



National  
Qualifications  
2019

**X807/76/12**

**Biology**  
**Paper 1 — Multiple choice**

TUESDAY, 30 APRIL  
09:00 AM – 09:40 AM

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**Total marks — 25**

Attempt ALL questions.

**You may use a calculator.**

Instructions for the completion of Paper 1 are given on *page 02* of your answer booklet X807/76/02.

Record your answers on the answer grid on *page 03* of your answer booklet.

Space for rough work is provided at the end of this booklet.

Before leaving the examination room you must give your answer booklet to the Invigilator; if you do not, you may lose all the marks for this paper.



\* X 8 0 7 7 6 1 2 \*

**Total marks — 25**  
**Attempt ALL questions**

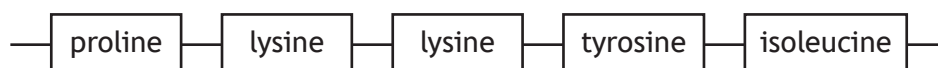
1. Embryonic stem cells can be used therapeutically to differentiate and replace any damaged or diseased tissue.

This is because they are

- A multipotent and specific genes are switched on
  - B pluripotent and all genes are switched on
  - C multipotent and specific genes can be switched on
  - D pluripotent and all genes can be switched on.
2. The table shows the anticodon sequence on tRNA molecules and the specific amino acid each carries.

Anticodon sequence	Amino acid
CCA	proline
AAG	lysine
UAU	tyrosine
AUU	isoleucine

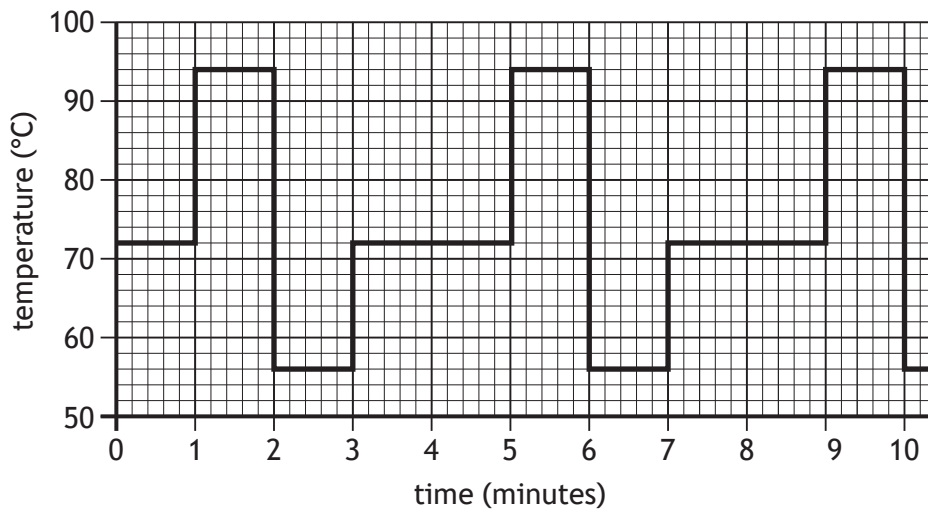
Part of the amino acid sequence of a protein is shown in the diagram.



Triplets of DNA nucleotides that code for the sequence of amino acids in this protein are

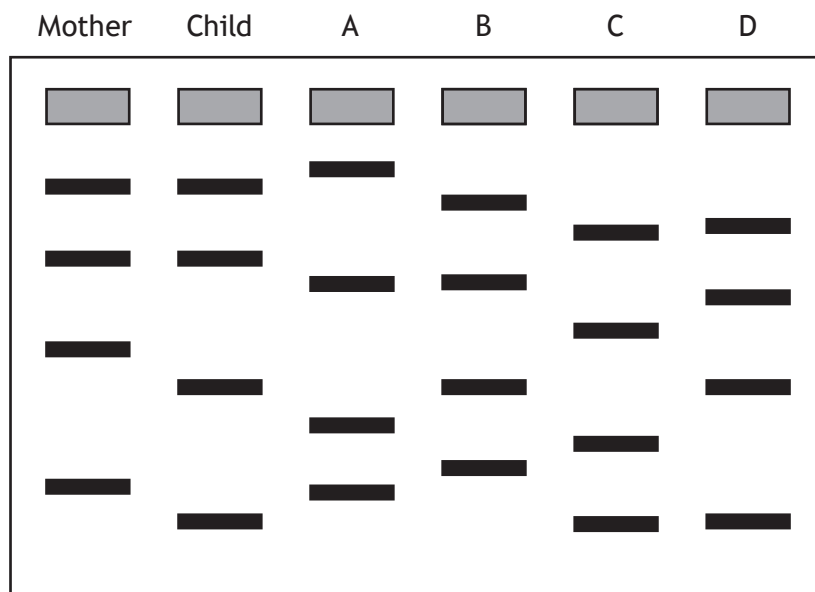
- A CCA UUC UUC AUA UAA
- B GGT TTC TTC ATA TAA
- C CCA AAG AAG TAT ATT
- D CCA AAG AAG UAU AUU.

