



National  
Qualifications  
2022

**X840/76/12**

**Human Biology  
Paper 1 — Multiple choice**

THURSDAY, 19 MAY

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.



\* X 8 4 0 7 6 1 2 \*

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

1. The following list shows some procedures in which stem cells can be used:

1. Corneal repair
2. Drug testing
3. Skin regeneration.

Which procedures involve the therapeutic use of stem cells?

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

2. The table shows the average cost of treating individuals with different types of cancer in the UK depending on their stage of diagnosis.

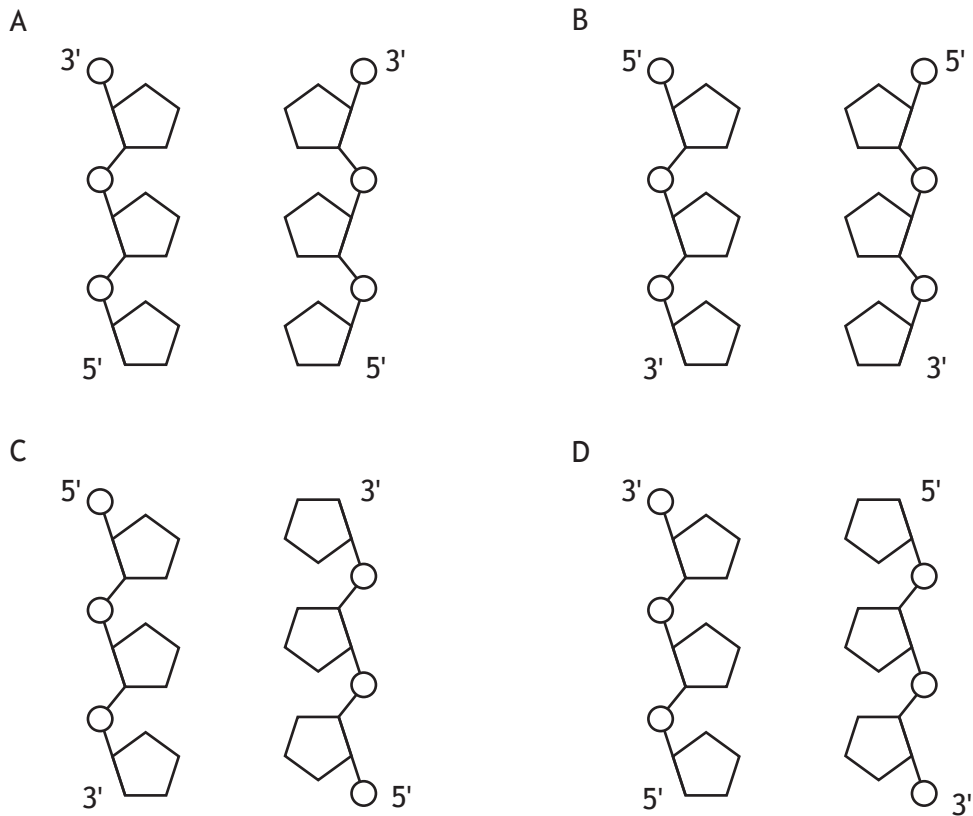
Type of cancer	Average cost of treatment (£)	
	Early stage diagnosis	Late stage diagnosis
Colon	3000	13 000
Ovarian	5000	15 000
Rectal	4000	12 000
Lung	8000	13 000

Which of the following statements is correct?

- A Colon cancer is always the least expensive cancer to treat.
- B Lung cancer is always the most expensive cancer to treat.
- C Late stage diagnosis of ovarian cancer results in a 300% increase in the cost of treatment compared to early stage diagnosis.
- D Early stage diagnosis of rectal cancer results in a 67% decrease in the cost of treatment compared to late stage diagnosis.

