National
Qualifications
2019

X840/76/12

Human Biology
Paper 1 — Multiple choice

TUESDAY, 30 APRIL
9:00 AM – 9:40 AM

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 X840/76/02.

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.

X8407612

Total marks — 25

Attempt ALL questions

1. A section of DNA containing 8000 bases has 1200 cytosine bases.
The number of adenine bases in this section of DNA is

A 800
B 1200
C 1400
D 2800.

2. Identify the RNA codon and anticodon for the DNA base sequence GAT.

	RNA codon	RNA anticodon
A	CTA	GAT
B	GAT	CTA
C	CUA	GAU
D	GAU	CUA

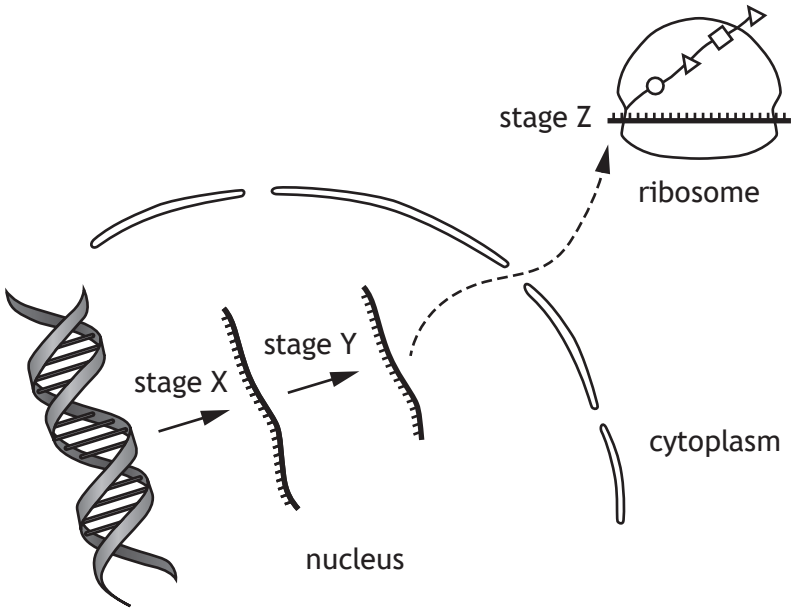
3. The following sequence shows the order of bases in a segment of mRNA.

A U G A U C G C U A U G A A G A C C G C A G C U

How many different amino acid molecules are coded for by this segment of mRNA?

A 6
B 7
C 8
D 24

4. The diagram shows three of the stages involved in gene expression.



Which row in the table identifies these stages?

	Stage		
	X	**Y**	**Z**
A	translation	RNA splicing	transcription
B	RNA splicing	transcription	translation
C	transcription	translation	RNA splicing
D	transcription	RNA splicing	translation

5. The diagram shows the base sequence for a section of a gene and a mutated version of this section.

section of gene C G T A T A T C C T A T G C C C C T G A C

mutated version C G T A T A T C C T A T C T C C C T G A C

This is an example of

A a deletion mutation

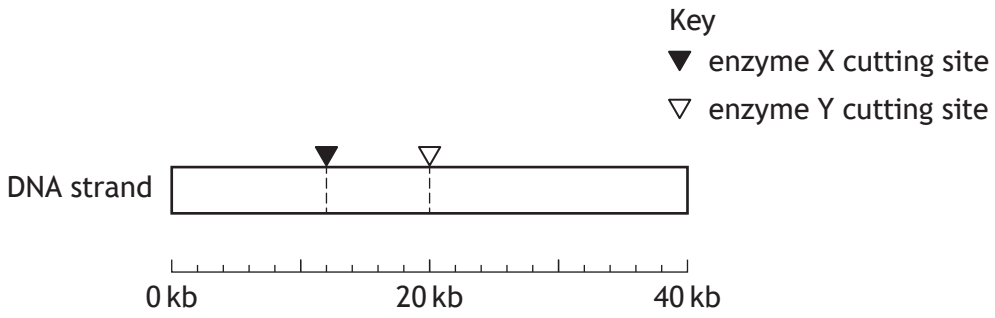
B an insertion mutation

C a substitution mutation

D a translocation mutation.

6. Enzymes can be used to cut strands of DNA into fragments.

The diagram shows the cutting sites of two different enzymes on a DNA strand that is 40 kilobases (kb) long.



What length of fragments (kb) would be produced if the DNA strand was cut with enzyme X only?