3. The graph shows how temperature changes during repeated cycles of a polymerase chain reaction (PCR).

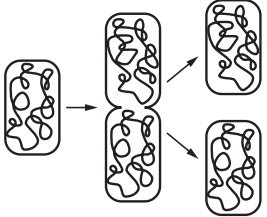
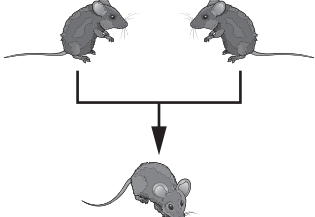
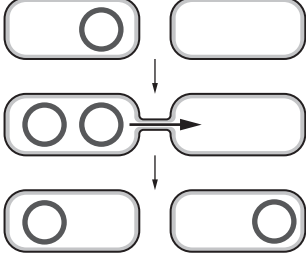


If there were 500 molecules of DNA at the start, predict how many copies there will be after 20 minutes.

- A 16 000
  - B 8000
  - C 2500
  - D 2000
4. DNA from a mother, child and four men (A, B, C and D) in a paternity suit was analysed. The DNA was amplified using PCR and separated by gel electrophoresis. From the results shown in the diagram, identify the likely father of the child.



5. The table shows three examples of gene transfer.

1	2	3
<b>Asexual reproduction by bacteria</b>	<b>Sexual reproduction by mice</b>	<b>Plasmid transfer by bacteria</b>
		

Which of these examples illustrate horizontal gene transfer?

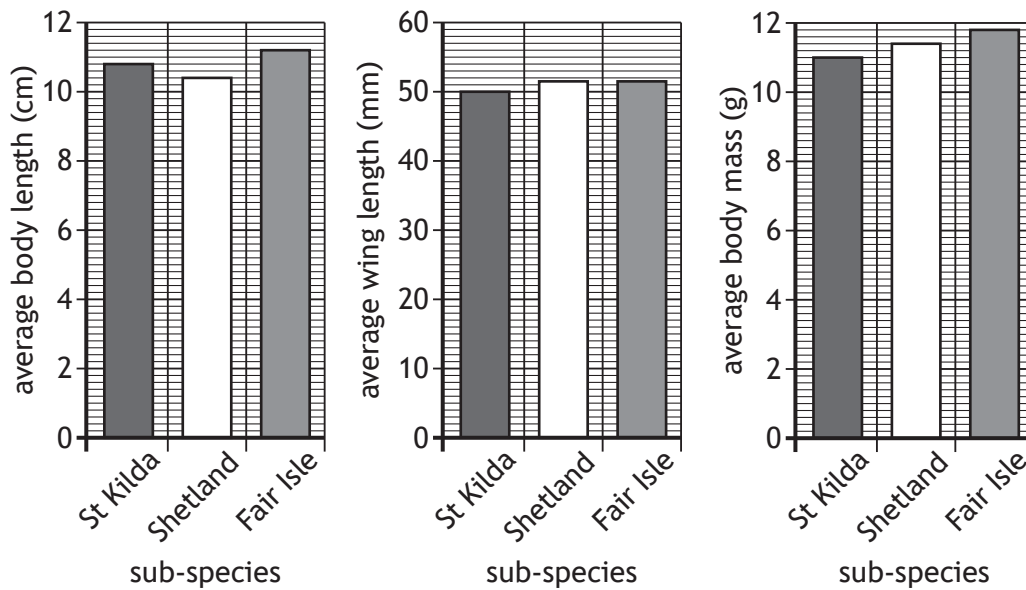
- A 2 only
  - B 3 only
  - C 1 and 2 only
  - D 1 and 3 only
6. Sickle cell anaemia is a human condition that affects haemoglobin, reducing the blood's ability to carry oxygen. It is caused by a mutation that changes one adenine base to thymine. This results in one amino acid in haemoglobin being changed.

