National
Qualifications
SPECIMEN ONLY

SQ04/H/02

Biology
Section 1—Questions

Date — Not applicable

Duration — 2 hours and 30 minutes

Instructions for the completion of Section 1 are given on *Page two* of your question and answer booklet.

Record your answers on the answer grid on *Page three* of your question and answer booklet.

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

SECTION 1 — 20 marks

Attempt ALL questions

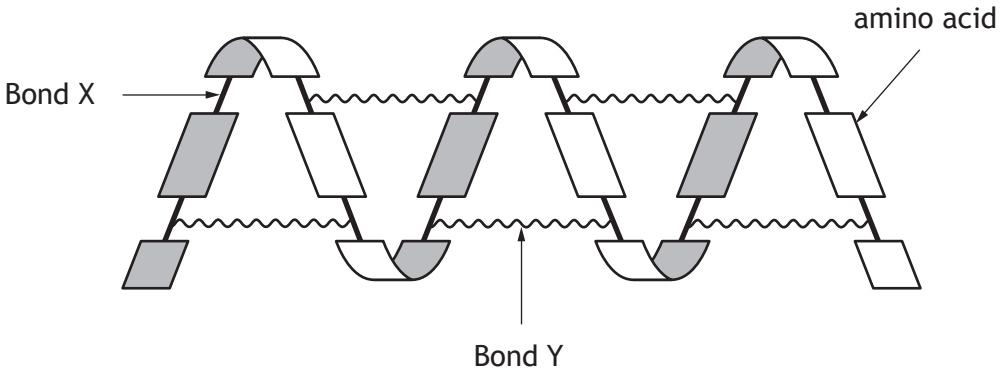
1. The genetic material in human mitochondria is arranged as

A linear chromosomes
B circular plasmids
C circular chromosomes
D inner membranes.

2. The main components of a ribosome are

A mRNA and tRNA
B rRNA and protein
C mRNA and protein
D rRNA and mRNA.

3. The diagram below represents part of a protein molecule.



Which line in the table below identifies bonds X and Y?

	Bond X	*Bond Y*
A	hydrogen	peptide
B	hydrogen	hydrogen
C	peptide	hydrogen
D	peptide	peptide

4. Types of single gene mutation are given in the list below.

1 substitution
2 insertion
3 deletion

Which of these would affect only one amino acid in the polypeptide produced?

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

5. Which line in the table below describes meristems?

	Found in	*Type of cell present*
A	animal	specialised
B	animal	unspecialised
C	plant	specialised
D	plant	unspecialised

6. The table below provides information about ancestral and modern Brassica species. The modern species have been produced by hybridisation of two ancestral species followed by a doubling of the chromosome number in the hybrids.

Brassica species	*Ancestral or modern species*	*Crop*	*Diploid chromosome number (2 n)*
B. oleracea	ancestral	cabbage	18
B. nigra	ancestral	black mustard	16
B. rapa	ancestral	turnip	20
B. juncea	modern	Indian Mustard	36
B. carinata	modern	Ethiopian Mustard	34
B. napus	modern	oilseed rape	38

Which of the following shows the ancestral hybridisation and the modern species produced?

