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**OXFORD CAMBRIDGE AND RSA EXAMINATIONS
ADVANCED SUBSIDIARY GCE**

F212

BIOLOGY

Molecules, Biodiversity, Food and Health

TUESDAY 18 JANUARY 2011: Afternoon

DURATION: 1 hour 45 minutes

SUITABLE FOR VISUALLY IMPAIRED CANDIDATES

Candidates answer on the question paper.

OCR SUPPLIED MATERIALS:

None

OTHER MATERIALS REQUIRED:

Electronic calculator


Ruler (cm/mm)

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes on the first page. Please write clearly and in capital letters.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. If additional space is required, you should use the lined pages at the end of this booklet. The question number(s) must be clearly shown.
- Answer ALL the questions.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is 100.
-  Where you see this icon you will be awarded marks for the quality of written communication in your answer.
- You may use an electronic calculator.
- You are advised to show all the steps in any calculations.

Answer ALL the questions.

1 The condition known as AIDS is widespread in some parts of the world.

(a) (i) Identify the infective agent that causes AIDS.

_____ [1]

(ii) The government has introduced needle exchange programmes for drug users.

Explain how this may help reduce the transmission of AIDS.

_____ [2]

(b) Fig. 1.1 shows a simplified diagram of the structure of the infective agent that causes the condition known as AIDS.

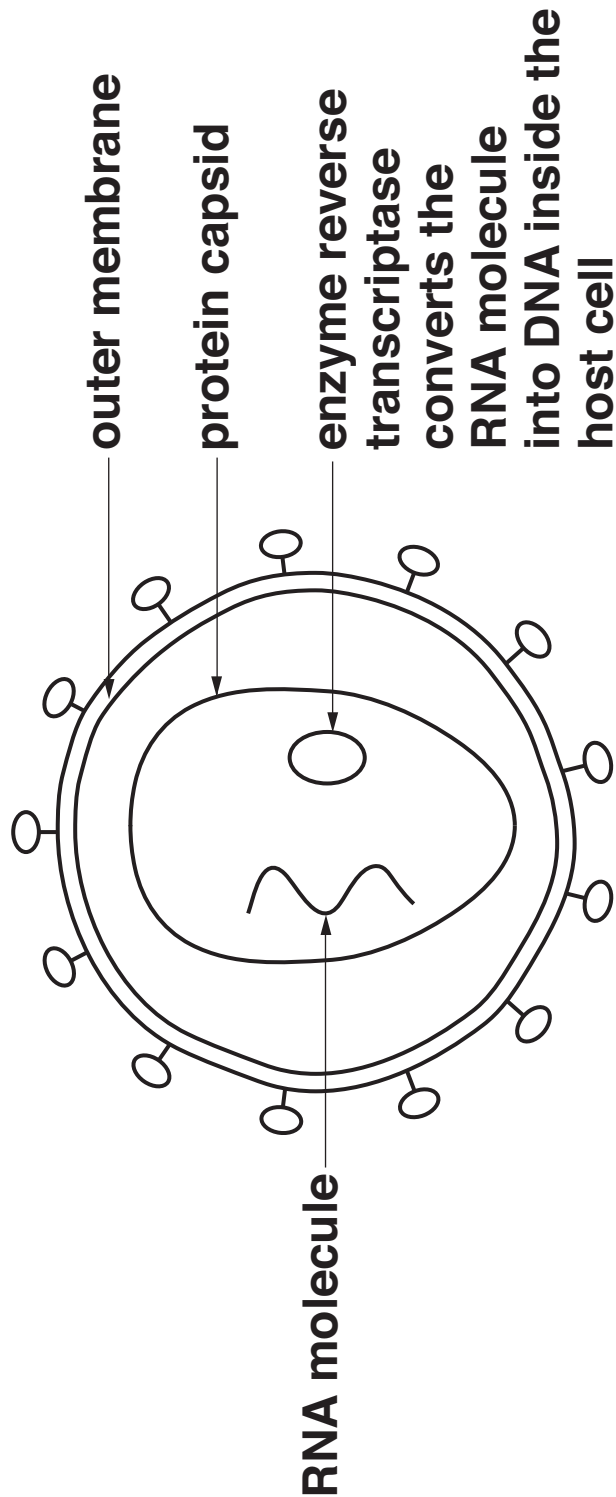


Fig. 1.1

- (i) The proteins in the capsid and the RNA molecules are polymers. Polymers are made up of smaller monomer subunits.**

