National Qualifications 2026

X840/76/12

Human Biology
Paper 1 — Multiple choice

TUESDAY, 28 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.

You must leave your answer booklet on your desk; if you do not, you could lose all the marks for this paper.

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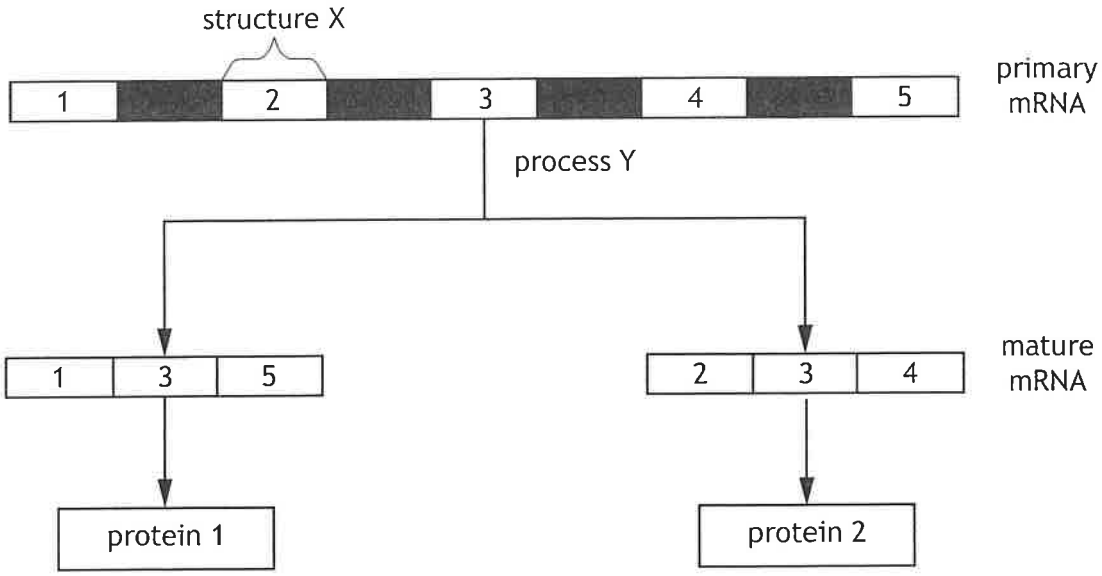
Attempt ALL questions

1. The diagram shows a stage during the synthesis of two different proteins.



Identify structure X and process Y.

	Structure X	Process Y
A	exon	translation
B	intron	alternative splicing
C	exon	alternative splicing
D	intron	translation

2. One cycle of PCR takes 2 minutes.

If the original sample contained one molecule of DNA, how many DNA molecules will be present after 20 minutes?

A 10

B 512

C 1024

D 2048

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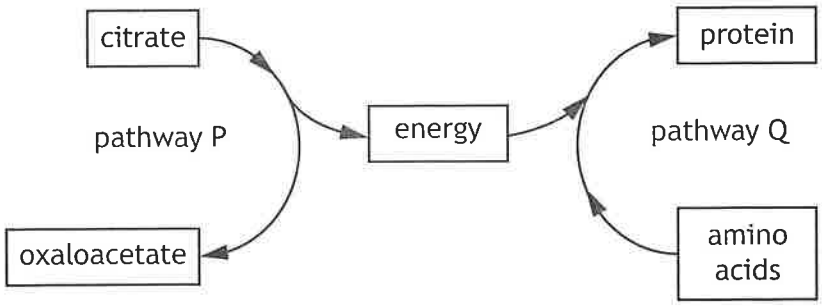
3. The following are descriptions of three chromosome structure mutations:

   1. A section of a chromosome is reversed.
   2. A section of a chromosome is added from its homologous partner.
   3. A section of a chromosome is added to a chromosome that is not its homologous partner.

   Which row in the table matches the description with the type of chromosome structure mutation?

	Chromosome structure mutation		
	Translocation	**Inversion**	**Duplication**
A	3	1	2
B	2	1	3
C	1	3	2
D	3	2	1

4. The diagram shows two linked metabolic pathways.



Which row in the table identifies the type of metabolic pathway and whether ATP is produced or required?