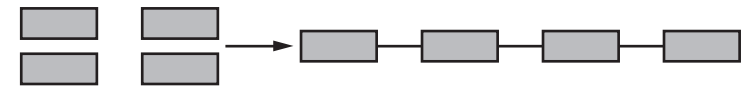
A Cabbage × turnip ⟶ oilseed rape

B Turnip × black mustard ⟶ Ethiopian mustard

C Turnip × cabbage ⟶ Indian mustard

D Cabbage × black mustard ⟶ Indian mustard

7. The diagram below shows how a molecule might be biosynthesised from building blocks in a metabolic pathway.

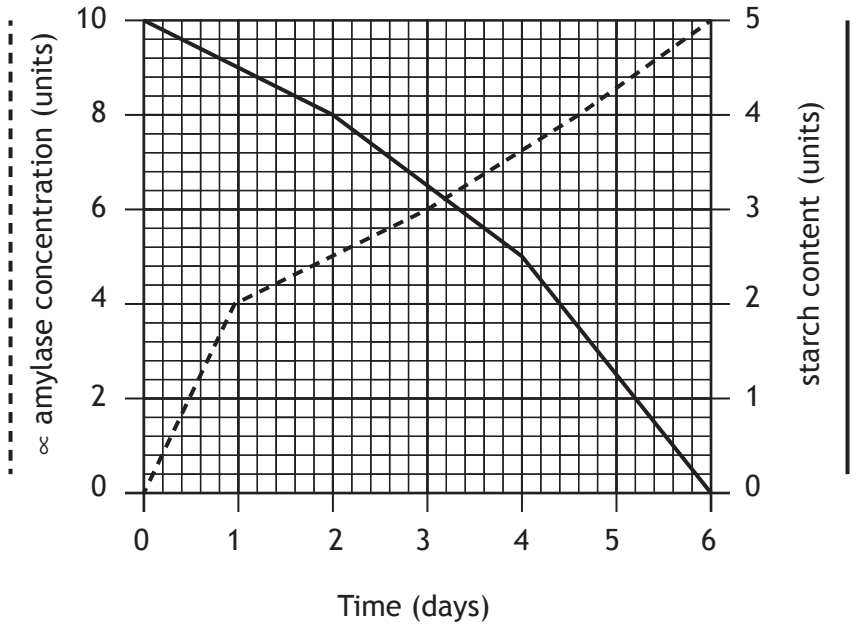


building blocks biosynthesised molecule

Which line in the table below describes the metabolic process shown in the diagram and the energy relationship involved in the reaction?

	Metabolic process	*Energy relationship*
A	anabolic	energy used
B	anabolic	energy released
C	catabolic	energy used
D	catabolic	energy released

8. The graph below shows changes in the α-amylase concentration and the starch content of a barley grain during early growth and development.



Identify the time by which the starch content of the barley grains had decreased by 50%.

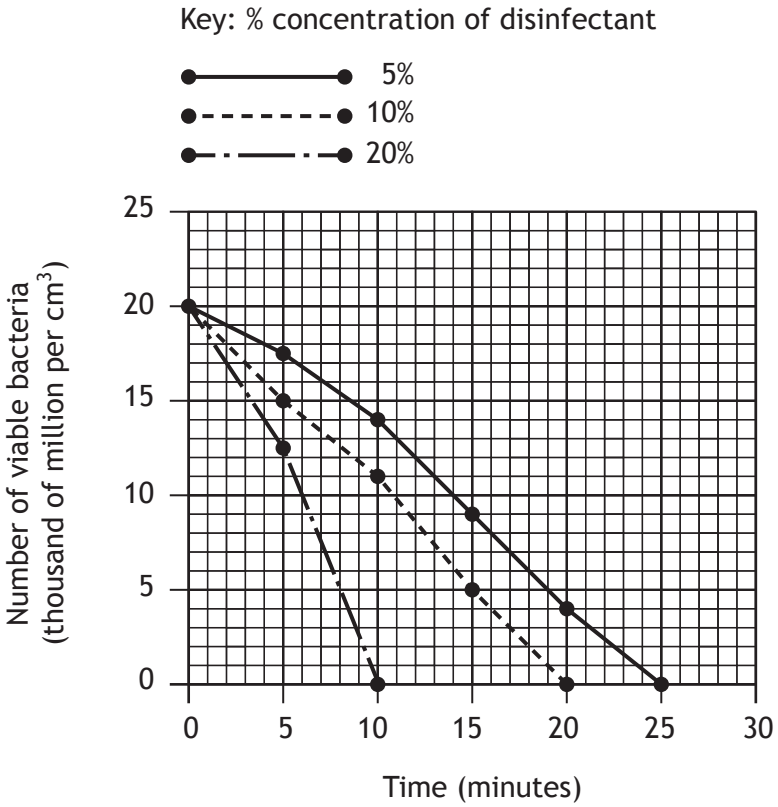
A 2·0 days

B 3·2 days

C 4·0 days

D 6·0 days

9. The graph below shows the effect of different concentrations of a disinfectant on the number of viable bacteria in liquid culture.



What percentage of bacteria was killed by 20% disinfectant after 5 minutes?

