National
Qualifications
2018

X740/76/02

Human Biology
Section 1 — Questions

TUESDAY, 15 MAY
1:00 PM – 3:30 PM

Instructions for the completion of Section 1 are given on *page 02* of your question and answer booklet X740/76/01.

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

X7407602

SECTION 1 — 20 marks

Attempt ALL questions

1. Each type of human cell has a different structure and function because

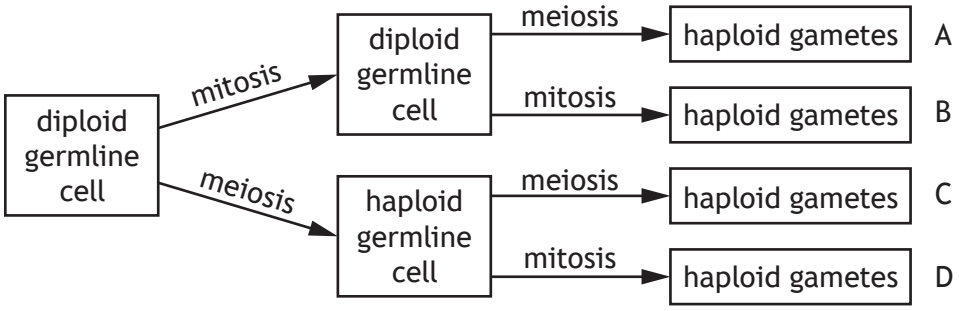
A they contain different genes

B different genes are expressed in each

C some genes are lost during differentiation

D some genes are gained during differentiation.

2. Which pathway describes the production of haploid gametes from diploid germline cells?



3. The table shows the number of dividing and non-dividing cells in samples of three types of tissue.

Type of tissue	*Number of cells dividing*	*Number of cells not dividing*
nerve	8	17
blood	4	16
muscle	1	19

The percentage of connective tissue cells which are dividing is

A 5%

B 20%

C 25%

D 32%

4. A fragment of DNA contained 144 nucleotide base pairs.

What is the total number of deoxyribose sugars in this fragment?

A 48
B 72
C 144
D 288

5. The table shows the positions of bases in the mRNA codons for specific amino acids.

	Second position				
First position	U	C	A	G	*Third position*
U	phenylalanine	serine	tyrosine	cysteine	U
					C
	leucine		stop	stop	A
			stop	tryptophan	G
C	leucine	proline	histidine	arginine	U
					C
			glutamine		A
					G
A	isoleucine	threonine	asparagine	serine	U
					C
	start/ methionine		lysine	arginine	A
					G
G	valine	alanine	aspartic acid	glycine	U
					C
			glutamic acid		A
					G

Which of the following mutations in a section of mRNA would result in the production of a shortened protein?

	Original mRNA codons	*Mutated mRNA codons*
A	..... AUG GCC CAU	..... AUG GCA CAU .....
B	..... CAG UAC GUG	..... CAG UAG GUG .....
C	..... AAU UGG CCA	..... AAU UGU CCA .....
D	..... GUC AAC UCG	..... GUC AAG UCG .....

6. A mature mRNA transcript is produced from a primary mRNA transcript by

A adding exons
B adding introns
C removing exons
D removing introns.

7. DNA probes are short fragments of DNA that

A allow RNA polymerase to begin transcription
B allow DNA polymerase to begin DNA replication
C are used to detect specific sequences in samples of DNA
D bind to specific target sequences in the PCR reaction to amplify DNA.

8. The list shows some of the substances produced during the respiration of glucose in the presence of oxygen.

1 acetyl group
2 pyruvate
3 citrate
4 ATP

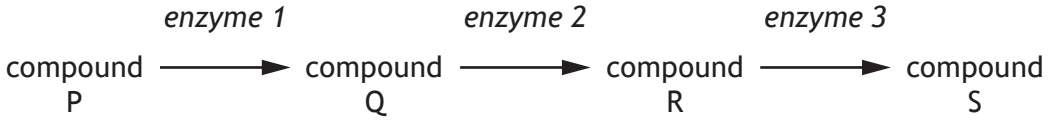
Which of the following sequences shows the order in which these substances are produced?

