

Past-paper walk-through

Chromosomes, genes and proteins ■ 17.1

eXercise

Questions in this set

- 0610/22 N25 Q30 ■ 1 mark
- 0610/22 N25 Q31 ■ 1 mark
- 0610/41 N25 Q6 ■ 5 marks
- 0610/23 J25 Q4 ■ 1 mark
- 0610/41 J25 Q5 ■ 12 marks
- 0610/22 M25 Q29 ■ 1 mark

Reading the mark scheme

- **B1** a mark that stands on its own – the point is either made or not.
- **M1** a *method* mark: the right approach, even if the number is wrong.
- **A1** an *answer* mark, and it usually needs its M mark first.
- **C1** a working mark on the way to the answer.
- **//** separates answers the examiner accepts equally.
- **ecf** = error carried forward: a later part is marked on your own earlier answer.
- **owtte** = “or words to that effect” – the wording need not match.

Question 30

0610/22 N25 ■ Q30 ■ 1 mark

- 30** Why are lymphocytes the only cells that produce antibody proteins?
- A** Lymphocytes express all the genes in the nucleus.
 - B** Lymphocytes have twice as many genes as other cells.
 - C** Other cells do **not** have the genes for antibodies.
 - D** The genes for antibodies are only expressed in lymphocytes.

Solution 30

Answer: **D**

Why

- Every cell has the same genes, so having more genes is not the reason.
- What differs is which genes are *expressed* – switched on.
- Only lymphocytes express the antibody genes, so only they make antibody protein.

Question 31

0610/22 N25 ■ Q31 ■ 1 mark

31 During protein synthesis, what is the function of the ribosome?

- A** It assembles amino acids in a chain.
- B** It carries a copy of a gene to the cytoplasm.
- C** It contains the code for the synthesis of a protein.
- D** It determines the order of bases in the protein.

Solution 31

Answer: **A**

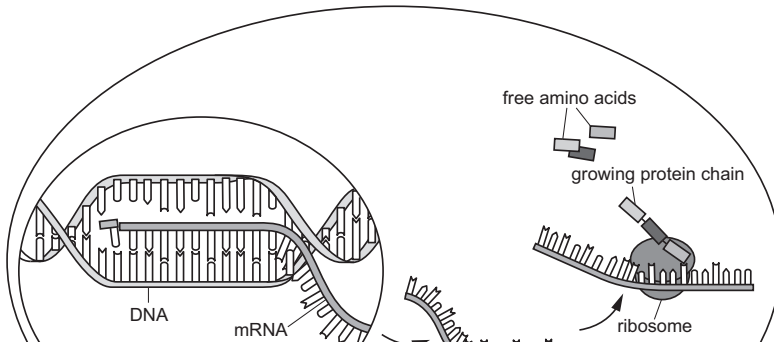
Why

- The mRNA carries the copy of the gene from the nucleus.
- tRNA brings the amino acids to the ribosome.
- The ribosome is where those amino acids are joined into a chain in the order the mRNA specifies.

Question 6

0610/41 N25 ■ Q6 ■ 5 marks

6 Fig. 6.1 is a diagram of a cell that shows how DNA is involved in protein synthesis.



Question 6

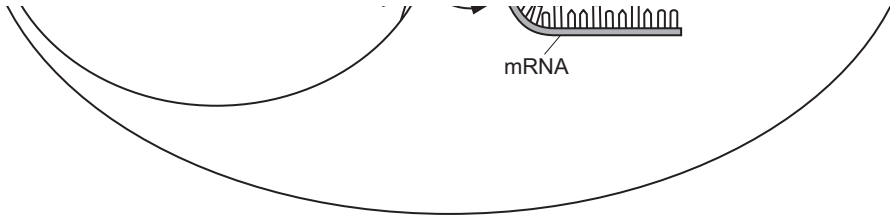


Fig. 6.1

- (a) State the name of the part of the cell that contains DNA.

Question 6

(b) DNA controls cell function by controlling the production of proteins.

State the name of **one** type of protein.

Question 6

(c) Using Fig. 6.1, explain how mRNA is involved in protein synthesis.

Question 6

[Total: 5]

Solution 6

(a)

Mark scheme

- nucleus ;
- 1

Solution 6

(b) Mark scheme

- any one from:
- enzymes ;
- membrane carriers ;
- receptors for neurotransmitters ;
- AVP ;
- 1
- e.g. insulin / glucagon / antibodies / keratin
- / haemoglobin

Solution 6

(c) Mark scheme

- any three from:
- (mRNA) is a copy of the gene / DNA / base sequence ;
- gene / DNA, remains in the nucleus ;
- (mRNA takes instructions) to cytoplasm / ribosome ;
- mRNA, passes through / attaches to / 'read by', ribosome ;
- base sequence determines sequence of amino acids (in the protein) ;
- 3

Question 4

0610/23 J25 ■ Q4 ■ 1 mark

- 4** In a DNA molecule, bonds between pairs of bases hold two strands together. High temperatures can break these bonds to form two single strands of DNA.