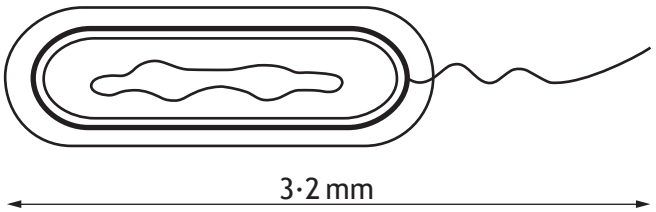
A 25

B 37·5

C 62·5

D 75

10. The diagram below shows a bacterial cell that has been magnified 800 times.



Calculate the length of the cell in micrometres (μm).

A 0·004

B 0·04

C 0·4

D 4·0

11. The cell membrane contains pumps that actively transport substances.

Which of the following forms the major component of membrane pumps?

A Protein

B Phospholipid

C Nucleic acid

D Carbohydrate

12. Maximum oxygen uptake per kg body mass can be used as a measure of fitness. Four athletes were weighed then given a fitness test during which their maximum oxygen uptake was measured.

Which line in the table below shows results for the least fit athlete?

Athlete	*Body mass* (kg)	*Maximum oxygen uptake* (litres per minute)
A	60	3·6
B	55	3·6
C	60	3·7
D	55	3·7

13. The list below gives some adaptations of weed plants.

1 high seed output

2 possession of storage organs

3 vegetative reproduction

4 long term seed viability

Which of these are competitive adaptations of annual weeds?

A 1 and 2 only

B 1 and 4 only

C 2 and 3 only

D 2 and 4 only

14. The table below gives measurements relating to productivity in a field of wheat grown to produce grain for making bread.

Measurement	*Productivity* (kg dry mass per hectare per year)
plant biomass	11 250
grain yield	4500

What is the harvest index of this wheat crop?

A 0·4

B 2·5

C 6750

D 15750

15. The action spectrum of photosynthesis is a measure of the ability of plants to

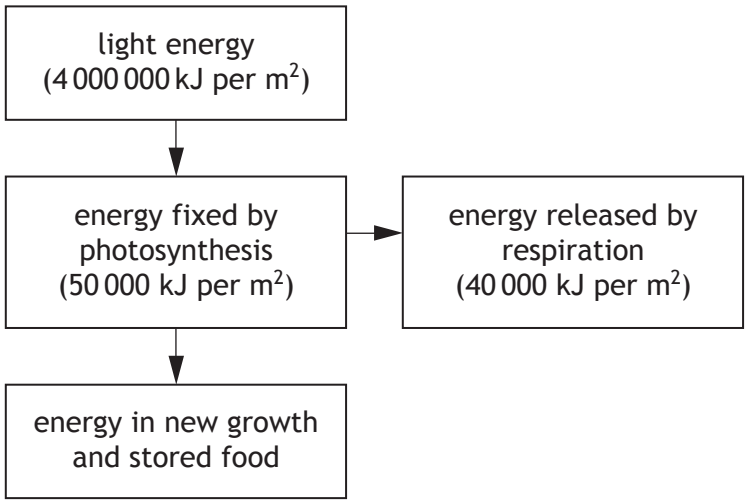
A absorb all wavelengths of light

B absorb light of different intensities

C use light to build up food

D use light of different wavelengths for photosynthesis.

16. The flow chart below shows the energy flow in a field of potatoes during one year.



What is the percentage of the available light energy present in new growth and stored food in the potato crop?

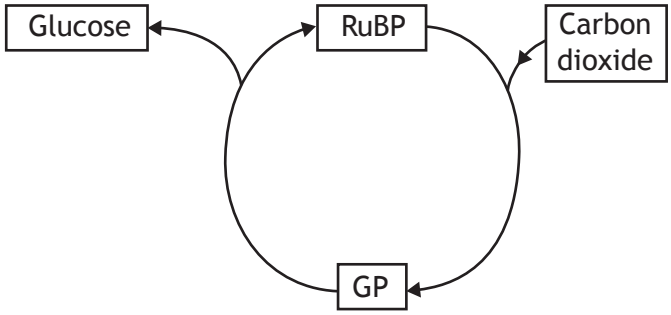
A 2·25

B 1·25

C 0·25

D 1·00

17. The diagram below represents part of the Calvin cycle within a chloroplast.



Which line in the table below shows the effect of decreasing CO_2 availability on the concentrations of RuBP and GP in the cycle?