A 4, 2, 1, 3
B 4, 2, 3, 1
C 2, 1, 4, 3
D 2, 3, 1, 4

9. In cellular respiration, the products of the electron transport chain are

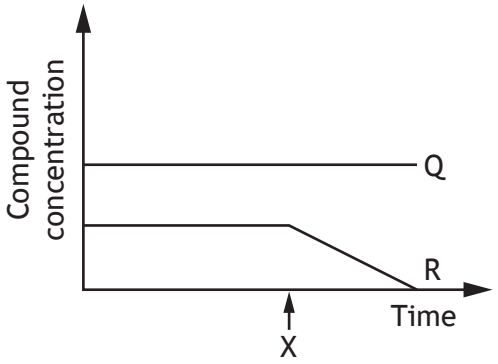
A water and ATP
B oxygen and ATP
C NADH and $FADH_2$
D carbon dioxide and water.

10. The following diagram shows an enzyme-controlled metabolic pathway.



If enzyme 2 is inhibited at time X, which graph predicts the resulting concentrations of compounds Q and R?

A



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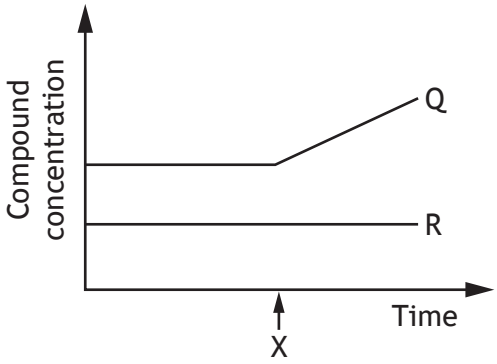

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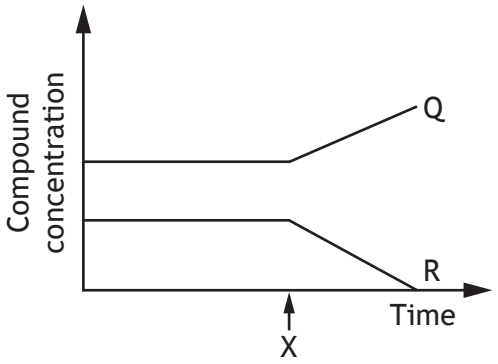

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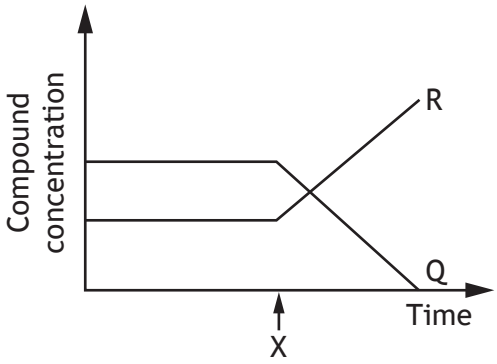