The mutation that causes sickle cell anaemia is

- A deletion
- B insertion
- C substitution
- D translocation.

7. Subspecies of the wren (*Troglodytes troglodytes*) have evolved in different island areas in Scotland.

The graphs show averages of body length, wing length and body mass for wrens from the islands of St Kilda, Shetland and Fair Isle.



Which of the following conclusions can be drawn from this data?

- A Shetland and Fair Isle wrens have a greater average wing length and body mass than St Kilda wrens
- B St Kilda and Fair Isle wrens have a greater average body length and wing length than Shetland wrens
- C St Kilda wrens are smaller in each characteristic than the other two subspecies
- D Fair Isle wrens are larger in each characteristic than the other two subspecies

[Turn over

8. Goldenrod gall flies (*Eurosta solidaginis*) lay eggs on the stems of several plant species. The newly hatched larvae then burrow into the plant, causing the growth of a mass of plant tissue (gall) around them. The larvae live and feed inside the gall.

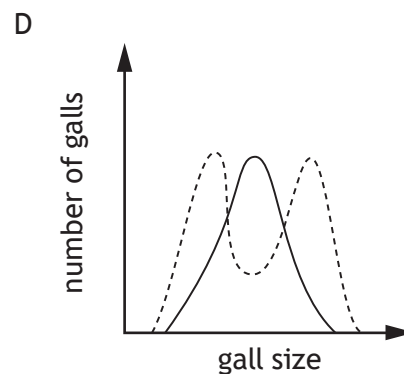
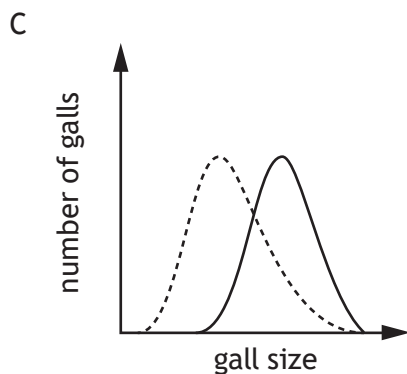
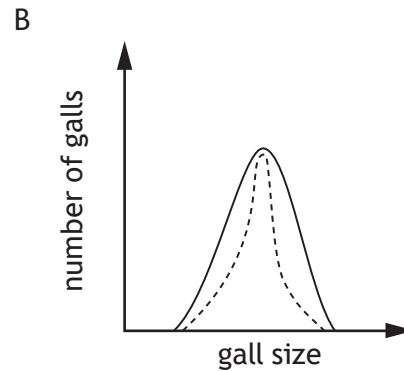
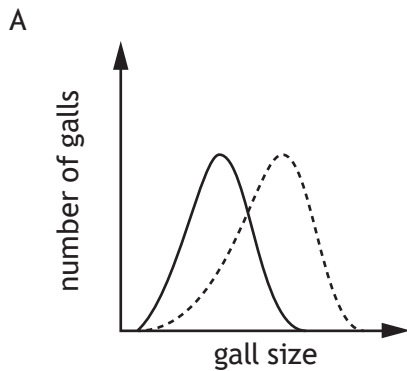
The size of gall is affected by two different selection pressures. Larvae in smaller galls are more likely to be predated by wasps, while larvae in larger galls are more likely to be predated by birds.

Which diagram represents the type of selection affecting gall size?