	RuBP concentration	*GP concentration*
A	decrease	decrease
B	increase	increase
C	decrease	increase
D	increase	decrease

18. The list below describes observed behaviour of pigs on a farm.

1 Stereotypic flicking of the head

2 Repeated wounding of other pigs by biting

3 Lying in a position which does not allow suckling

Which of these behaviours indicate poor animal welfare?

A 1 and 2 only

B 1 and 3 only

C 2 and 3 only

D 1, 2 and 3

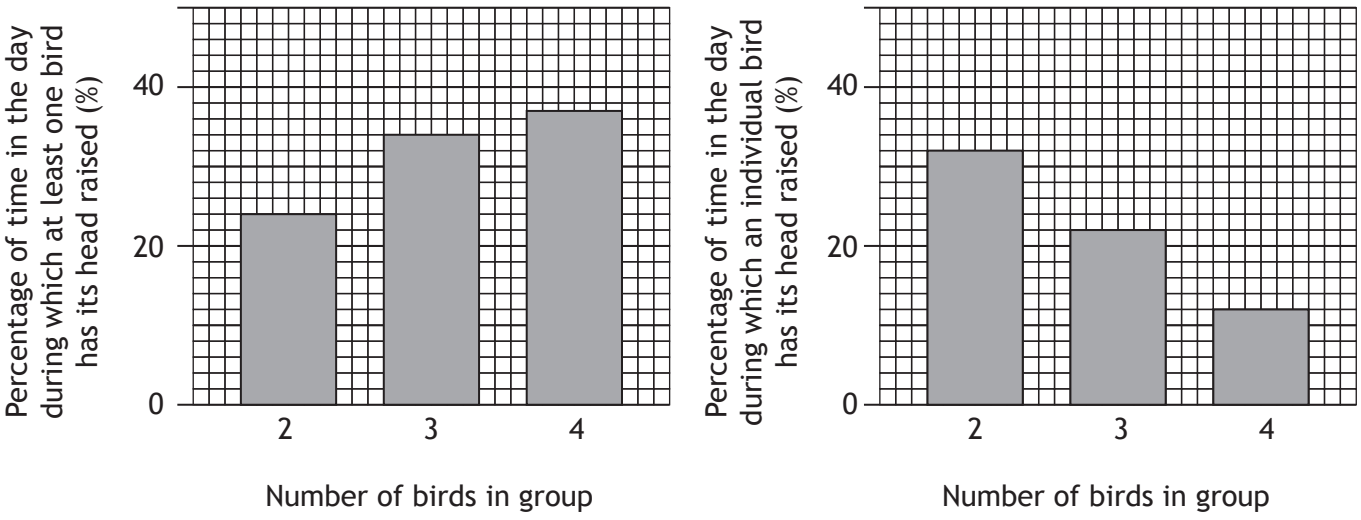
19. Adult beef tapeworms live in the intestine of humans. Segments of the adult worm are released in the faeces. Embryos that develop from them remain viable for five months. The embryos may be eaten by cattle and develop in their muscle tissue.

Which row in the table below identifies the roles of the human, tapeworm embryo and cattle?

	Role		
	human	*tapeworm embryo*	*cattle*
A	host	resistant stage	secondary host
B	host	vector	secondary host
C	secondary host	vector	host
D	secondary host	resistant stage	vector

20. Ostriches are large birds that live on open plains in Africa. They divide their time between feeding on vegetation and raising their heads to look for predators.

The graphs below show the results of a study on the effect of group size in ostriches on their behaviour.



Which of the following is a valid conclusion from these results?

In larger groups, an individual ostrich spends

A less time with its head raised so the group is less likely to see predators

B less time with its head raised but the group is more likely to see predators

C more time with its head raised so the group is more likely to see predators

D more time with its head raised but the group is less likely to see predators.

[END OF SECTION 1. NOW ATTEMPT THE QUESTIONS IN SECTION 2 OF YOUR QUESTION AND ANSWER BOOKLET