A 12, 20

B 12, 28

C 20, 20

D 12, 8, 20

7. Three applications of human genomics are listed.

1. Comparing genomes to settle paternity disputes
2. Screening a genome for a particular sequence to diagnose disease
3. Using genome information in the choice of effective drug treatments

Which of these applications are examples of pharmacogenetics?

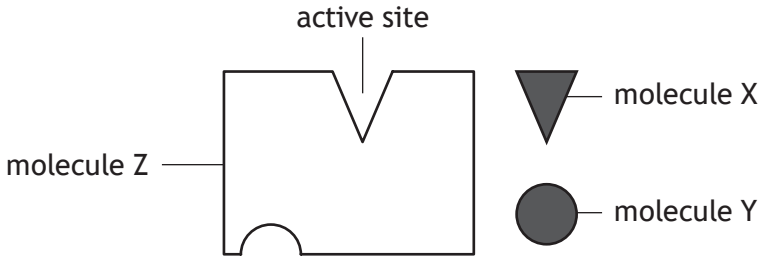
A 1 only

B 3 only

C 2 and 3 only

D 1, 2 and 3

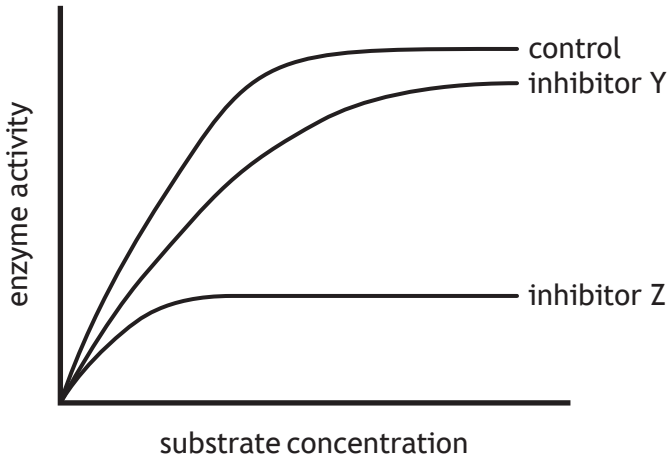
8. The diagram shows molecules involved in an enzyme controlled reaction.



Which row in the table identifies these molecules?

	Molecule X	**Molecule Y**	**Molecule Z**
A	substrate	non-competitive inhibitor	enzyme
B	non-competitive inhibitor	enzyme	substrate
C	substrate	competitive inhibitor	enzyme
D	competitive inhibitor	non-competitive inhibitor	substrate

9. The graph shows the results of an investigation into the effects of two different inhibitors on enzyme activity.



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

A Inhibitor Z is a competitive inhibitor

B There is a steady increase in enzyme activity with no inhibitor

C Inhibitor Y has less effect on enzyme activity than inhibitor Z

D Increasing substrate concentration increases the effect of both inhibitors

[Turn over

10. At the end of the electron transport chain hydrogen ions and electrons combine with

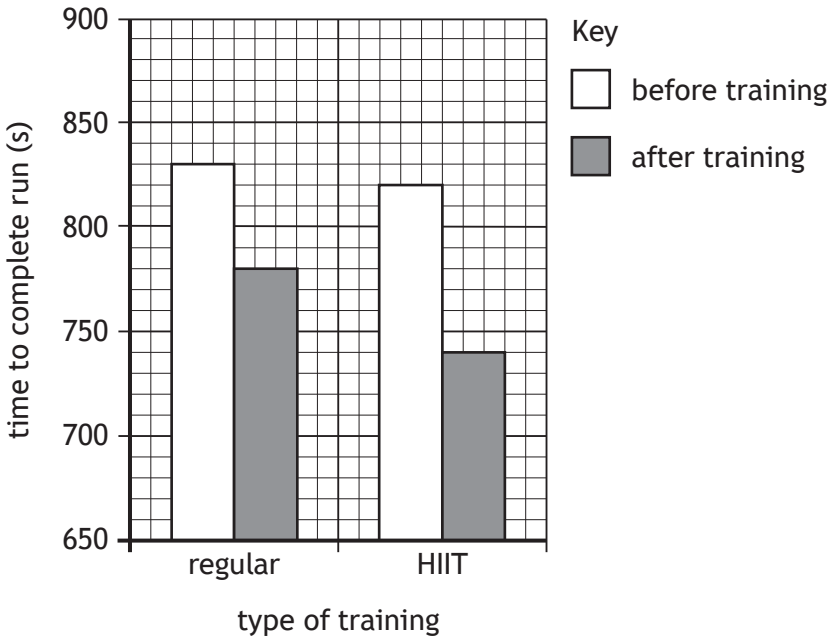
A NAD
B ATP
C water
D oxygen.