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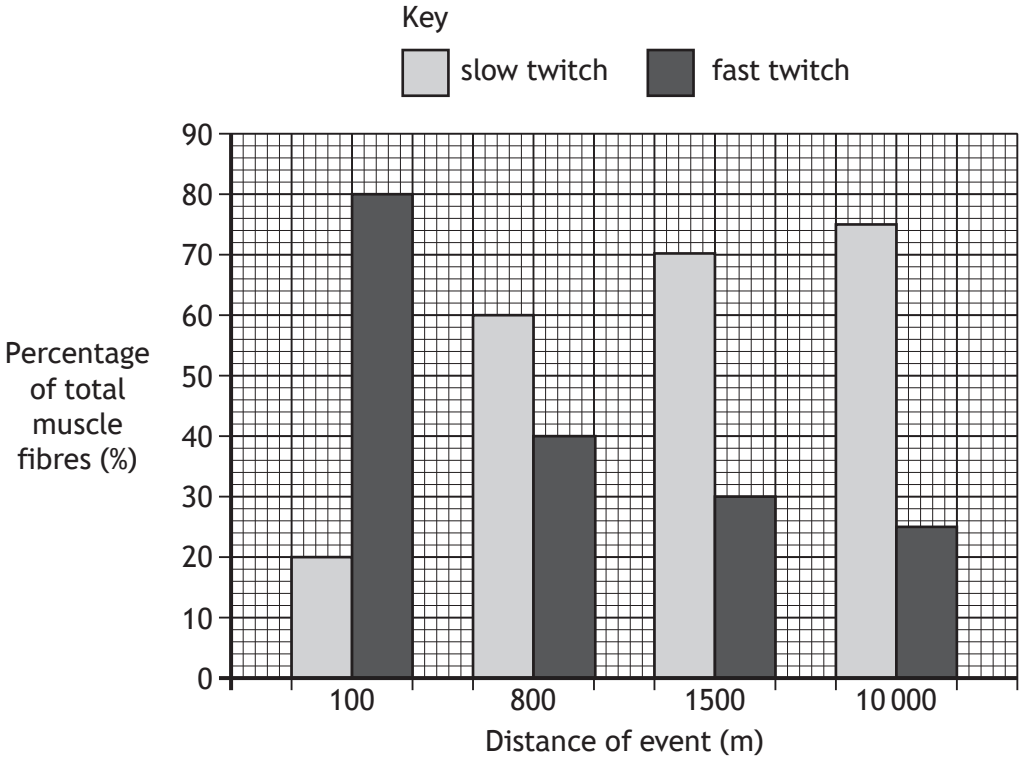
11. The graph shows the percentage of slow and fast twitch muscle fibres present in athletes who trained for events of different distances.



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

A Athletes who trained for the 100 m event have 5 times more fast twitch muscle fibres than slow twitch muscle fibres.

B Athletes who trained for the 10 000 m event have 4 times more slow twitch muscle fibres than fast twitch muscle fibres.

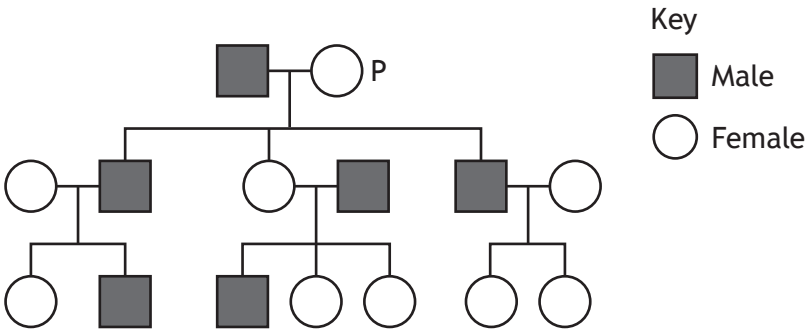
C Athletes who trained for the 800 m event have twice as many slow twitch muscle fibres as athletes in the 1500 m event.

D Athletes who trained for the 100 m event have twice as many fast twitch muscle fibres as athletes in the 800 m event.

12. The mitochondria of human cells contain DNA.

Women can pass mitochondrial DNA to their offspring but men cannot.

The diagram shows a family tree.



Identify the number of individuals in the family tree that have inherited mitochondrial DNA which originated from P.

A 3

B 4

C 5

D 6

13. Thalassaemia is an inherited condition that affects the ability of haemoglobin to carry oxygen. The condition is **not** sex-linked.

The table shows genotypes and phenotypes associated with thalassaemia.