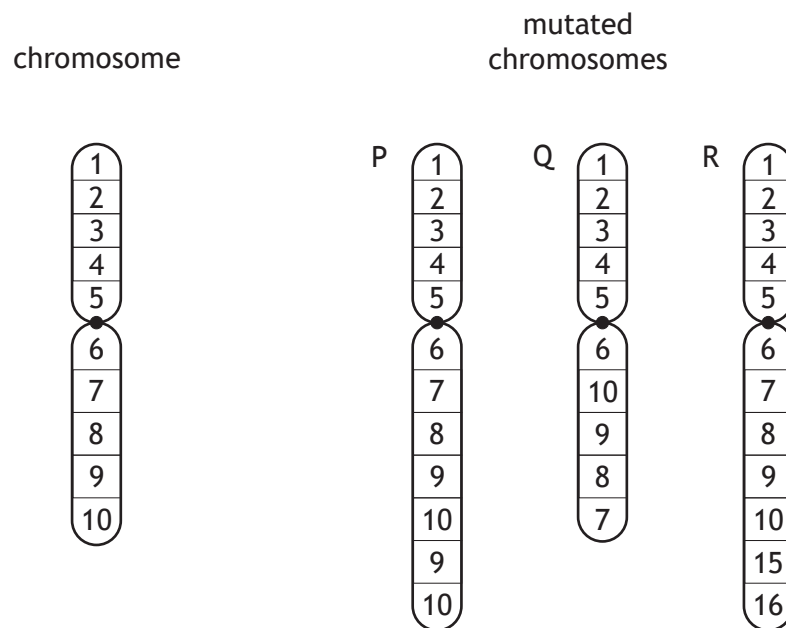
3. A section of a molecule of DNA has 12 000 bases with a 1:3 ratio of adenine to cytosine. The number of guanine bases in this section is:
- A 1500
  - B 3000
  - C 4500
  - D 9000.

4. Which diagram shows the correct arrangement and labelling of the strands found in a section of a molecule of DNA?



[Turn over

5. The diagram shows a chromosome and mutated versions of the same chromosome. Each numbered segment on the chromosomes represents a gene.

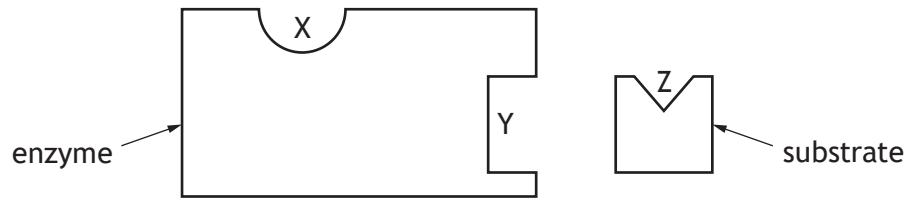


Which row in the table shows the type of mutations that have occurred?

	Chromosome P	Chromosome Q	Chromosome R
A	duplication	inversion	translocation
B	duplication	translocation	insertion
C	translocation	duplication	inversion
D	insertion	inversion	translocation

6. Which statement describes induced fit between an enzyme and its substrate?
- A The active site changes shape after the substrate binds.
  - B The substrate changes shape after the enzyme binds.
  - C The active site changes shape before the substrate binds.
  - D The substrate changes shape before the enzyme binds.

7. The diagram shows an enzyme and its substrate.



Which row in the table identifies the sites where a competitive and a non-competitive inhibitor could bind?

	Competitive inhibitor	Non-competitive inhibitor
A	X	Y
B	X	Z
C	Y	Z
D	Y	X

8. Saliva contains the enzyme amylase, which breaks down starch into maltose.

The presence of starch can be tested for by adding iodine solution, which turns blue/black if starch is present.

In an investigation, four test tubes were set up in a water bath at 37 °C. Each test tube contained 10 cm<sup>3</sup> of starch solution and 2 cm<sup>3</sup> of amylase. 2 cm<sup>3</sup> of buffer solutions of different pH values were added to each test tube.

A sample of the contents of each test tube was removed every 30 seconds for 10 minutes and tested with iodine.

Identify the independent variable in this investigation.

