sexual reproduction would be an advantage to the yeast. [3]

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- (e) A knowledge of population numbers is very important in ecology so that changes can be detected quickly. To estimate the populations of mobile animals, a method of mark and recapture is commonly used. The photograph below shows a marked Chittenango snail (*Novisuccinea chittenangoensis*), which is classified as an endangered species.



The table below shows the method used to estimate the population and the results obtained.

Method	Result
1. Capture and count animals.	430 snails
2. Mark/tag them.	
3. Release them back into the community.	
4. Capture a second sample and count them.	410 snails
5. Record the number of marked/tagged individuals re-captured.	100 snails

The population can be estimated using the following equation.

$$\frac{M}{P} = \frac{R}{n}$$

P is the population size to be estimated.

M is the number of members of the population that are captured initially and tagged.

n is the number of members of the population that are captured subsequently.

R is the number of members of this re-captured population that are tagged.

Use the equation to calculate the population of snails.

[2]

Population = snails

(f) Suggest **two** assumptions that must be made when using this technique to estimate snail population numbers. [2]

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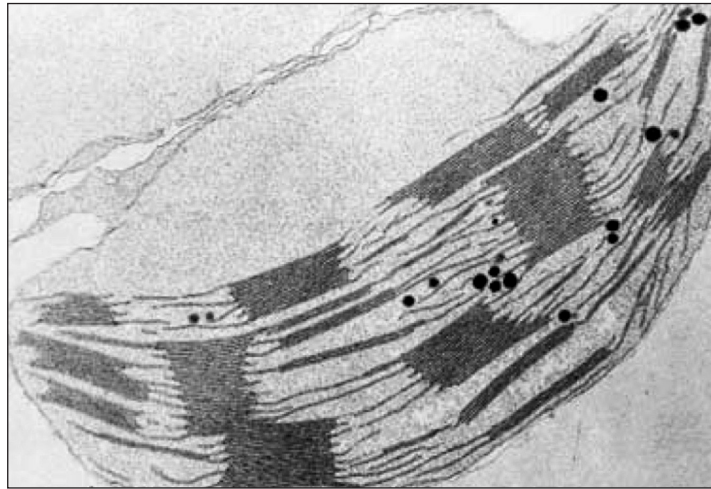
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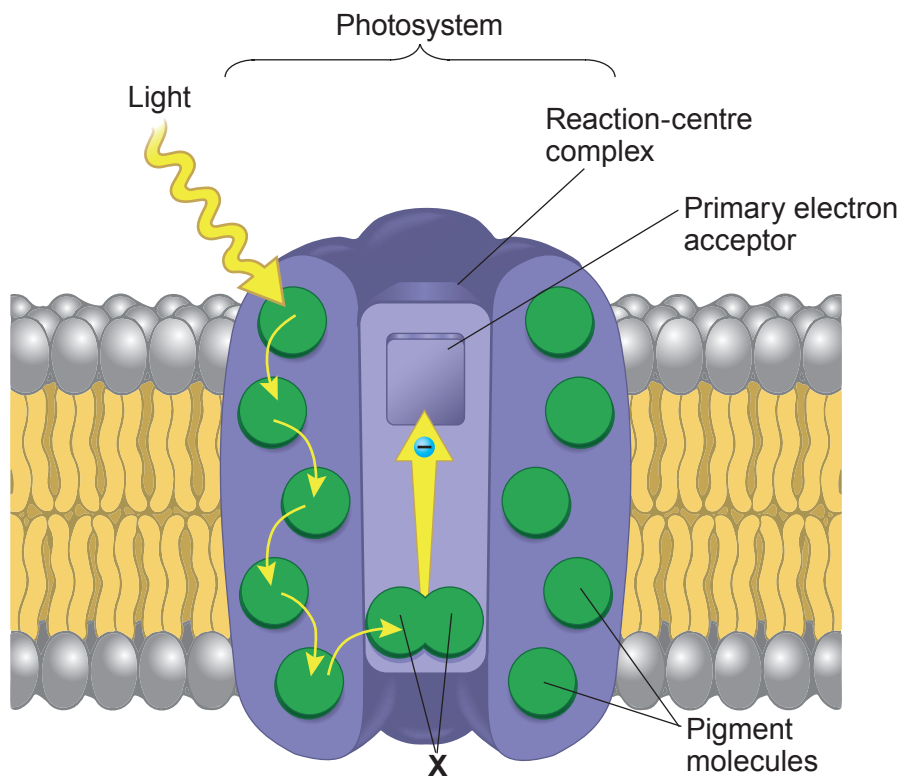
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2. The electron micrograph below shows a chloroplast, taken from a eukaryotic organism.



(a) (i) **Identify using a clearly labelled arrow** where photosystems are found on the electron micrograph above. [1]

The diagram below represents one photosystem.



(ii) Identify the pigment found at X.

[1]

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(b) Explain the role of photosystems in the light dependent stage of photosynthesis. [3]

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Many micro-organisms living in dark regions of the oceans use chemosynthesis to produce organic molecules. Some deep sea vent bacteria oxidise hydrogen sulfides. This releases energy which is used to combine carbon dioxide and hydrogen to synthesise carbohydrates. Sulfur and water are released in this process as shown in the equation below.



(c) Complete the table to state **four** differences between chemosynthesis and photosynthesis. [4]

Chemosynthesis	Photosynthesis

(d) Following the synthesis of carbohydrate, a number of inorganic ions are needed to synthesise other biological molecules.

State **three** different biological molecules **and** the inorganic ions required to synthesise them. [3]

I.

II.

III.

(e) Herbicides inhibit photosynthesis in many ways.
One group of herbicides block electron transport, so chlorophyll continues to absorb light energy but cannot pass this energy on.
Light energy not used in electron emission damages chlorophyll leading to chlorosis.
Desiccation occurs because of the formation of oxygen free-radicals, which are highly destructive to cell membranes.

Use the information given and your own knowledge to explain how blocking electron transport from photosystems with this herbicide could lead to the death of a plant. [4]

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