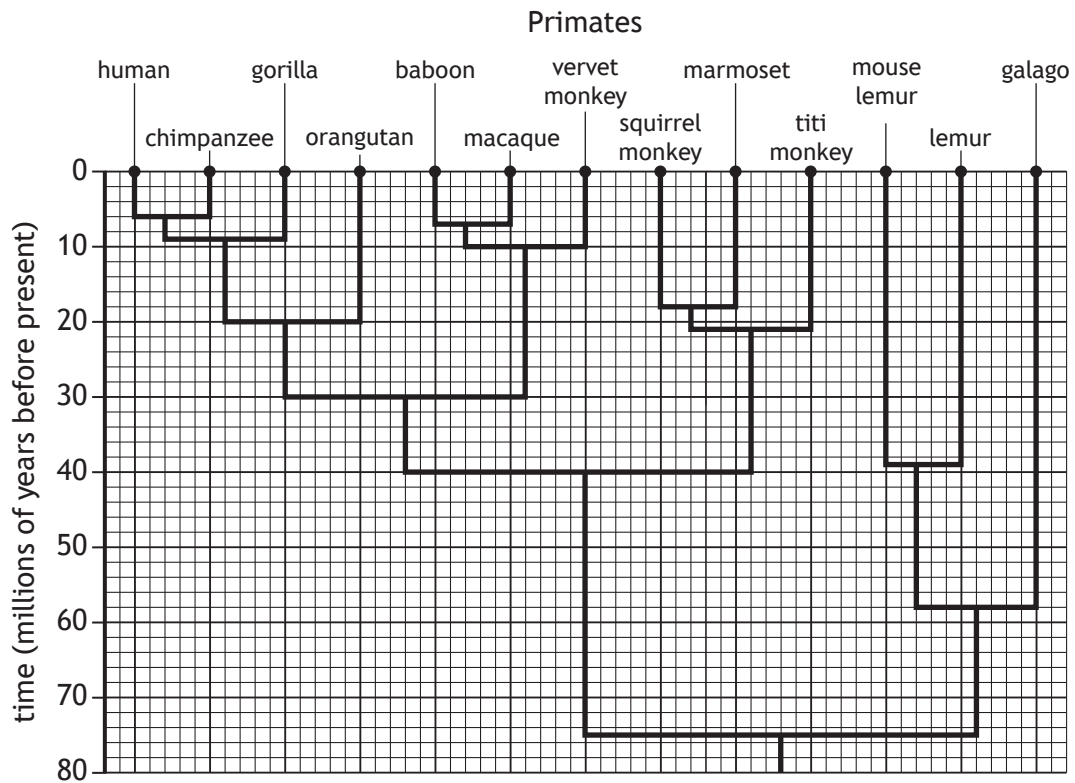
Key

———— original population

..... population after selection



9. The diagram shows the divergence of lineages in the evolution of some primates.

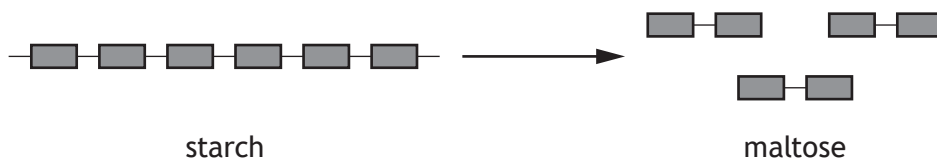


Which row in the table identifies the time that the last common ancestor of vervet monkeys and humans existed, and the number of other species that shared this common ancestor?

	Time (millions of years before present)	Number of other species that shared this common ancestor
A	30	5
B	30	11
C	40	8
D	75	11

[Turn over

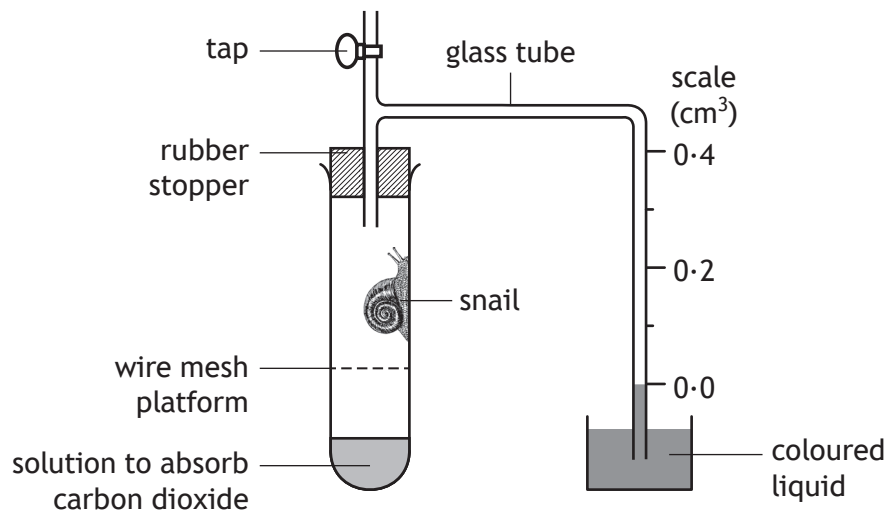
10. The diagram represents the conversion of starch into maltose.



Which row in the table identifies the type of reaction shown in the diagram and whether it requires or releases energy?