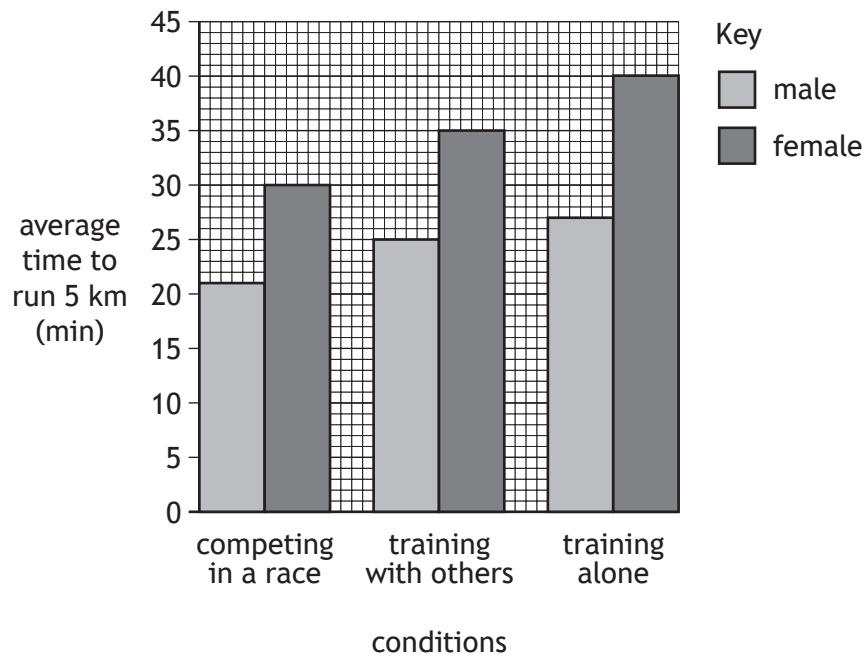
- A pH of solution in each test tube
- B Volume of starch solution in each test tube
- C Temperature of the test tubes in the water bath
- D Time taken for iodine solution to no longer turn blue/black

[Turn over

9. Which row in the table matches a substance with the stage of respiration in which it is involved?

	Substance	Stage
A	pyruvate	citric acid cycle
B	oxaloacetate	citric acid cycle
C	oxaloacetate	electron transport chain
D	pyruvate	electron transport chain

10. The graph shows the results of a survey carried out on members of a running club who ran 5 km under three different conditions.



What is the percentage improvement shown by females competing in a race compared to training alone?

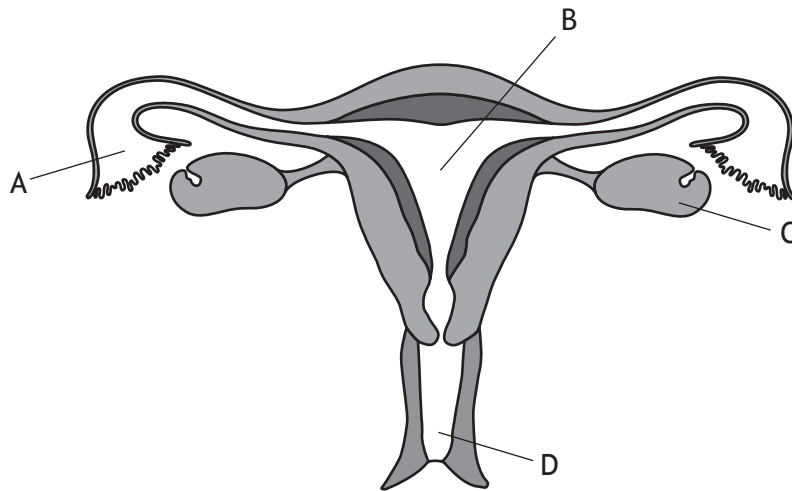
- A 10%
- B 12.5%
- C 25%
- D 33.3%

11. The onset of puberty in males is triggered by a secretion from the:

- A pituitary gland
- B hypothalamus
- C interstitial cells
- D seminal vesicles.

12. During IVF a fertilised egg is incubated until at least eight cells are formed.

Which letter indicates the location in the reproductive system into which this ball of cells would be transferred?



13. Red-green colour blindness is caused by an allele that is sex-linked and recessive.

A woman's father has the allele for colour blindness, but her mother does not.