The base pair C and G is held together more strongly than the base pair A and T.

Two DNA molecules containing the same number of bases were studied.

- In DNA molecule 1, 20% of bases are T.
- In DNA molecule 2, 20% of bases are C.

Which DNA molecule would require the lowest temperature to break into single strands?

- A** DNA molecule 1, because there are more A bases present.
- B** DNA molecule 1, because there are more G bases present.

Question 4

- C** DNA molecule 2, because there are more A bases present.
- D** DNA molecule 2, because there are more G bases present.

Solution 4

Answer: **C**

Why

- A–T pairs are held by two hydrogen bonds; C–G pairs by three.
- More bonds take more energy to break.
- So a DNA molecule richer in C–G needs a higher temperature to separate its strands.

Question 5

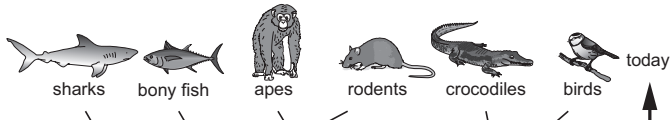
0610/41 J25 ■ Q5 ■ 12 marks

- 5 (a) Organisms can be classified by their features and by studying the sequence of bases in their DNA.

Fig. 5.1 is a diagram showing the evolutionary relationships between some different groups of organisms.

Each branch shows the point at which organisms developed new features that classify them as a new group.

The point where the branch starts also indicates a common ancestor shared by the new groups.



Question 5

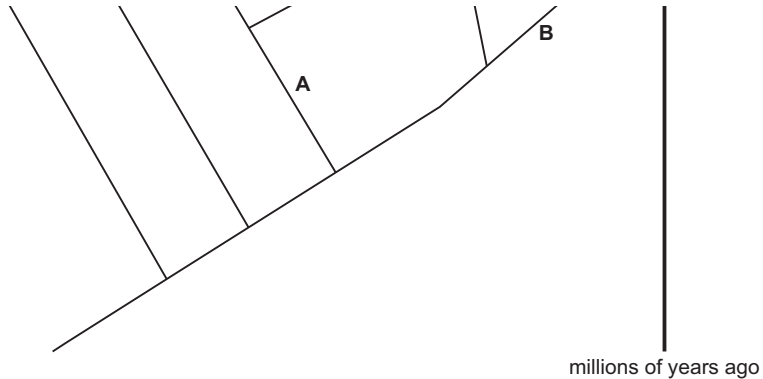


Fig. 5.1

- (i) Suggest which visible features have developed at **A** and **B** in Fig. 5.1.

Question 5

Question 5

Question 5

[2]

- (ii) Identify the names of the **two** groups that share the most recent common ancestor in Fig. 5.1.

Question 5

- (iii) Suggest the groups with the most similar and least similar DNA base sequences to crocodiles in Fig. 5.1.

Question 5

Question 5

[2]

(b) Describe the structure of a DNA molecule.

Question 5

(c) Outline how the base sequences in DNA control cell function.

Question 5

[Total: 12]

Solution 5

(a)(i)

Mark scheme

- A - hair / external ears ;
- B – wings / feathers ;
- 2

Solution 5

(a)(ii)

Mark scheme

- apes and rodents ;
- 1

Solution 5

(a)(iii)

Mark scheme

- most similar – birds ;
- least similar – sharks ;
- 2

Solution 5

(b) Mark scheme

- any four from:
 - 1
 - ref. to two strands / chains ;
 - 2
 - double helix ;
 - 3
 - ref. to four bases / A, T, C, G ;
 - 4

Solution 5

- A pairs with T and C pairs with G ;
- 5
- ref. to bonds between bases ;
- 4 A annotated diagram
- 0610/41
- May/June 2025
- Guidance

Solution 5

(c) Mark scheme

- any three from:
- (base sequences of DNA / mRNA) determine sequence of amino acids ;
- amino acids form proteins / protein synthesis / production of proteins ;
- named example of protein ;
- ref. to sequence of amino acids determining protein shape ;
- 3
- e.g. enzymes / neurotransmitters
- Guidance

Question 29

0610/22 M25 ■ Q29 ■ 1 mark

29 Which term is defined as a length of DNA that codes for a protein?

- A** amino acid
- B** chromosome
- C** gene
- D** mutation

Solution 29

Answer: **C**

Why

- A gene is a length of DNA that codes for one protein.
- A chromosome is a whole DNA molecule carrying many genes.
- An amino acid is a building block of protein, and a mutation is a change in the DNA.