A-Level Edexcel

BIOLOGY

UNIT 4(IAL)

2015 — 2019

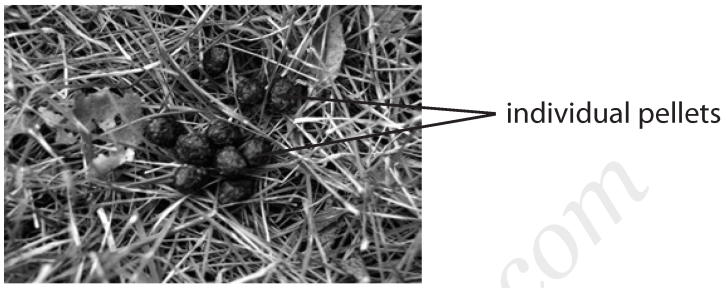
1 - (BI0-S 2016-Unit 4(IAL)-Q8) - *Molecules, Transport and Health, Energy Flow, Ecosystems and the Environment*

Mountain hares are small mammals that eat a number of species of plants.

The habitats of hares can be identified by looking for grazed plants and pellets left at feeding sites.

Pellets are small round droppings that contain undigested cellulose, left at feeding sites by mountain hares.

The photograph below shows some pellets.



Magnification ×1

(a) Describe the structure of a cellulose molecule.

(3)

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(b) The presence of pellets in five habitats was investigated.

The table below shows the results of this investigation.

Habitat	Percentage of quadrats containing pellets (%)
Young heather	84
Old heather	20
Wavy hair grass	50
Bilberry	30
Mat grass	20

*(i) Describe how an investigation could be carried out to collect the data shown in this table.

(5)

(ii) State **two** conclusions that can be made from the results of this investigation.

(2)

(iii) Suggest the limitations of using the percentage of quadrats containing pellets as an indication of the food preferences of mountain hares.

(3)

2 - (BI0-S 2015-Unit 4(IAL)-Q4) - *Membranes, Proteins, DNA and Gene Expression*

Evolution can come about as a result of a change in the structure of DNA.

(a) The questions below refer to the structure of DNA.

(i) Put a cross ☒ in the box next to the term that completes the following statement.

Each DNA strand consists of mononucleotides joined together by bonds between

(1)

☒ **A** one deoxyribose sugar and one phosphate group

☒ **B** one ribose sugar and one phosphate group

☒ **C** two bases

☒ **D** two pentose sugars

(ii) Put a cross ☒ in the box next to the term that completes the following statement.

The mononucleotides in one DNA strand are joined together by

(1)

☒ **A** glycosidic bonds

☒ **B** hydrogen bonds

☒ **C** peptide bonds

☒ **D** phosphodiester bonds

(iii) The table below shows the percentages of bases in a sample of DNA.

Put **one** cross ☒ in the appropriate box, in each row, to show the percentage of bases in a sample of DNA that has 33% thymine.

(3)

Base	0%	17%	33%	34%
Adenine	☒	☒	☒	☒
Cytosine	☒	☒	☒	☒
Uracil	☒	☒	☒	☒

(b) There are two species of rhinoceros in Africa. The white rhinoceros and the black rhinoceros evolved from a common ancestor.

The photographs below show a white rhinoceros and a black rhinoceros.

White rhinoceros

Black rhinoceros

The white rhinoceros feeds on grasses. It has a shoulder height of 1.5 m to 1.8 m and has broad flat lips.

The black rhinoceros eats the leaves of shrubs. It has a shoulder height of 1.4 m to 1.7 m and has a pointed mouth.

(i) Calculate how many times bigger the white rhinoceros is than the black rhinoceros.

(2)

Answer .....

(ii) Suggest how these two species of rhinoceros evolved from their common ancestor.

(4)

(iii) Suggest why both species of rhinoceros can be found in the same region in Africa.

(2)

3 - (BI0-W 2015-Unit 4(IAL)-Q2) - *Membranes, Proteins, DNA and Gene Expression*

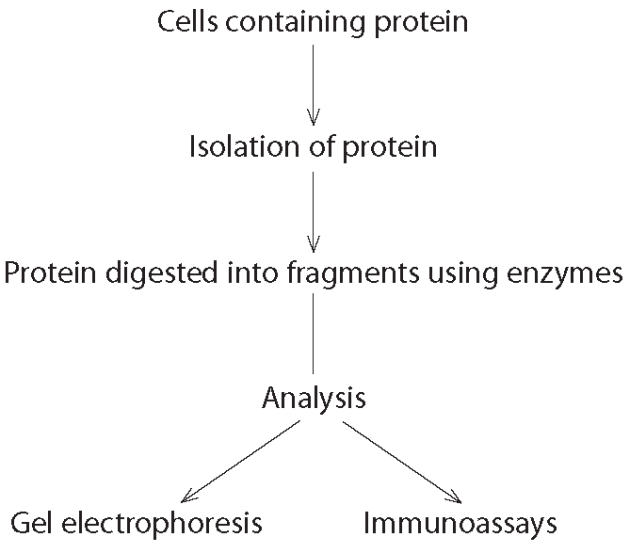
Proteomics can be used to study gene expression and to analyse the structure of proteins.

(a) Describe the structure of proteins.

(4)

(b) The diagram below shows some of the steps involved in proteomics.

The analysis uses gel electrophoresis and immunoassays. Immunoassays identify protein fragments using antibodies.



(i) Enzymes can be used to produce protein fragments from the isolated protein.

Put a cross ☒ in the box next to the description that completes the following statement.

Enzymes are

(1)

☒ **A** fibrous proteins that decrease activation energy

☒ **B** fibrous proteins that increase activation energy

☒ **C** globular proteins that decrease activation energy

☒ **D** globular proteins that increase activation energy

(ii) Put a cross ☒ in the box next to the term that completes the following statement.

Enzymes digest proteins into fragments using

(1)

☒ **A** condensation reactions

☒ **B** esterification reactions

☒ **C** hydrolysis reactions

☒ **D** polymerisation reactions

(iii) Using your knowledge of gel electrophoresis in the analysis of DNA, suggest how gel electrophoresis could be used to analyse the protein.

(3)

(iv) Immunoassays use antibodies to identify the protein fragments.

Suggest why antibodies are suitable molecules for identifying protein fragments.

(2)

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(c) Gene expression can be analysed by isolating and studying mRNA.

However, the structure and number of mRNA molecules do not always correspond to the proteins in the cell.

Suggest why the mRNA molecules do not always correspond to the proteins in the cell.

(2)

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