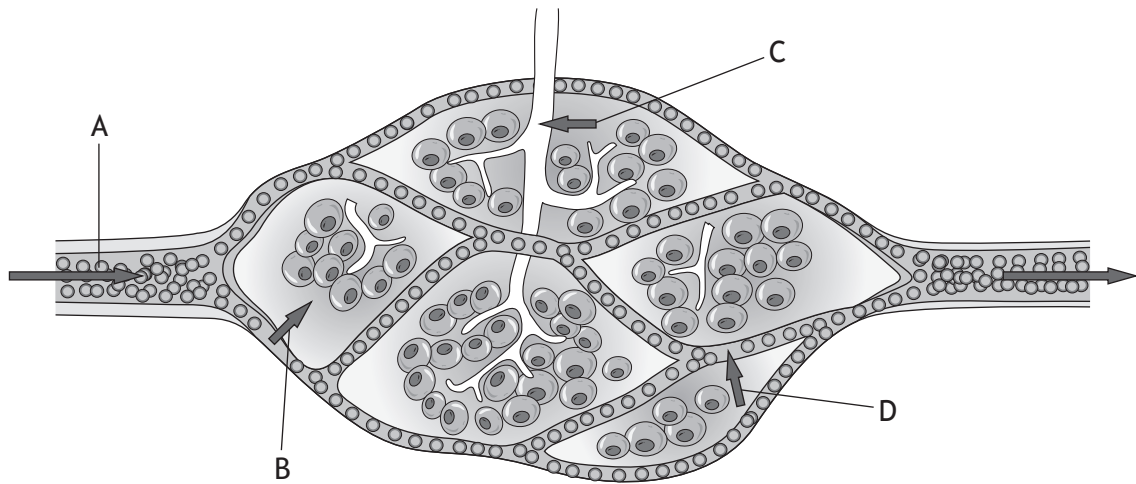
The woman has a son with a man who is not colour blind.

What is the percentage chance that their son will be colour blind?

- A 0%
- B 25%
- C 50%
- D 75%

[Turn over

14. The diagram shows a capillary network within a tissue.  
Which arrow represents pressure filtration of plasma?



15. Which row in the table shows the typical blood pressure in a blood vessel of a young adult during the cardiac cycle?

	Blood pressure (mmHg)	Blood vessel	Cardiac cycle stage
A	80	vein	diastole
B	80	artery	systole
C	120	vein	diastole
D	120	artery	systole

16. Which row in the table describes features typical of type 2 diabetes?

	Onset	Effect
A	Occurs in childhood	Cells unable to produce insulin
B	Occurs in childhood	Cells less sensitive to insulin
C	Develops later in life	Cells unable to produce insulin
D	Develops later in life	Cells less sensitive to insulin

17. The table shows the number of new cases of diabetes diagnosed in the UK in 2013 and 2018.

		Number of new cases of diabetes (thousands)	
		2013	2018
Location	Year		
England		2700	3200
Scotland		250	300
Wales		170	200
Northern Ireland		80	100

Which statement is correct for the number of new cases between 2013 and 2018?

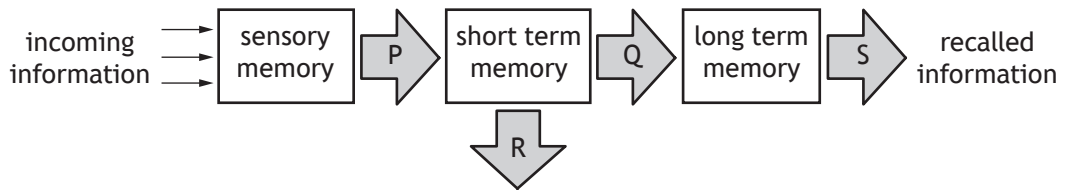
- A Scotland had a 50% increase in new cases.
- B Wales had the lowest increase in new cases.
- C England had a yearly average increase of 100 new cases.
- D Northern Ireland had a 25% increase in new cases.

18. The increase in an athlete's heart rate and breathing rate during a race involves:

- A sympathetic neurons of the autonomic nervous system
- B parasympathetic neurons of the somatic nervous system
- C sympathetic neurons of the somatic nervous system
- D parasympathetic neurons of the autonomic nervous system.

[Turn over

19. The diagram shows the processing of information within memory.



Which row in the table identifies the memory processes shown in the diagram?

Memory process			
	Retrieval	Encoding	Displacement
A	S	Q	R
B	P	R	Q
C	S	P	Q
D	Q	P	R

20. The following are methods used to aid memory:

1. Chunking
2. Elaboration
3. Organisation.

Which of these methods can be used to improve the transfer of information from short term to long term memory?