Name the monomers that make up:

proteins _____

RNA _____ [2]

- (ii) The infective agent that causes AIDS takes control of the T lymphocytes of the host.**

Using the information in Fig. 1.1, suggest why the infective agent is able to 'take control' once it has entered the T lymphocytes.

_____ [2]

(c) People with AIDS frequently become ill following infection with opportunistic diseases such as tuberculosis (TB).

(i) State THREE factors that increase the chance of infection with TB.

1 _____

2 _____

3 _____ **[3]**

(ii) When an infection occurs, some T lymphocytes produce cell signalling molecules called cytokines. These cytokines stimulate specific groups of B lymphocytes to divide.

Describe how cytokine molecules can stimulate specific groups of B lymphocytes to divide.

_____ **[3]**

[Total: 13]

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QUESTION 2 STARTS ON PAGE 8

2 Fig. 2.1 shows part of an AMYLOSE molecule. This is an unbranched form of starch.

When iodine solution is added to starch, iodine fits into the helix of the amylose molecule, producing a colour change.

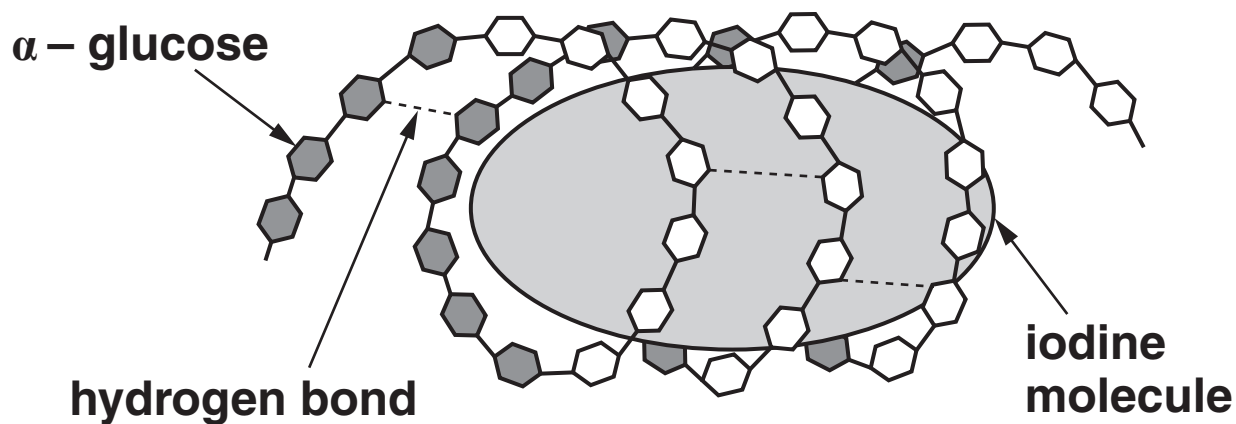


Fig. 2.1

(a) (i) State the colour of iodine solution in the presence of starch.

_____ [1]

(ii) Hydrogen bonds hold the amylose molecule in its helical shape.

Describe how a hydrogen bond is formed.

_____ [2]

(iii) Using the information in Fig. 2.1, suggest what would happen to the iodine-amylose complex if the solution was heated to 60 °C.