Genotype	*Phenotype*
AA	unaffected
AT	thalassaemia trait
TT	severe thalassaemia

An unaffected man and a woman with thalassaemia trait have a child.

The chance that the child will also have thalassaemia trait is

A 0%

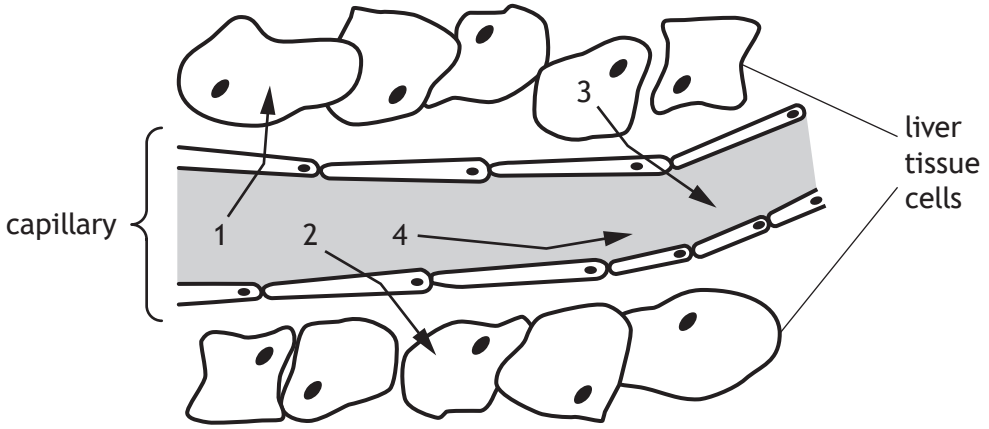
B 25%

C 50%

D 100%

[Turn over

14. The diagram shows the movement of substances between a capillary and the surrounding liver tissue cells.



Which row in the table identifies the substances in the diagram?

	Substance			
	1	2	3	4
A	glucose	carbon dioxide	oxygen	protein
B	oxygen	glucose	carbon dioxide	protein
C	protein	glucose	oxygen	carbon dioxide
D	protein	oxygen	carbon dioxide	glucose

15. During the formation of a thrombus, fibrin

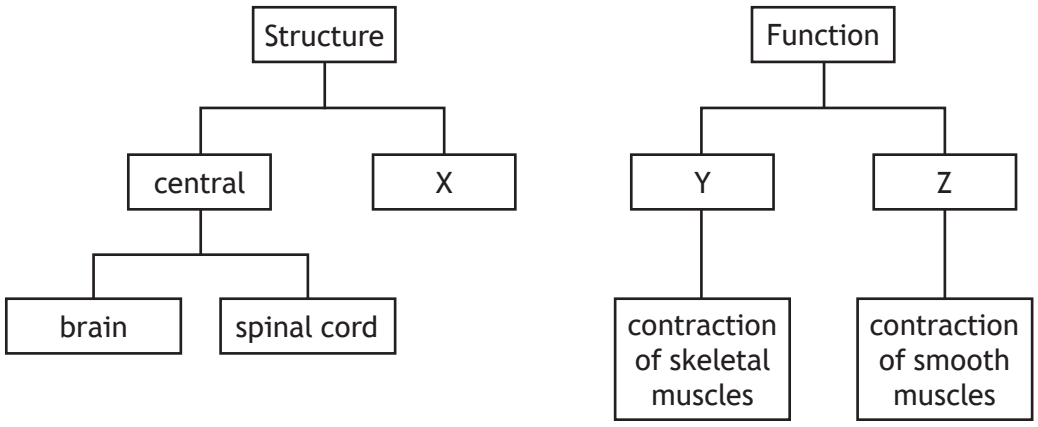
A converts prothrombin to thrombin

B causes the formation of fibrinogen

C forms a meshwork to clot the blood

D causes the release of clotting factors.

16. The diagrams show two ways to classify the nervous system.



Which row in the table identifies X, Y and Z?