11. Which row in the table describes the generation of ATP in slow-twitch muscle fibres?

	Generation of ATP	**Relative number of mitochondria**
A	aerobic respiration	many
B	aerobic respiration	few
C	glycolysis only	many
D	glycolysis only	few

12. Two athletes took part in different training programmes. One undertook regular training sessions while the other undertook high intensity interval training (HIIT) sessions.

The graph shows the time taken to complete a run before and after each training programme.



The improvement in performance as a result of HIIT training compared to regular training is

A 30 s

B 40 s

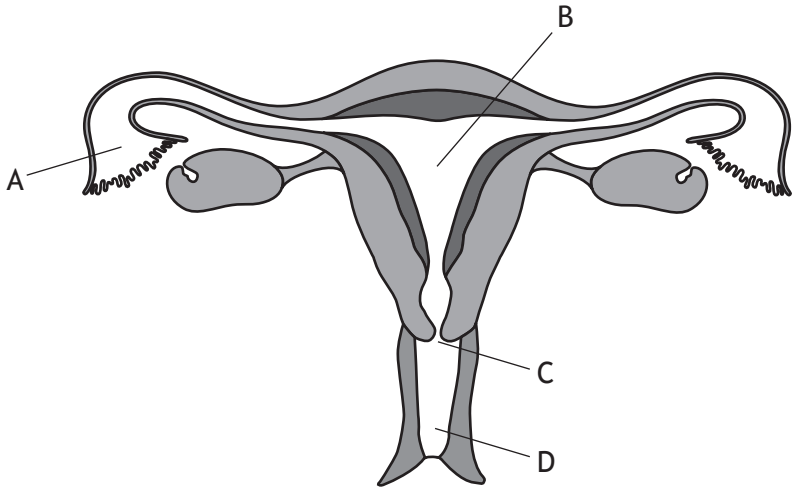
C 50 s

D 80 s.

[Turn over

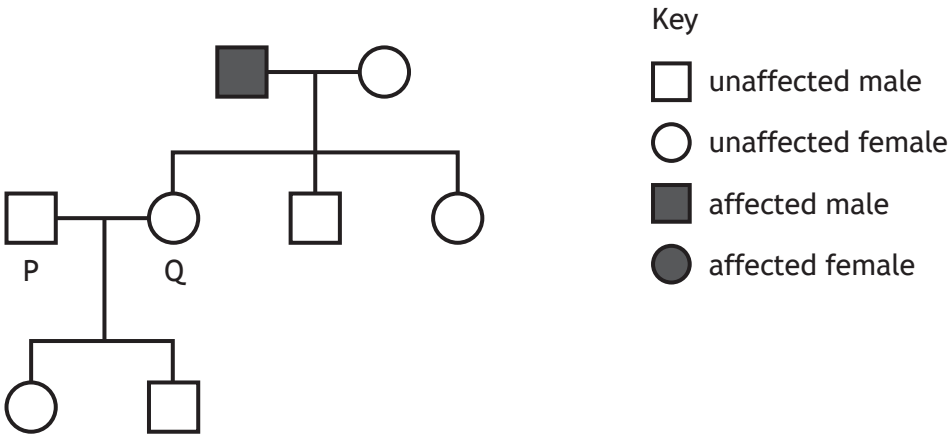
13. The diagram represents the female reproductive system.

Which letter indicates the location where an intra-uterine device would be positioned to prevent pregnancy?



14. The diagram shows the inheritance of haemophilia, a blood clotting disorder, in three generations of a family.

Haemophilia is caused by a sex-linked recessive allele.



Individuals P and Q are expecting a third child.

What is the percentage chance that this child will have haemophilia?

