

SUMMIT EDUCATION

Biology

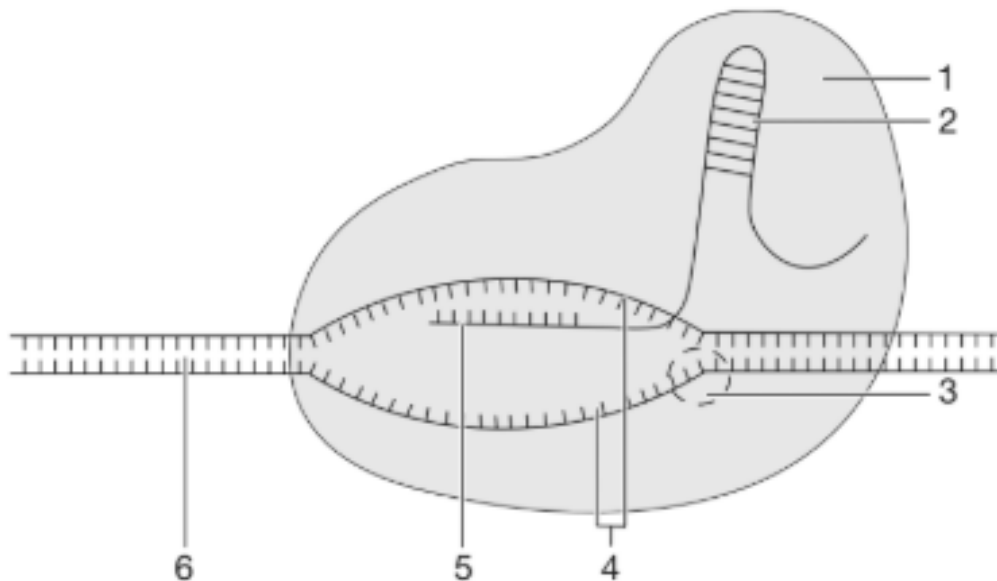
Revision (55 Marks)

Exam

Website: _____ | Phone: _____ | Email: _____

Question 1 (11 marks)

CRISPR-Cas9 technology has revolutionised modifying genes through the methods of disruption, correction or replacement. The diagram below shows a CRISPR-Cas9 complex and labels 1-6 represent different parts of the complex.



- a. Complete the table below by stating the name and describing the function of the listed parts of the CRISPR-Cas9 complex. 4 marks

- b. Explain how CRISPR-Cas9 would be used to disrupt a gene in a plant which produces a pest-attracting compound 3 marks

- c. Explain how your answer in part b. could be advantageous. 1 mark

- d.** Explain how your answer in part b. could be disadvantageous. 1 mark

- e.** A researcher uses CRISPR-Cas9 to modify this gene in a population of plants. Some plants show the desired characteristic, whilst others do not. Suggest a reason why this may have occurred, justifying your answer. 2 marks

Question 2 (11 marks)

Plants can be categorized into C3, C4, and CAM. In C3 plants, Rubisco is used to fix carbon, in carbon dioxide, at the first stage of photosynthesis.

- a.** Describe the process of photosynthesis in a C3 plant, referring to carbon fixation and reactants/products. 3 marks

- b.** Identify the main limitation of C3 plants and explain how the issue arises. 2 marks

- c.** Describe one difference between C3 plants and each of the following, and explain why they are suited to their specific environments. 6 marks

- i.** C4 plants. 3 marks

ii. CAM plants.

3 marks

Question 3 (11 marks)

Smallpox is one of the only diseases which has been globally eradicated due to public health efforts. Its genome is comprised of a single linear double stranded DNA molecule.

a. Complete the following table to compare two differences between viruses and bacteria. 2 marks

b. Briefly explain how the smallpox virus would replicate in humans. 2 marks

c. Describe the second line of defense mechanism against the smallpox virus, referring to cellular and non-cellular components. 2 marks

d. The vaccine used to eradicate smallpox is a modified live vaccinia virus. Identify the type of immunity provided by vaccination. 1 mark

e. List two demographics which would be susceptible to this vaccination, explaining why they are not recommended to

be vaccinated with the smallpox vaccine.

- f.** Describe two strategies that could be used to control the spread of smallpox such that these vulnerable populations can be protected 2 marks

Question 4 (11 marks)

The classification of fossil remains of Hominins is often complicated by migration which occurred by some subspecies. Various events of interbreeding between hominin subspecies have also required scientific breakthroughs to be discovered.

- a.** Describe the Out of Africa theory, referring to the different subspecies which may be found in different parts of the world and how humans eventually ended up in Australia. 3 marks

- b.** Identify 2 characteristics which modern humans have compared to the earliest hominins, and state why each evolution may have occurred. 2 marks

- c.** A small tool made from animal bone was discovered recently off the coast of a rural town in South Australia. It 2 marks

was dated to approximately 4500 years old.

- i. Describe two ways in which the age of this tool may have been determined.

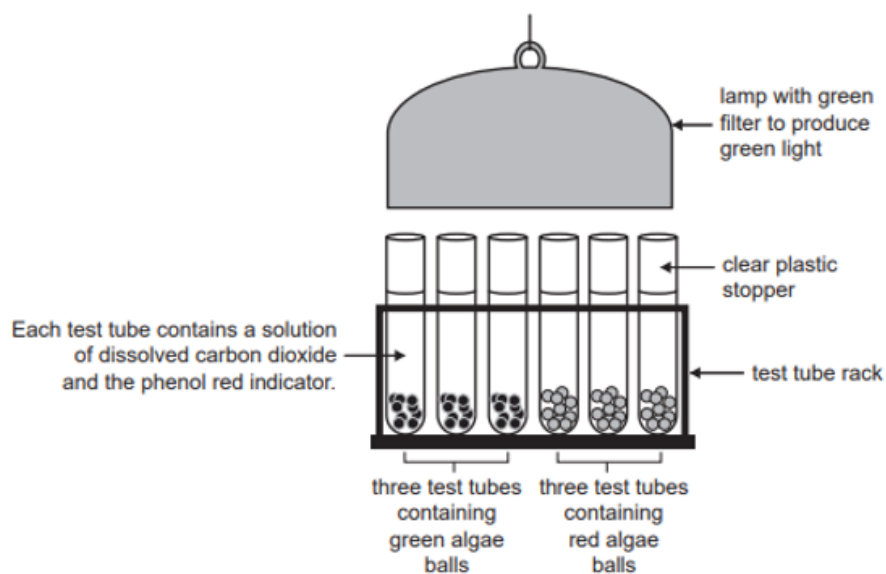
4 marks

- ii. Scientists are debating whether this bone tool is a rare discovery or just a common fossil. Explain your opinion on its rarity, justifying your answer.

2 marks

Question 5 (11 marks)

Anna read that red algae survives at greater water depths than green algae because of a pigment in the red algae called phycoerythrin. This pigment enables the algae to absorb more of the green light available at greater water depths.



marks

a. State the hypothesis that Anna was testing. 1 mark

b. List 3 variables that would need to be controlled to ensure the experiment produced valid results. 3 marks

c. State the independent and dependent variable in this experiment. 2 marks

d. What results would disprove the hypothesis of Anna's experiment? 2 marks

e. Anna's lab partner suggested they should also set up an identical experiment but keep the test tubes and their contents dark. Explain why this is a good suggestion. 1 mark

f. Anna's teacher said that even if the students completed the additional experiment in the dark and even if all of those results supported the hypothesis, there may still be other plausible explanations for their results. Suggest two other explanations to which the teacher could be referring. 2 marks