	Nervous System		
	X	Y	Z
A	peripheral	somatic	autonomic
B	somatic	autonomic	peripheral
C	autonomic	peripheral	somatic
D	peripheral	autonomic	somatic

17. A child was stung by a wasp. This led to them being afraid of all flying insects.
This is an example of

A discrimination
B generalisation
C internalisation
D reinforcement.

[Turn over

18. An investigation was carried out into the effect of colour on the recognition of shapes.
The procedure included the following features.

- Two groups of 20 students were selected.
- Each group was shown the same sequence of shapes but in a different colour.
- One group was shown blue shapes and the other group was shown red shapes.
- The time taken by each student to identify each shape was noted.

Which of the following would improve the reliability of the results?

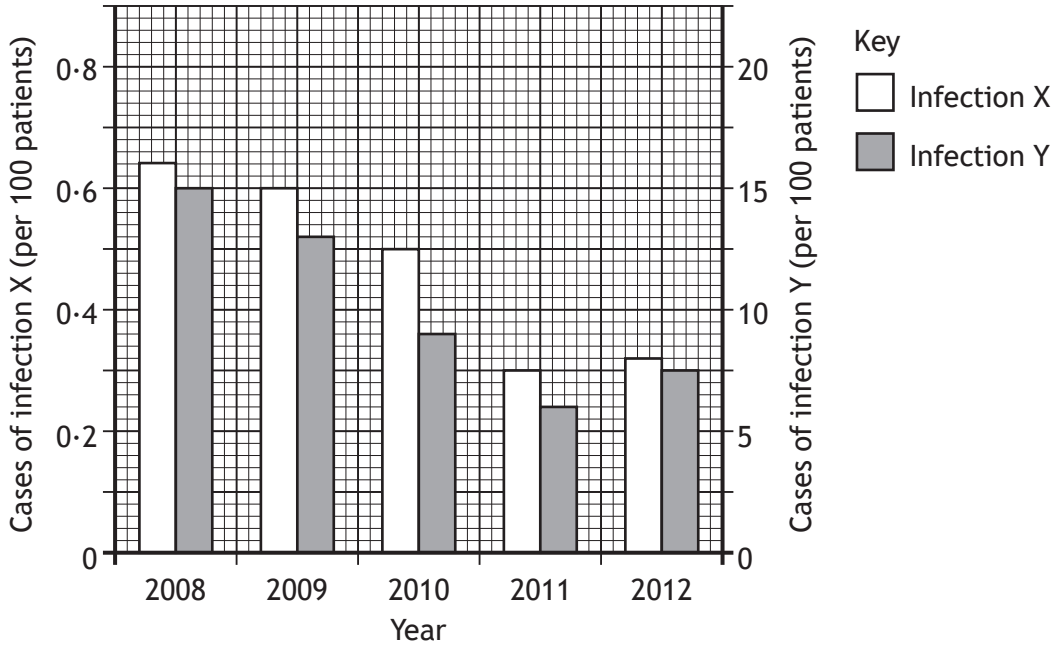
A Showing the same set of shapes to each group.
B Ensuring all the selected students were the same age.
C Having the same number of males and females in each group.
D Repeating the whole procedure with two more groups of students.

19. The virus that causes influenza can evade the specific immune response by

A attacking phagocytes
B attacking lymphocytes
C surviving within phagocytes
D showing antigenic variation.

20. A hospital introduced a programme of handwashing in 2008.

The graph shows the impact of this on the number of cases of two infections.



Which of the following statements is **not** correct?

A The cases of both infections fell by 50% over the 5 year period.

B The number of cases of infection Y was always greater than the number of cases of infection X.

C The highest number of cases of infection X was 0·62 per 100 patients while the highest number of cases of infection Y was 15 per 100 patients.

D The lowest number of cases of infection X was 0·3 per 100 patients while the lowest number of cases of infection Y was 6 per 100 patients.

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

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