[2]

(c) Fig. 2.2 shows the results that the student obtained from a practical procedure in which the rate of formation of maltose was measured in the presence and absence of chloride ions.

concentration
of maltose (%)

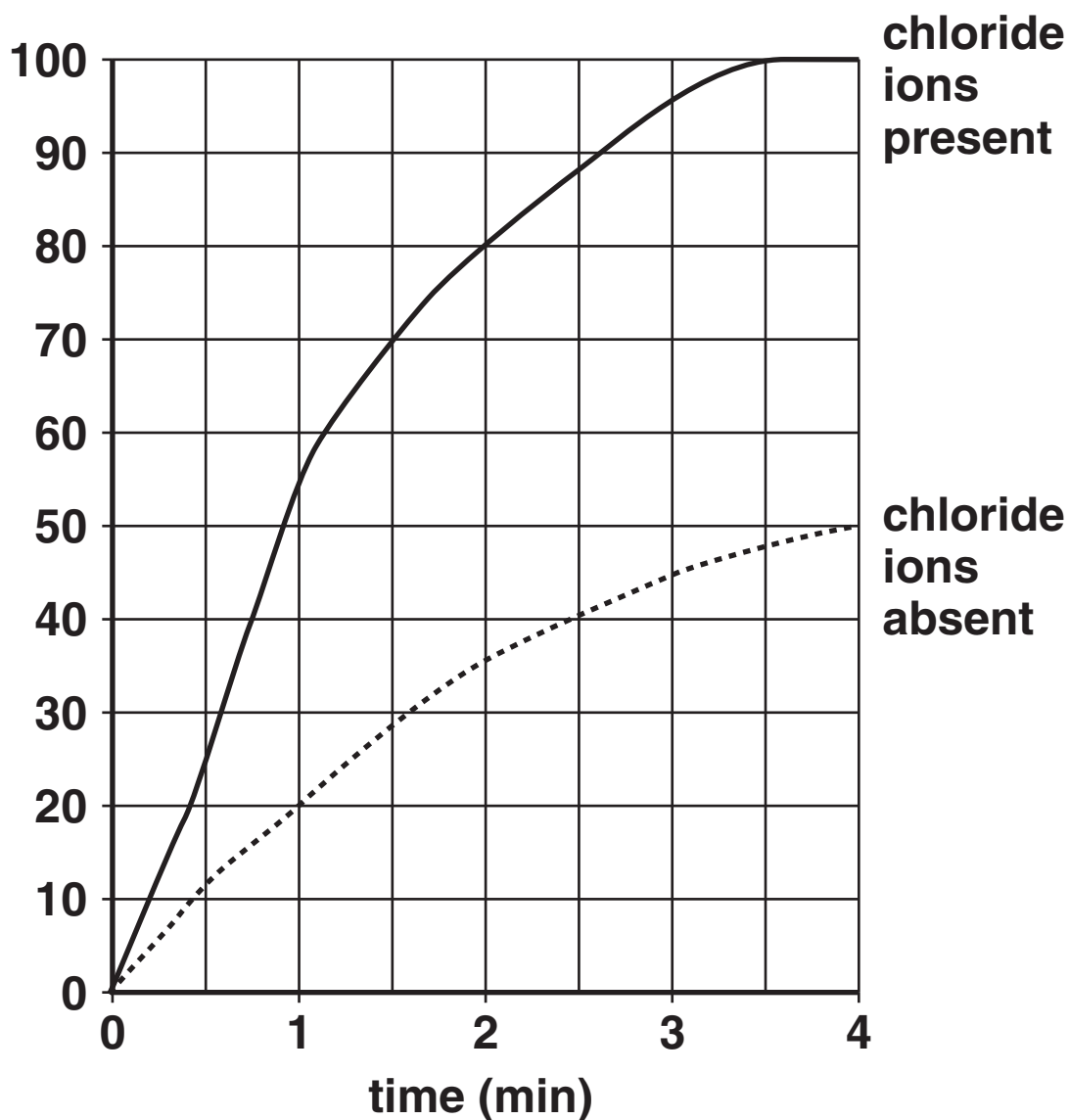


Fig. 2.2

(i) Describe the effect of chloride ions on the rate of reaction.

[2]

(ii) Suggest how chloride ions have this effect on the rate of reaction.

[2]

(iii) State THREE variables that need to be controlled in this practical procedure in order to produce valid results.

1 _____

2 _____

3 _____ [3]

[Total: 19]

- 3 Part of the Cairngorms National Park in the Scottish Highlands is at an altitude of approximately 1000 metres. It presently supports a range of plants and animals including some that are normally found in sub-arctic conditions.**

Table 3.1 shows the breeding success of a number of bird species between 1970 and 2000. Specialist sub-arctic species are marked with an asterisk *.