	Pathway	**Type of metabolic pathway**	**ATP**
A	P	anabolic	produced
B	P	catabolic	required
C	Q	anabolic	required
D	Q	catabolic	produced

[Turn over

5. An investigation was carried out into the effect of substrate concentration on enzyme activity.

Catalase is an enzyme that breaks down hydrogen peroxide to water and oxygen.

Test tubes were set up containing 5 cm^3 of hydrogen peroxide at different concentrations.

Catalase was added to each test tube and the volume of oxygen produced was measured.

Which row in the table identifies variables in this investigation?

	Independent variable	Dependent variable	Controlled variable
A	concentration of hydrogen peroxide	enzyme activity	volume of oxygen
B	concentration of hydrogen peroxide	enzyme activity	volume of hydrogen peroxide
C	enzyme activity	concentration of hydrogen peroxide	volume of hydrogen peroxide
D	enzyme activity	concentration of hydrogen peroxide	volume of oxygen

6. An investigation into the effect of substrate concentration on enzyme activity showed that enzyme activity levelled off at high substrate concentrations.

The explanation for this observation is that

A all the active sites are occupied

B no active sites are occupied

C the affinity of the active site has increased

D the affinity of the active site has decreased.

7. Three drops of iodine solution were added to a test tube containing 5 cm^3 of starch suspension, turning the starch suspension blue/black. When 1 cm^3 of enzyme amylase was added, the blue/black colour disappeared. It was concluded that the starch was broken down by the amylase.

To show that the starch was broken down by the amylase, a control test tube would contain

A 5 cm^3 of distilled water, 3 drops of amylase and 1 cm^3 of iodine solution

B 5 cm^3 of distilled water, 3 drops of iodine solution and 1 cm^3 of amylase

C 5 cm^3 of starch suspension, 3 drops of distilled water and 1 cm^3 of amylase

D 5 cm^3 of starch suspension, 3 drops of iodine solution and 1 cm^3 of distilled water.

8. The following list describes some effects of male hormones:

1. Stimulates sperm production.
2. Activates the prostate gland.
3. Inhibits the seminal vesicles.
4. Stimulates the interstitial cells.

Which of these are effects of testosterone?

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

9. The onset of puberty is controlled by a hormone.

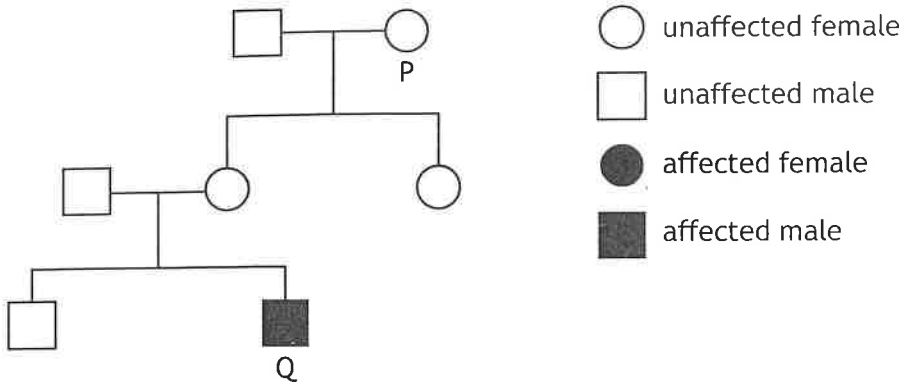
Which row in the table identifies this hormone and matches it with its site of production and target tissue?

	Hormone	Site of production	Target tissue
A	releaser hormone	pituitary gland	hypothalamus
B	FSH	hypothalamus	pituitary gland
C	releaser hormone	hypothalamus	pituitary gland
D	FSH	pituitary gland	hypothalamus

[Turn over

10. Haemophilia is a sex-linked recessive genetic disorder.

The diagram shows the pattern of inheritance of haemophilia in a family over three generations.



The allele for haemophilia is represented by 'h'.

Which row in the table shows the genotypes of individuals P and Q?