	Type of reaction	Energy required or released
A	catabolic	required
B	catabolic	released
C	anabolic	required
D	anabolic	released

11. The effect of temperature on the metabolic rate of a snail was investigated using the respirometer shown.



The experiment was carried out at 10°C, 15°C, 20°C and 25°C. At each temperature, the tap was left open for 15 minutes then closed and readings were taken from the scale every 2 minutes.

Identify how the dependent variable was measured.

- A Temperature change
  - B Heat production
  - C Oxygen consumption
  - D Carbon dioxide production
12. Which row in the table identifies the temperature monitoring centre, and the location of an effector in thermoregulation in mammals?

	Temperature monitoring centre	Location of effector
A	hypothalamus	nerves
B	skin	hypothalamus
C	hypothalamus	skin
D	nerves	hypothalamus

[Turn over

13. The Gila monster (*Heloderma suspectum*) is a species of lizard that lives in North America. Its internal temperature is dependent on the environmental temperature.

Which row in the table identifies the metabolic cost to and the range of ecological niches of the Gila monster?

	Metabolic cost	Range of ecological niches
A	low	narrow
B	high	narrow
C	low	wide
D	high	wide

14. Which statement describes an event that occurs during the lag phase of microbial growth?

- A Secondary metabolites are produced
- B Certain enzymes are induced
- C Most rapid growth occurs due to plentiful nutrients
- D The culture medium becomes depleted of nutrients

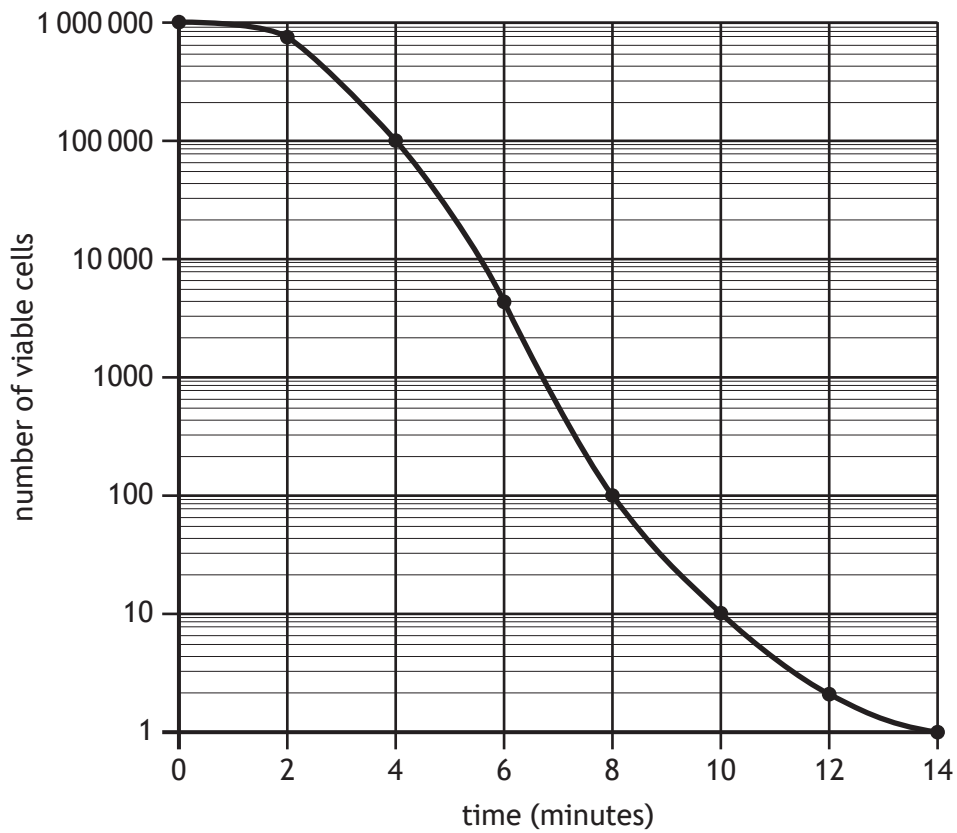
15. Using recombinant DNA technology, a culture of the bacteria species *Micrococcus luteus* was genetically modified with a plasmid containing a gene for a human protein. The protein was synthesised by the genetically modified bacteria, but it failed to fold correctly.

Which of the following changes to this procedure may lead to a correctly folded protein being produced?