Table 3.1

species	number of young raised per year			
	1970	1980	1990	2000
snow bunting *	78	69	36	2
Lapland bunting *	7	3	0	0
ptarmigan *	1280	1134	960	876
red grouse	890	920	933	962
wheatear	209	240	190	231
meadow pipit	23	45	48	82
ring ouzel	23	21	29	26
dotterel *	45	43	39	35

*** = specialist sub-arctic species**

(b) A study of insects was carried out in the same area of the Cairngorms National Park to determine species richness.

(i) What is meant by species richness?

[1]

(ii) The insects were sampled using a sweep net method.

Fig. 3.1 shows a sweep net being used.

With this method, a net is swept through the vegetation. Insects are removed, identified and counted.

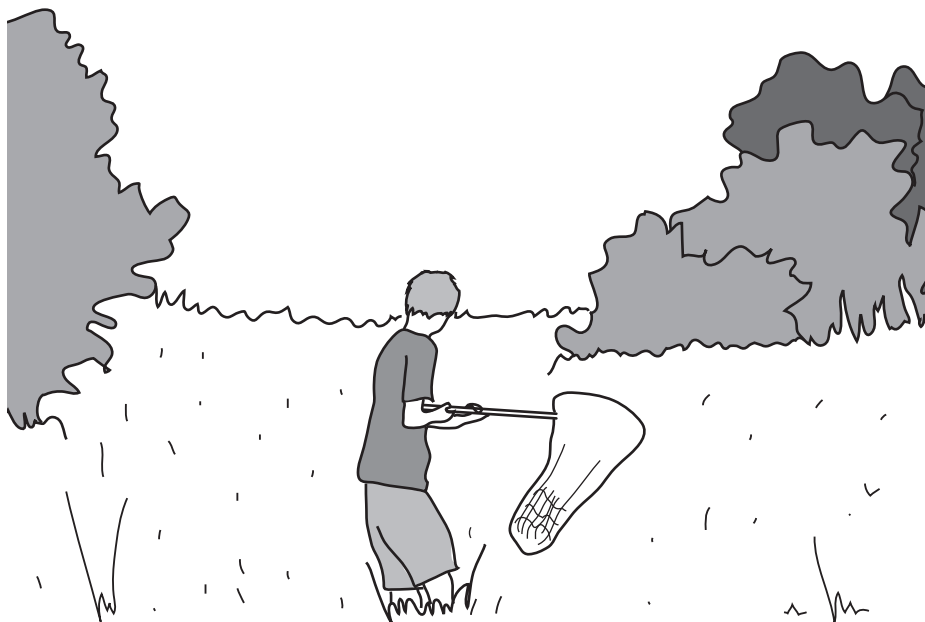


Fig. 3.1

Describe THREE ways in which the sampling procedure could be designed to try to make sure that a representative sample was obtained.

[3]

(iii) Species evenness also contributes to the measurement of biodiversity.

Explain the importance of species evenness in determining the biodiversity in a habitat.

[3]

[Total: 12]

- 4 (a) The World Health Organisation has promoted the concept of health.

What is meant by the term *health*?

[2]

- (b) The body has adaptations that provide it with a primary defence against the entry of pathogens and parasites.**

State TWO features of the body that form part of the primary defence.

For each feature, explain how it HELPS TO PREVENT THE ENTRY of pathogens and parasites into the body.

feature 1 _____

explanation _____

feature 2 _____

explanation _____

_____ **[4]**

(c) Fig. 4.1 shows the life cycle of the threadworm. This is a common parasite in young children.