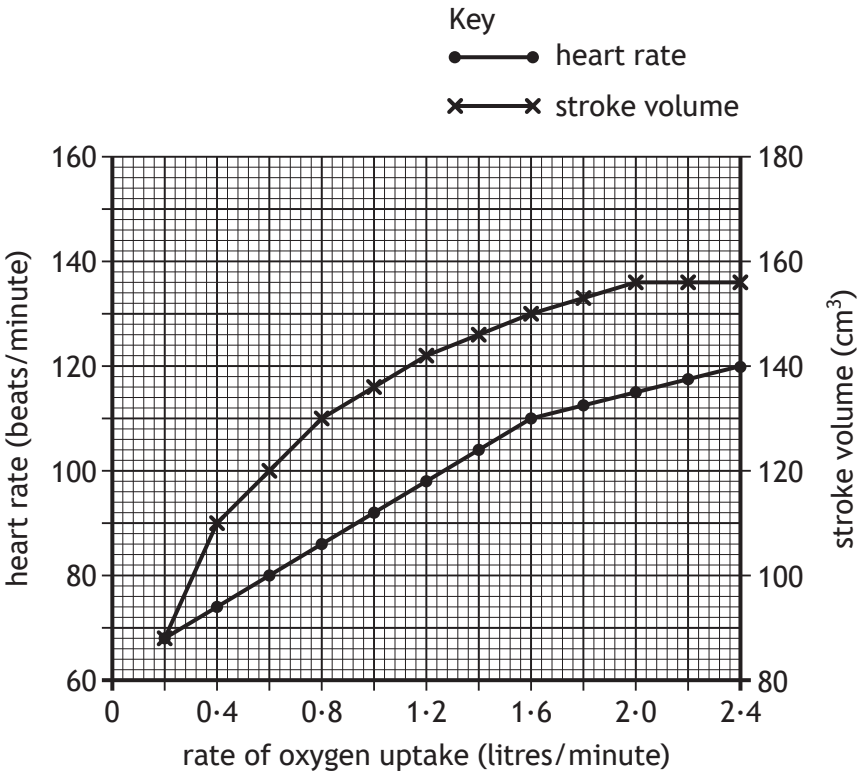
A 0%

B 25%

C 50%

D 75%

15. The graph shows how increasing oxygen uptake affects heart rate and stroke volume.



What is the cardiac output when the rate of oxygen uptake is 0·6 litres/minute?

A 1·50 cm^3/min

B 8000 cm^3/min

C 9600 cm^3/min

D 10 000 cm^3/min

16. Increased blood flow within an artery is the result of smooth muscle

A relaxation causing vasodilation

B contraction causing vasodilation

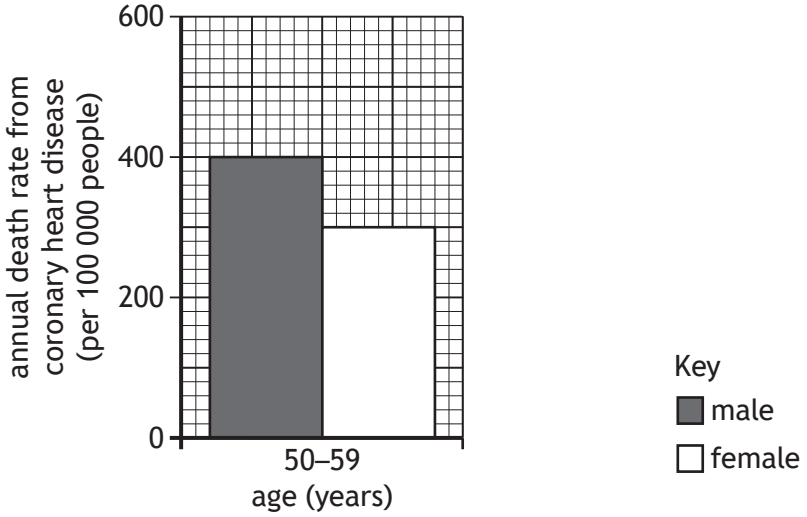
C relaxation causing vasoconstriction

D contraction causing vasoconstriction.

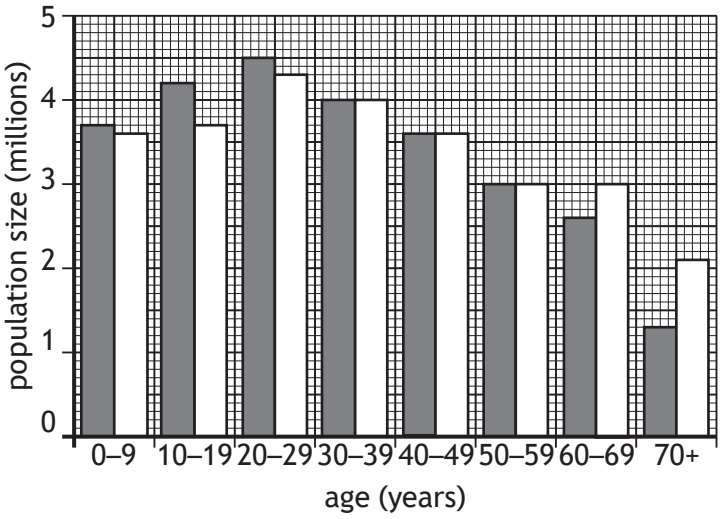
[Turn over

17. The graphs contain information about the population of the United Kingdom.

Graph 1



Graph 2



How many males aged between 50–59 years die from coronary heart disease annually in the United Kingdom?