- A Use a different species of bacteria
- B Use yeast cells rather than bacteria
- C Insert an artificial chromosome instead of a plasmid
- D Insert a regulatory sequence into the plasmid

16. Bacterial cells were exposed to disinfectant for 14 minutes. Every 2 minutes a sample was taken and the number of viable cells counted.

The results are shown in the graph.



Calculate the percentage decrease in viable cells after being exposed to disinfectant for 6 minutes.

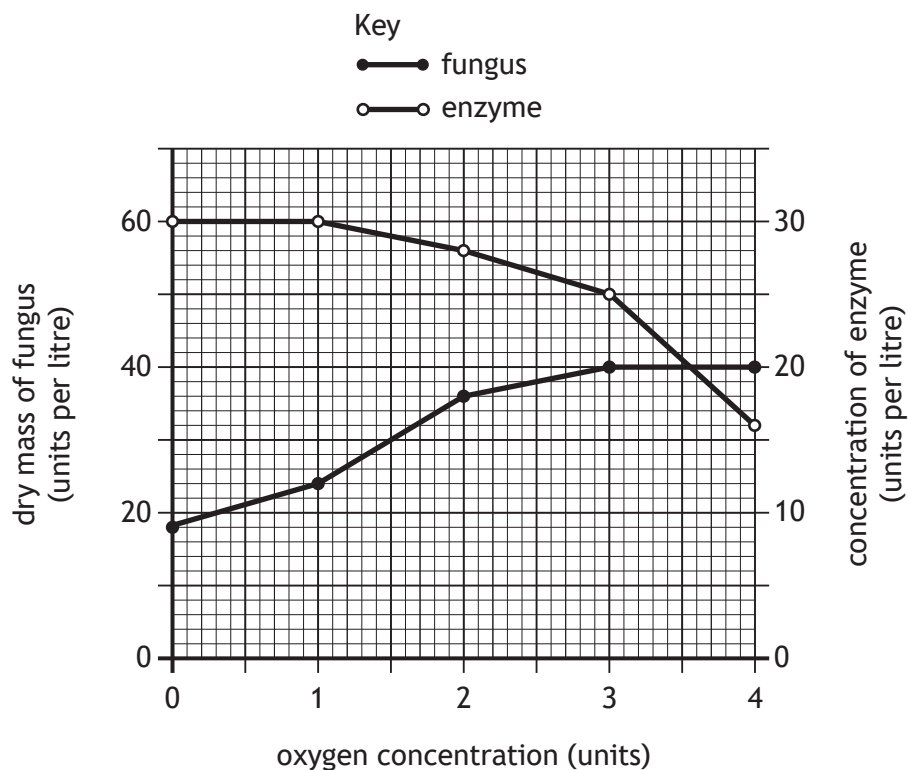
- A 99.60
- B 99.87
- C 996 000.00
- D 998 700.00

[Turn over

17. A field trial was carried out to investigate the effect of applying different masses of phosphate fertiliser on grain yield of a wheat cultivar. The wheat was grown in three fields. A mass of 50, 100 or 150 kg of phosphate fertiliser per hectare was applied.

How could the design of the field trial be improved to minimise the effects of bias?

- A Repeat the trial using a wider range of masses of phosphate fertiliser
  - B Increase the number of replicates at each phosphate fertiliser application
  - C Carry out another field trial exactly the same using a different wheat cultivar
  - D Divide each field and randomly apply different masses of phosphate fertiliser
18. Fungi were cultured in a fermenter to produce an enzyme that was released into the culture medium. The graph shows the effect of oxygen concentration on the dry mass of the fungus and the concentration of enzyme in the medium after 48 hours growth.



The concentration of enzyme when the dry mass of fungus was 36 units per litre was