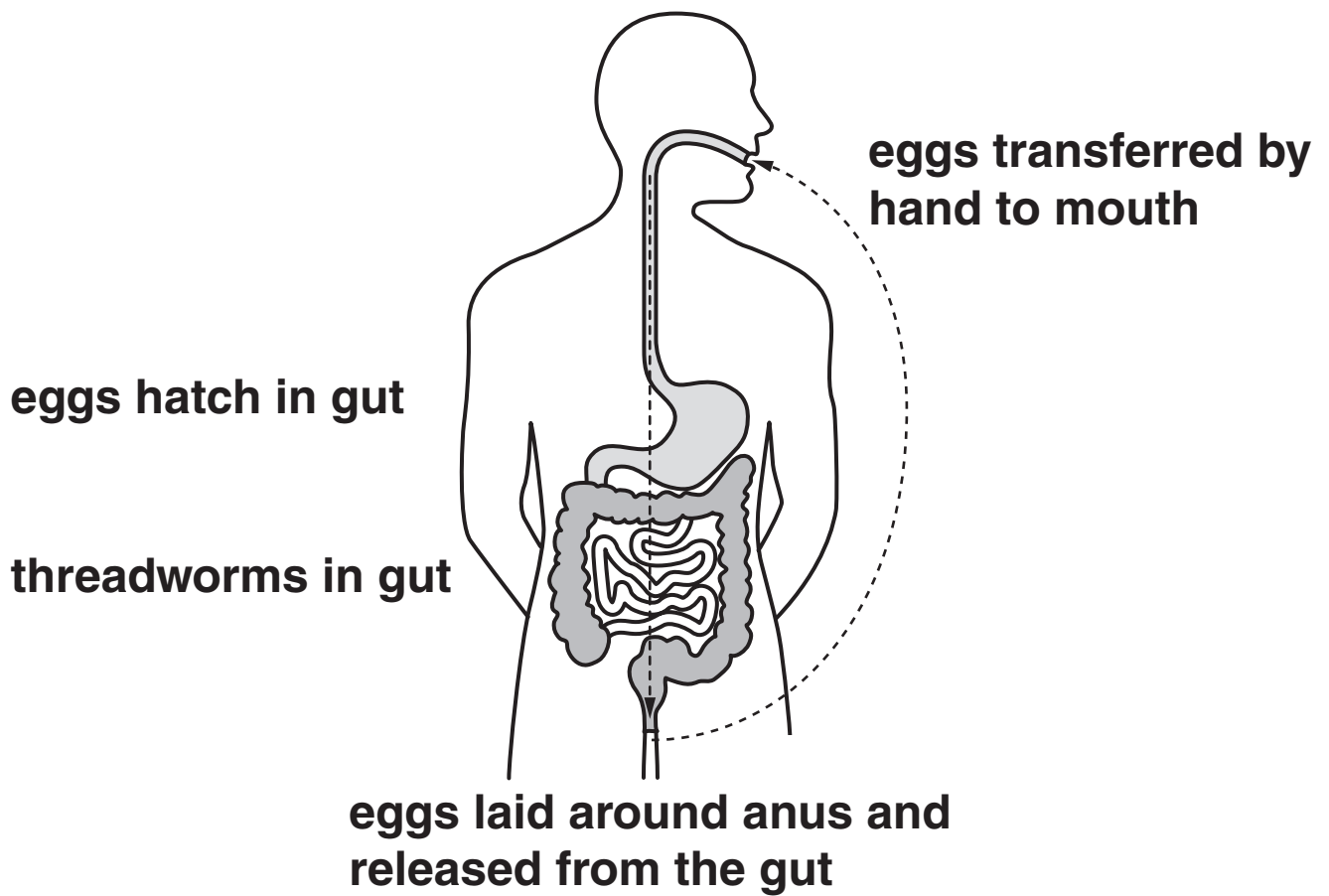


Fig. 4.1

5 DNA and RNA are nucleic acids.

(a) The table opposite contains a number of statements relating to nucleic acids.

Complete the table, using a letter D, R or B, to show whether each statement applies to:

- **DNA only (D)**
- **RNA only (R)**
- **both DNA and RNA (B).**

The first one has been done for you.

statement	DNA only (D) or RNA only (R) or both DNA and RNA (B)
contains thymine	D
contains ribose	
consists of two chains connected to each other with hydrogen bonds	
has a sugar-phosphate backbone	
has four different nitrogenous bases	
contains a pentose sugar	
is found in the nucleus and cytoplasm	

[6]

(b) It has been found that 98.4% of chimpanzee DNA is identical to that of a human.