	Genotype of P	Genotype of Q
A	X^hX^h	X^HY
B	X^HX^h	X^HY
C	X^hX^h	X^hY
D	X^HX^h	X^hY

11. Compared to amniocentesis, chorionic villus sampling (CVS) can be carried out

A earlier in pregnancy and has a higher risk of miscarriage

B earlier in pregnancy and has a lower risk of miscarriage

C later in pregnancy and has a higher risk of miscarriage

D later in pregnancy and has a lower risk of miscarriage.

12. The table contains information about the rate of blood flow to parts of an individual's body at rest and during exercise.

	Rate of blood flow to body part (cm^3/min)				
	Heart muscle	Skin	Small intestine	Kidneys	Brain
At rest	250	500	700	1000	750
During exercise	750	1500	150	550	750

Which of the following statements describes the effect of exercise on blood flow?

A The rate of blood flow to all body parts changes.

B The decrease in blood flow to the small intestine is equal to the decrease in blood flow to the kidneys.

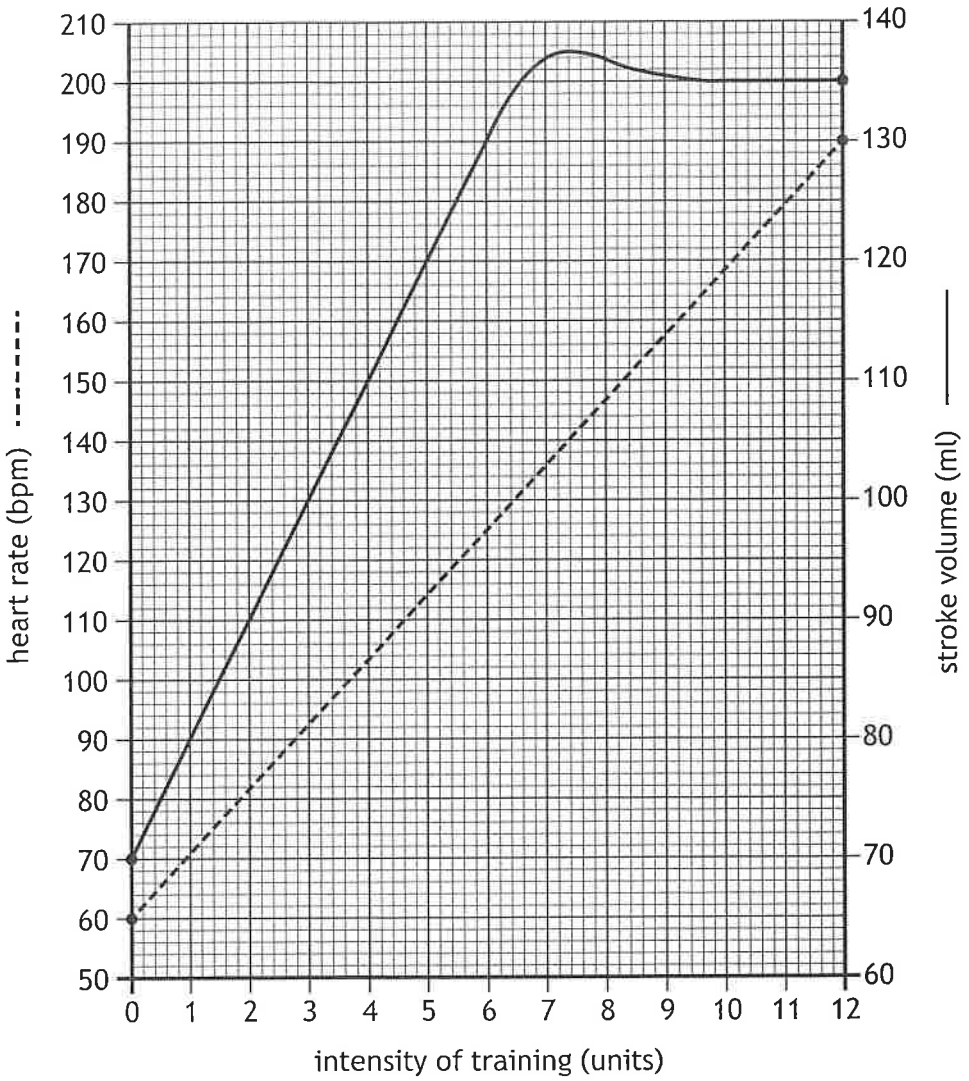
C The increase in blood flow to the skin is two times greater than the increase in blood flow to the heart muscle.