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

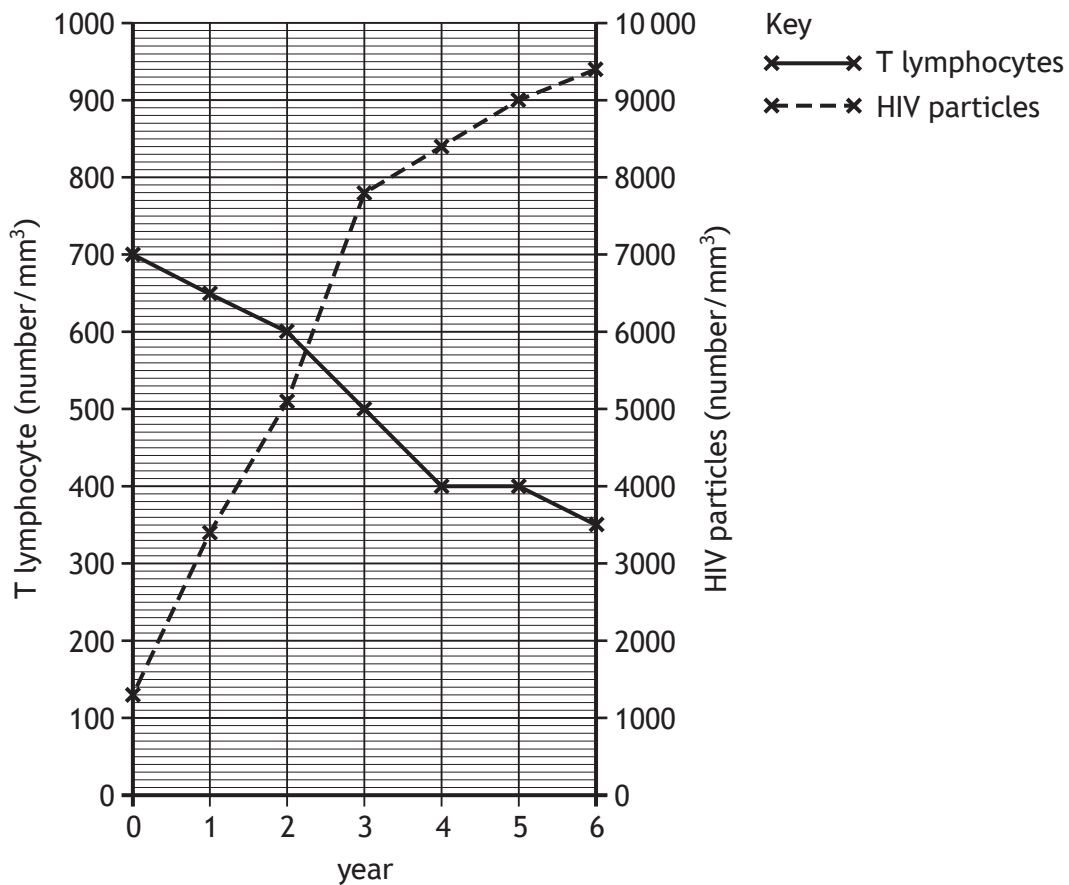
21. The following steps occur during the inflammatory response:
1. Blood flow increases.
  2. Histamine is released by mast cells.
  3. Phagocytes accumulate at the site of infection.
  4. Vasodilation occurs and capillary permeability increases.

In which sequence do these steps occur?

- A 2, 1, 4, 3
  - B 4, 2, 1, 3
  - C 4, 1, 3, 2
  - D 2, 4, 1, 3
22. Autoimmune diseases are a result of:
- A T lymphocytes responding to pathogens
  - B T lymphocytes responding to self-antigens
  - C B lymphocytes responding to pathogens
  - D B lymphocytes responding to self-antigens.
23. Some individuals have allergies, which mean they cannot receive certain vaccines. These individuals may benefit from vaccination programmes through:
- A herd immunity
  - B antigenic variation
  - C non-specific immunity
  - D personalised medicine.

[Turn over

24. The graph shows the relationship between the number of T lymphocytes and the number of HIV particles present in the blood of an infected individual over a 6-year period.



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

- A The ratio of T lymphocytes to HIV particles at year 4 is 1:21.  
 B The HIV particle number increased fastest between years 2 and 3.  
 C The T lymphocyte number decreases continuously over the 6-year period.  
 D The HIV particle number is always higher than the T lymphocyte number.
25. Which experimental design feature reduces the magnitude of experimental error in a clinical trial?
- A A placebo control  
 B A suitable group size  
 C Double-blind protocols  
 D Using randomised groups

[END OF QUESTION PAPER]

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