Pearson Edexcel

Additional Assessment Materials Summer 2021

Pearson Edexcel GCSE in Biology (1BI0) Higher

Resource Set Topic 4: Natural selection and GM

Questions

(Public release version)

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Additional Assessment Materials, Summer 2021

General guidance to Additional Assessment Materials for use in 2021

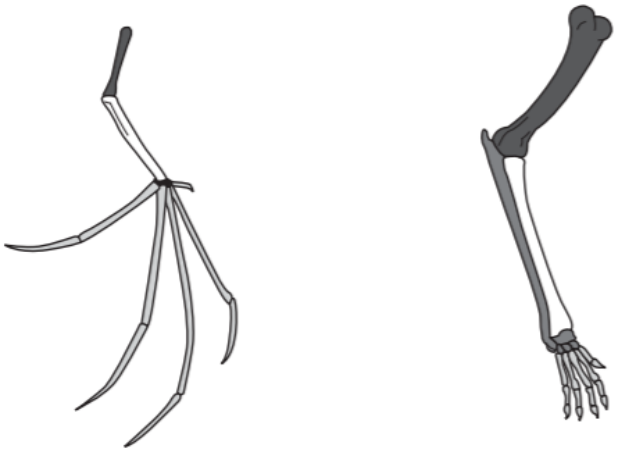
Context

- Additional Assessment Materials are being produced for GCSE, AS and A levels (with the exception of Art and Design).
- The Additional Assessment Materials presented in this booklet are an **optional** part of the range of evidence teachers may use when deciding on a candidate's grade.
- 2021 Additional Assessment Materials have been drawn from previous examination materials, namely past papers.
- Additional Assessment Materials have come from past papers both published (those materials available publicly) and unpublished (those currently under padlock to our centres) presented in a different format to allow teachers to adapt them for use with candidate.

Purpose

- The purpose of this resource to provide qualification-specific sets/groups of questions covering the knowledge, skills and understanding relevant to this Pearson qualification.
- This document should be used in conjunction with the mapping guidance which will map content and/or skills covered within each set of questions.
- These materials are only intended to support the summer 2021 series.

7 (a) Figure 13 shows the pentadactyl limb of a bat and a cat.



bat cat

Figure 13

(i) Describe the reasons why the anatomy of the pentadactyl limb suggests that bats and cats evolved from a common ancestor.

(2)

The pentadactyl limb of bats and cats have the same bone structure. Bat and cat both have 5 fingers. These shared features are likely to be inherited from their common ancestor which also has the same basic bone structure.

(ii) Genetic analysis also provides evidence for evolution.

Scientists can sequence genes from different organisms.

Describe how this type of genetic analysis provides evidence for evolution.

(2)

The gene sequence of different organisms can be compared. Organisms which are more closely related have more similar sequences.

9 (a) Yeast cells can be genetically modified to produce a painkiller.

This painkiller is usually obtained from opium poppies.

One method for genetically modifying a yeast cell uses a plasmid containing the desired gene.

(i) Explain how a gene can be inserted into a plasmid.

(2)

Restriction enzymes are used to isolate the required gene by cutting the DNA at a specific sequence and leaving sticky ends. The same restriction enzyme is used to cut the plasmid to give complementary sticky ends. DNA ligase is used to join the plasmid and the gene, and the plasmid is inserted back into the yeast cell.

(ii) Discuss the possible benefits and risks of producing painkillers from genetically modified yeast cells rather than extracting the painkillers from poppies.

(3)

It is cheaper and faster to produce painkillers from genetically modified yeast cells. However, the painkillers might not be as effective or have other side effects.

3 (b) Colistin is an antibiotic used to treat infections in the bloodstream.

Some bacteria are resistant to Colistin.

Explain how these bacteria have become resistant to Colistin.

(4)

Some bacteria are more resistant to Colistin due to natural variation or mutation. The bacteria which are resistant are more likely to survive and reproduce to form a colony with identical characteristics, which are also resistant to Colistin.

5 (a) Organisms can be classified by the five kingdom or three domain method.

(i) What is the name of the domain that plants belong to?

(1)

☒ **A** Eukarya

☐ **B** Archaea

☐ **C** Monera

☐ **D** Protista

(ii) Plant cells contain chloroplasts.

What happens in a chloroplast?

(1)

☒	**A**	oxygen produced	sunlight absorbed by chlorophyll
☐	**B**	carbon dioxide produced	sunlight absorbed by mitochondria
☐	**C**	oxygen produced	sunlight absorbed by mitochondria
☐	**D**	carbon dioxide produced	sunlight absorbed by chlorophyll

(iii) Give a reason why the three domain method of classification has been suggested.

(1)

New evidence shows the fundamental differences between the three domains.

(c) Figure 8 shows a plasmid containing the human insulin gene.

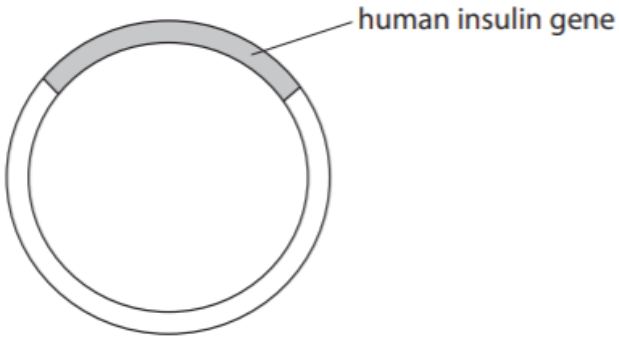


Figure 8

Explain how the human insulin gene can be inserted into a plasmid.

(3)

A restriction enzyme is used to cut the human insulin gene, giving sticky ends. The same restriction enzyme is used to cut the plasmid to give complementary sticky ends. DNA ligase is used to join the sticky ends of the plasmid and insulin gene.

5 (b) Scientists think that great tits living now have longer beaks because of the increased use of bird feeders during the last 50 years.

Explain how natural selection could have caused an increase in beak length because of the use of bird feeders.

(4)

Birds with longer beaks have an advantage as they can eat from the bird feeders easily. Birds with long beaks are more likely to survive and reproduce. Their offsprings are likely to have long beaks. Over time, the allele frequency in the population increases and more birds will have longer beaks.

(c) Birds are classified in the domain Eukarya.

(i) Why are the cells from birds described as eukaryotic?

(1)

- ☒ **A** they have membrane-bound organelles
- ☐ **B** they do not have nuclei
- ☐ **C** they have a rigid cell wall
- ☐ **D** they have a cell membrane

(ii) Give **one** reason why the three domain classification system was proposed.

(1)

New evidence shows the fundamental differences between the three domains.

(b) Some bacteria contain a gene that produces a toxin that can kill insects.

This gene can be inserted into the genome of a crop plant.

(i) What method is used to insert the gene from the bacteria into the crop plant?

(1)

☒ **A** selective breeding

☒ **B** asexual reproduction

☒ **C** genetic engineering

☒ **D** tissue culture

*(ii) Discuss the advantages and disadvantages of growing crop plants that produce a toxin that can kill insects.

(6)

Growing crop plants which can produce toxins to kill insects can improve the yield of crops and raise the farmer's income. Insecticides do not have to be used, and this reduces soil pollution and prevents insects from developing resistance as well as prevents harming other organisms. However, genetically modified crops can be more costly to grow and there might be health hazards when consumed. (e.g. allergic reaction) Over time, insects might develop resistance towards the toxin produced by the crop.

TOTAL = 33 MARKS