(i) Suggest how the information obtained by DNA analysis can be useful to taxonomists.

[2]

(ii) State TWO types of evidence, other than biochemical evidence, that are used by taxonomists when classifying organisms.

[2]

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Q5(c) STARTS ON PAGE 26

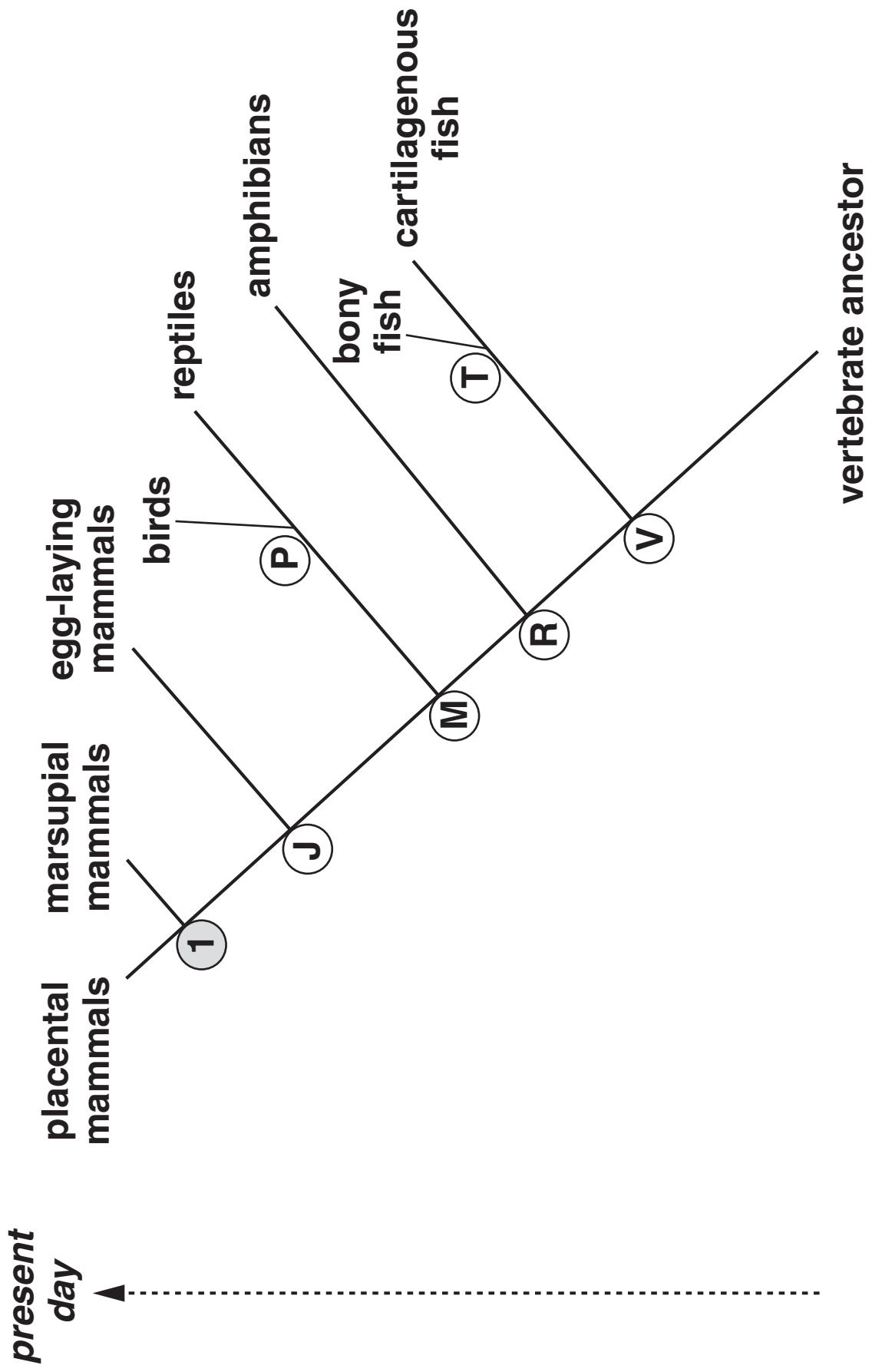


Fig. 5.1

- (c) Cytochrome C is a protein found in living organisms. The structure of cytochrome C varies between different organisms. However, closely related organisms have similar cytochrome C.**

Fig. 5.1 opposite shows a possible evolutionary tree for vertebrates.