D The rate of blood flow to the heart muscle increases by 500 times.

[Turn over

13. The heart rate (HR) and stroke volume (SV) of an individual was measured throughout a training session.

The graph shows the results.



Calculate the increase in cardiac output as the intensity of training increased from 0–12 units.

A 21.45 l/min

B 21 450 l/min

C 25 650 l/min

D 510.7 l/min

14. A study was carried out to investigate the effect of a drug used to decrease blood pressure.

The following protocols were followed:

1. 50% of the participants were female.
2. Participant selection was randomised.
3. 300 000 participants completed the study.
4. The study included 20 repeated trials.

Identify the protocols that would make the study reliable.

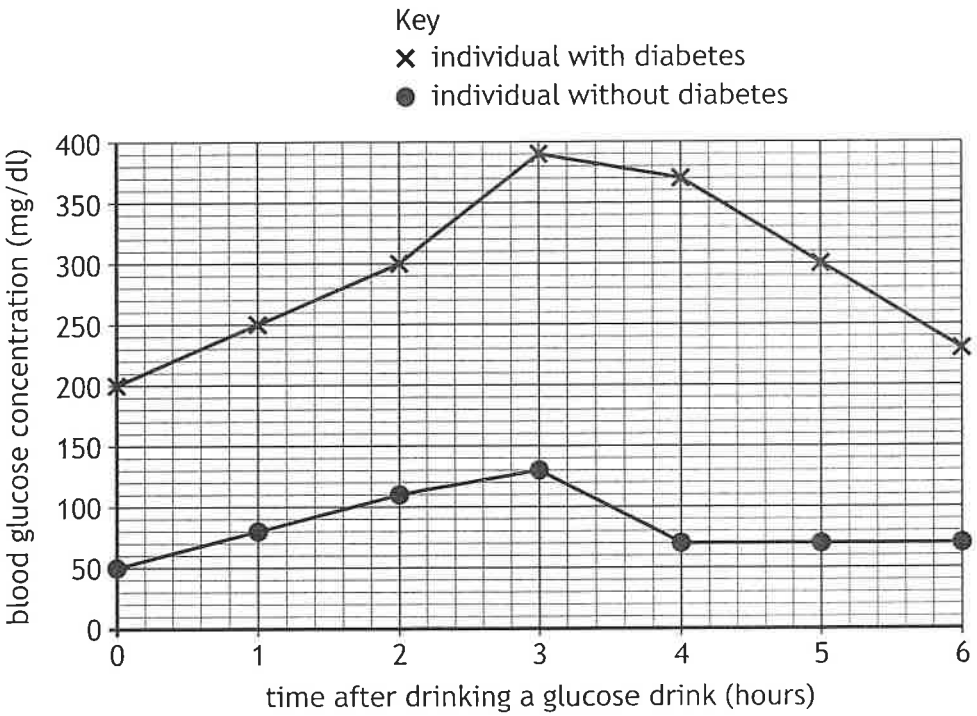
A 1 and 2

B 1 and 4

C 2 and 4

D 3 and 4

15. The graph shows the blood glucose concentrations of an individual with diabetes and an individual without diabetes, after a glucose drink.



Calculate the percentage increase in blood glucose concentration for the individual with diabetes three hours after the glucose drink.

A 49%

B 95%

C 160%

D 200%

[Turn over

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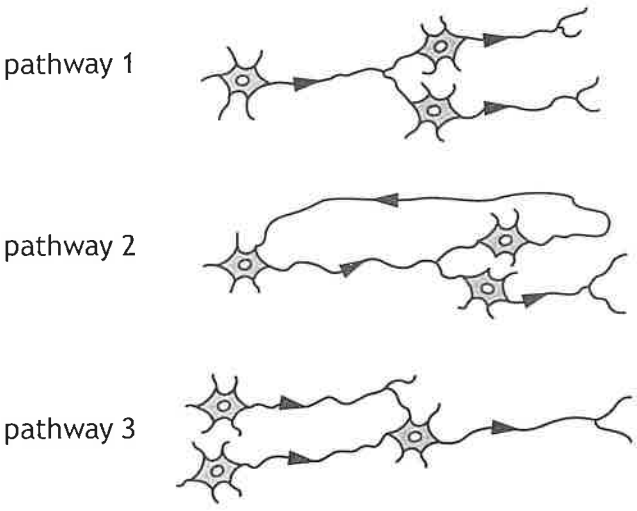
16. The diagram shows three neural pathways. The arrowheads show the direction of impulse.