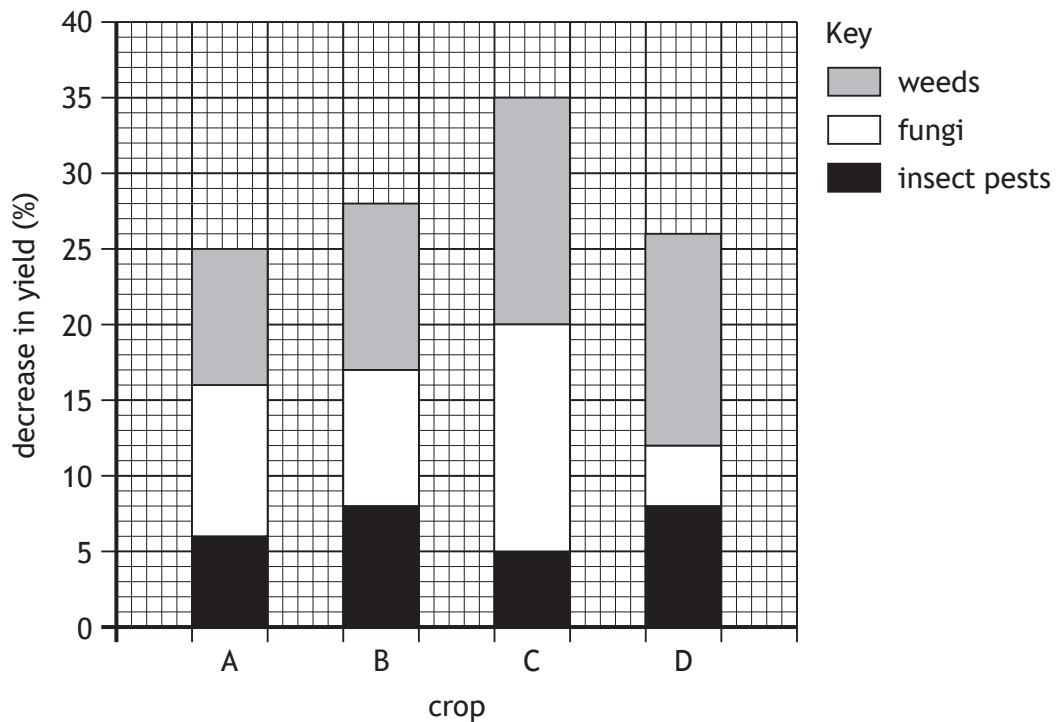
- A 18 units per litre
- B 28 units per litre
- C 48 units per litre
- D 56 units per litre.

19. Breeding programmes can be used to increase starch levels in barley plants. This involves breeding closely related plants with high starch levels for several generations.

This is carried out in order to

- A increase the frequency of homozygous deleterious alleles
- B reduce the frequency of homozygous deleterious alleles
- C increase the frequency of heterozygotes
- D reduce the frequency of heterozygotes.

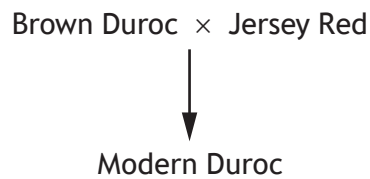
20. The bar chart shows the percentage decrease in yield of four crops as a result of the effects of weeds, fungi and insect pests.



Predict which crop will show the greatest increase in yield if herbicides and insecticides are applied.

[Turn over

21. The diagram shows the breeding of two parental pig breeds to produce the Modern Duroc pig.



The Modern Duroc pig has increased quality and quantity of meat compared to both parental breeds.

The development of the Modern Duroc pig breed is an example of

- A inbreeding
  - B cross breeding
  - C natural selection
  - D genetic modification.
22. A study into animal welfare in a zoo was carried out by observing the behaviour of some of the animals in their enclosures.

The behaviours observed are shown in the table.

Animal	Behaviour
Lion	Continuously pacing back and forward
Sun bear	Feeding young
Spider monkey	Subordinate monkey grooming the dominant male
White rhino	Repeatedly chewing bars of enclosure
Spotted hyena	Sleeping in the sun

Which two animals show signs of poor welfare?

- A Spotted hyena and lion
- B White rhino and spider monkey
- C Lion and white rhino
- D Sun bear and spider monkey

23. Which of the following is **not** a behaviour of a worker honeybee?

- A Producing eggs
- B Defending the hive
- C Gathering pollen
- D Feeding offspring

24. The statements describe examples of behaviour used by animals as protection from predators.

1. A hedgehog rolls into a ball so that its spines protect it from a fox.
2. Mackerel swim in a large shoal making it difficult for a predator to single one out.
3. An individual meerkat watches for predators while the other meerkats feed.

Which are examples of social defence?

- A 1 and 2 only
- B 1 and 3 only
- C 2 and 3 only
- D 1, 2 and 3

25. The list describes some aspects of biodiversity.

1. The number and frequency of different alleles in a species.
2. The proportion of each species in an ecosystem.
3. The number of different species in an ecosystem.

Which are components of species diversity?

- A 1 only
- B 3 only
- C 1 and 2 only
- D 2 and 3 only

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