Common ancestors are indicated by the number 1 and various letters.

State the LETTER of the common ancestor that has cytochrome C which will be:

MOST similar in structure to common ancestor 1

LEAST similar in structure to common ancestor 1

[2]

- (d) The pine marten is a small mammal that is rare in the United Kingdom. Its numbers are particularly low in Wales and there have been few confirmed sightings of this animal in the past 50 years. There have been plans to introduce pine martens from other areas of the United Kingdom into Wales to increase the size of the population.**

The DNA of museum specimens of Welsh pine martens in the National Museum of Wales was tested, the most recent specimens dating from 1948. The DNA analysis suggests that Welsh pine martens are genetically distinct from those found elsewhere in the United Kingdom.

- (i) The relevance of this analysis has been questioned by some scientists.**

Suggest why the findings from the museum specimens may not relate closely to the current pine marten population of the United Kingdom.

[1]

- (ii) Suggest why some people are concerned about the plan to introduce pine martens from other areas into Wales.**

[1]

[Total: 14]

QUESTION 6 STARTS ON PAGE 30

6 An important aspect of food production is maximising productivity. Maximum productivity can be achieved in a number of different ways.

(a) In selective breeding, humans look for variation between members of the same species and use this variation to improve productivity.

(i) State the TWO different causes of variation.

1 _____

2 _____ [2]

Fig. 6.1 is a scattergraph that shows the growth rate and egg productivity in a flock of chickens.