Which row in the table identifies the types of neural pathways shown?

	Neural pathway		
	Converging	Diverging	Reverberating
A	1	3	2
B	3	1	2
C	2	1	3
D	3	2	1

17. There is localisation of brain functions in the cerebral cortex.
Which of the following are functions controlled by the cerebral cortex?

A Language processing and breathing rate
B Heart rate and conscious thought
C Language processing and recall of memory
D Recall of memory and breathing rate

18. Identify the structure that transfers information between the cerebral hemispheres and the hemisphere that processes information from the right visual field.

	Structure	Hemisphere
A	corpus luteum	left
B	corpus callosum	left
C	corpus callosum	right
D	corpus luteum	right

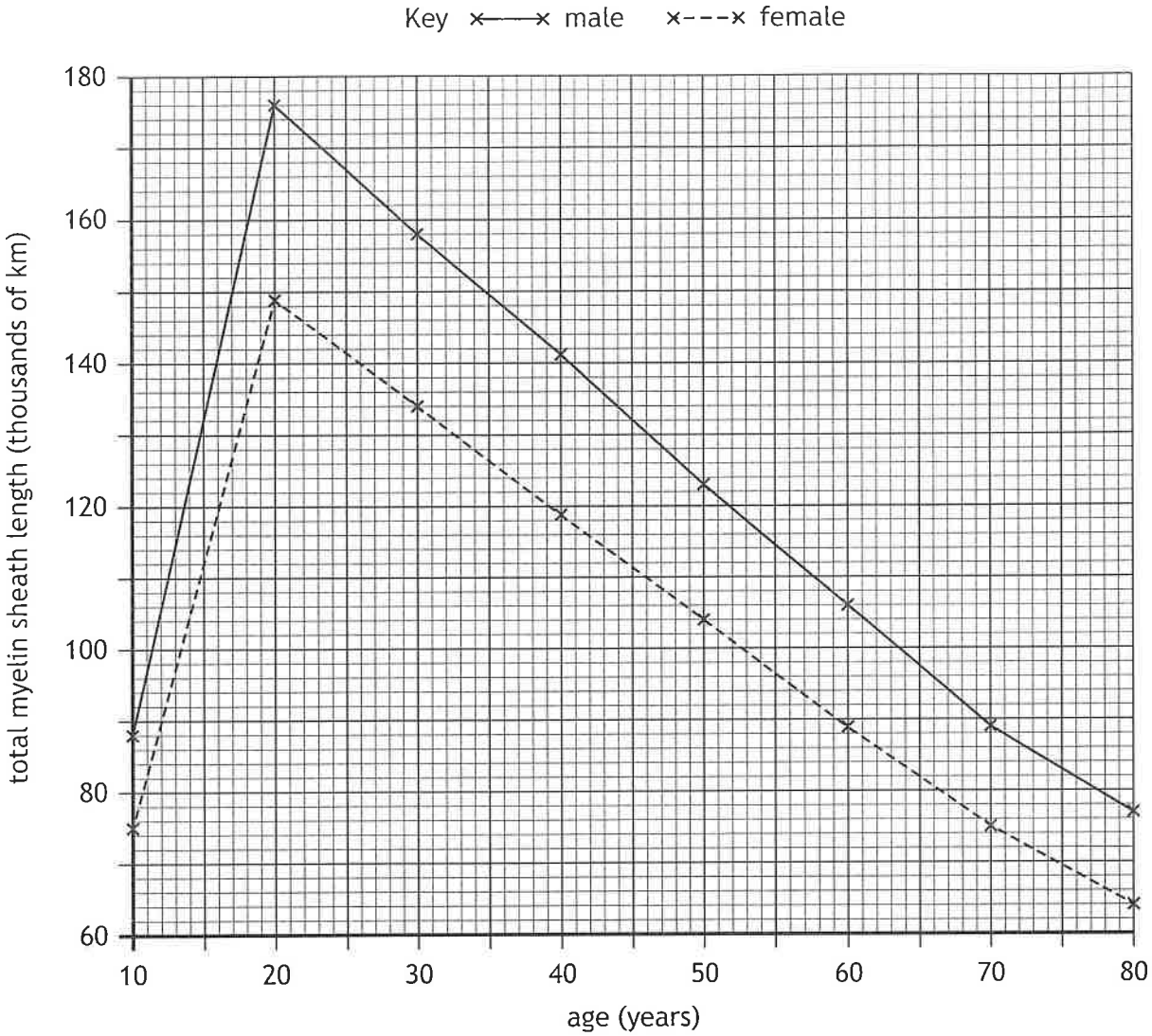
19. Which of the following stimulate neurons involved in the reduction of the intensity of pain?