A 400

B 9000

C 12 000

D 21 000

18. Which row in the table identifies components of the central and peripheral nervous systems?

	Central nervous system		Peripheral nervous system	
A	spinal cord	brain	somatic	medulla
B	brain	spinal cord	sympathetic	somatic
C	parasympathetic	brain	spinal cord	sympathetic
D	sympathetic	parasympathetic	brain	spinal cord

19. Transfer of information between cerebral hemispheres occurs through the

A medulla
B glial cells
C myelin sheath
D corpus callosum.

20. The following statements refer to events that occur at a synapse.

1. An impulse is generated
2. Acetylcholine diffuses across the synaptic cleft
3. Acetylcholine is broken down by an enzyme
4. Acetylcholine is released from storage vesicles

In which sequence do these events occur?

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

21. A function of glial cells is the production of

A axons
B myelin
C dopamine
D noradrenaline.

[Turn over

22. A drug trial was carried out to study the effect of a drug on mice.

A group of mice, with an average body mass of 20 g, were given 1 mg per kg of their body mass of the drug. The drug was given twice a day for 15 days.

What was the total mass of drug given to each mouse over the 15 days?

A 0·02 mg

B 0·04 mg

C 0·30 mg

D 0·60 mg

23. Multiple sclerosis (MS) is an autoimmune disease in which lymphocytes destroy the myelin sheath.

Which row in the table shows the type of lymphocyte involved and the effect on the speed of nerve impulse transmission?

	Type of lymphocyte	**Speed of nerve impulse transmission**
A	B	increased
B	B	decreased
C	T	increased
D	T	decreased

24. The table shows the number of cases of a disease and the number of deaths resulting from this disease in a country over four years.

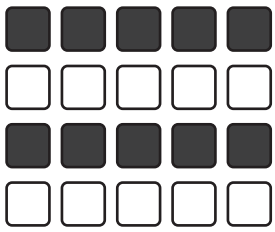
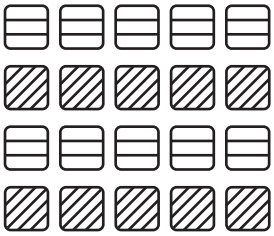
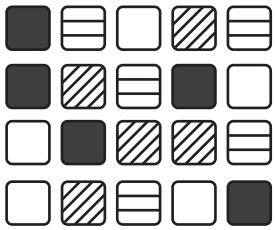
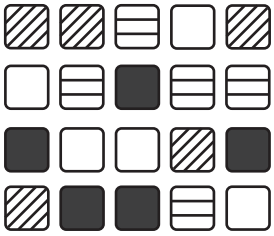
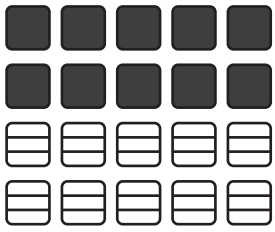
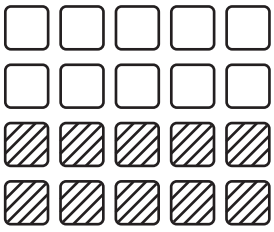
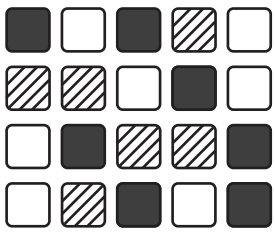
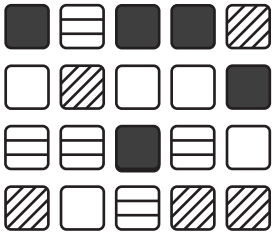
In which year did the greatest percentage of deaths occur?

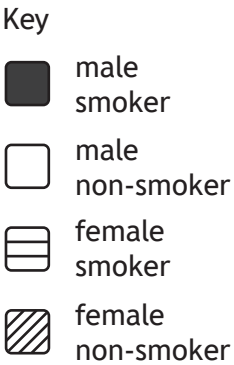
	Year	**Number of cases**	**Number of deaths**
A	2014	1070	45
B	2015	420	12
C	2016	1960	60
D	2017	2290	90

25. Forty individuals were selected to take part in a clinical trial for a new drug to treat a lung condition.

They were split into two groups. One group was treated with the drug while the other group was treated with a placebo.

Which row in the table would have allowed a valid comparison of the treatments?

	Group treated with drug	**Group treated with placebo**
A		
B		
C		
D		



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SPACE FOR ROUGH WORK

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