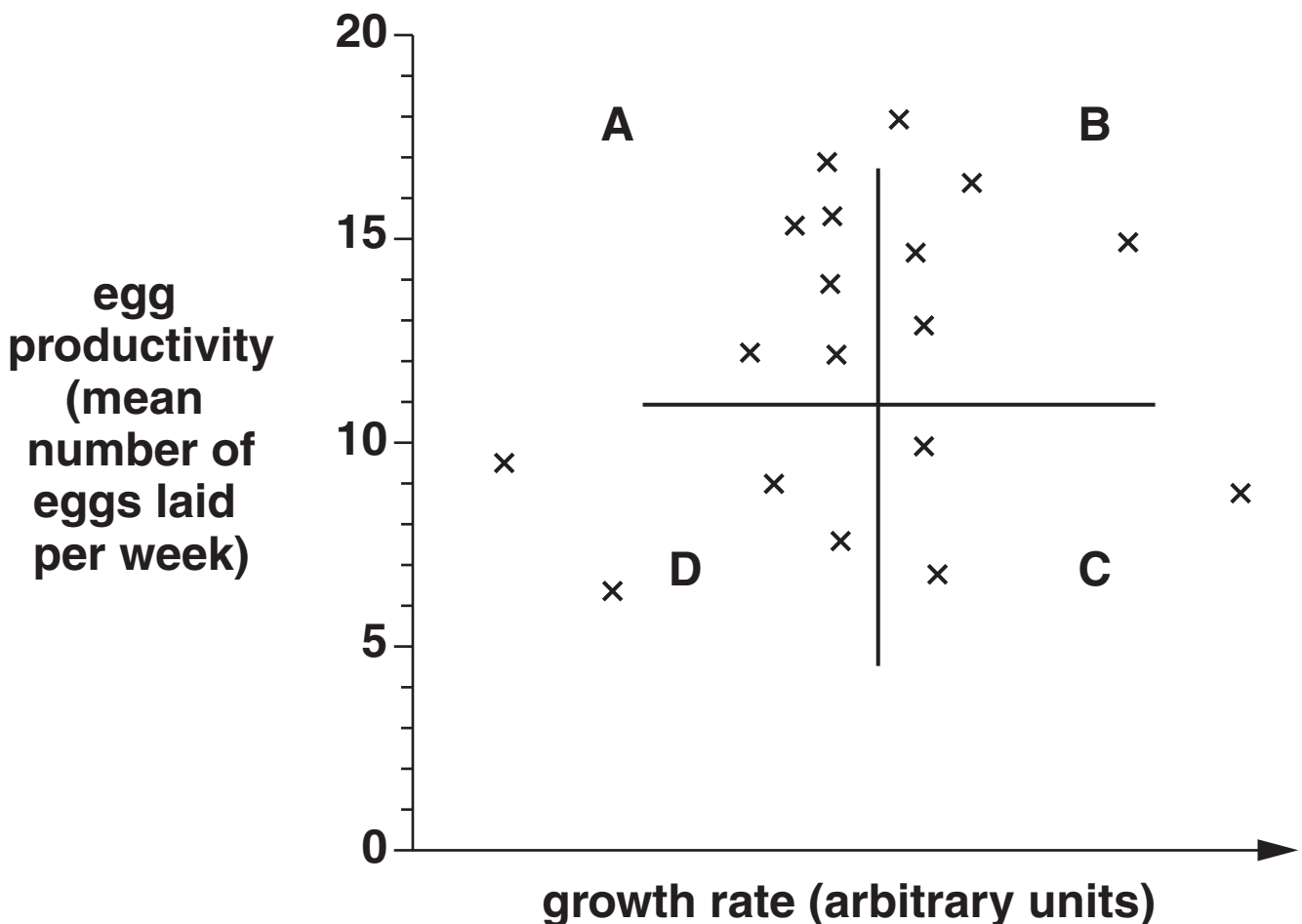


Fig. 6.1

- (ii) The growth rate of the chickens in Fig. 6.1 shows CONTINUOUS variation.**

Describe THREE characteristics of this type of variation.

[3]

- (iii) A chicken breeder divides the flock into four groups, A, B, C and D, as shown in Fig. 6.1.**

State which group of chickens, A, B, C or D, he should use to breed from in order to improve the growth and productivity of the flock.

[1]

(iv) Suggest TWO UNDESIRABLE consequences of selective breeding in chickens.

[2]

(v) The wild ancestor of the domestic chicken is the red jungle fowl found in the rainforests of South East Asia.

Explain why it is important to preserve the population of the red jungle fowl.

[2]

(b) In the past, domestic chickens were given antibiotics as a growth promoter.

(i) When antibiotic growth promoters were used, it was claimed that the meat was of better quality, with less fat and increased protein content.

Suggest TWO FURTHER benefits of using antibiotics.

1 _____

2 _____

_____ **[2]**

(ii) The use of antibiotics as growth promoters in animal production was banned in the European Union in 2006.

Suggest a concern that led to this ban.

_____ **[1]**

[Total: 13]

8 Complete the following passage by selecting the most suitable term from the list below.

Each term may be used once, more than once or not at all.

ANTIBIOTICS

NATURAL

ANTIBODIES

NON-SPECIFIC

ANTIBODY

SPECIFIC

ANTIGEN

VACCINATION

ARTIFICIAL

VACCINES

The body can acquire immunity in a number of different ways.

In passive immunity, _____ are introduced directly into the body. This may occur via breast milk or the placenta, in which case it is described as _____ immunity. This immunity provides the growing child with valuable protection until its immune system has developed fully. It is sometimes important to provide immediate protection, such as when a person has a wound that could be contaminated with tetanus bacteria.

In this case, suitable blood serum from another individual is injected into the bloodstream to provide _____ immunity.

Edward Jenner pioneered the technique of stimulating the immune system into action so that the body develops immunity without developing the symptoms of the disease. Jenner's technique mimics the way in which the body would develop _____ immunity from direct contact with the pathogen and the stimulation of the primary response. Nowadays, a harmless form of the _____ is injected so that the body develops antibodies and memory cells for future defence. This technique is known as _____ .

[6]

[Total: 6]

END OF QUESTION PAPER