A Dopamine
B Endorphins
C Noradrenaline
D Acetylcholine

[Turn over

20. Myelination occurs from birth to adolescence.

The graph shows the changes in total myelin sheath lengths for different ages in males and females. Fast impulse conduction occurs when the total myelin sheath length is greater than 100 000 km.

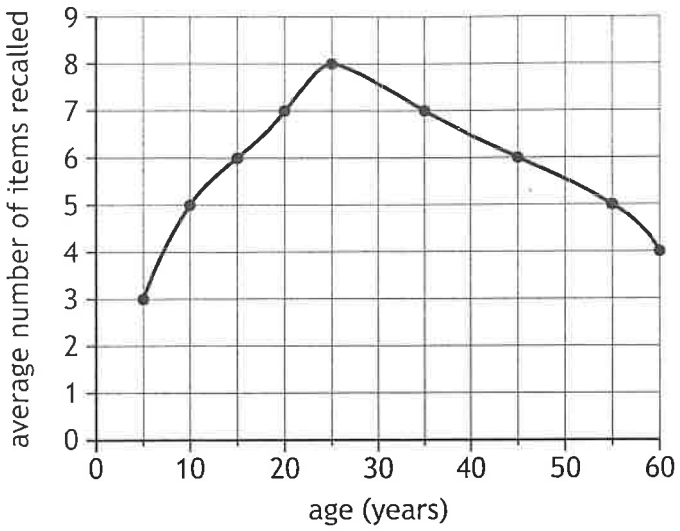


Which row in the table is correct for the data shown?

	Sex	Age (years)	Speed of impulse conduction	Response to stimuli
A	male	20	fast	slow
B	female	20	slow	fast
C	male	80	fast	fast
D	female	80	slow	slow

21. Individuals of various ages were shown 12 different items and then asked to recall as many as they could.

The graph shows how the average number of items recalled changed with age.



Which of the following statements is **not** supported by the data in the graph?

A The average number of items recalled was greatest at 25 years of age.

B The average percentage recall at age 60 is 33%.

C The average number of items recalled was the same at ages 10 and 55.

D The average percentage recall at age 25 is 66%.

[Turn over

22. The table shows the results of an experiment to demonstrate the serial position effect.

Position of item in the list	Percentage recall
1	93
2	81
3	64
4	54
5	42
6	27
7	31
8	51
9	54
10	72

Which row in the table shows the reason for the percentage recall of item 6 and the type of memory involved?

	Reason	Memory involved
A	displacement	long term
B	displacement	short term
C	decay	long term
D	decay	short term

23. An increase in sensitivity of neurotransmitter receptors causes

A drug tolerance due to repeated exposure to agonists

B drug addiction due to repeated exposure to agonists

C drug tolerance due to repeated exposure to antagonists

D drug addiction due to repeated exposure to antagonists.

24. The following events take place at the site of tissue damage:

P Increased blood flow

Q Phagocytes accumulate

R Mast cells release histamine

S Cytokines are released

The order of these events is

A P, Q, S, R

B R, Q, P, S

C R, P, Q, S

D S, Q, R, P.

25. Two groups of subjects volunteered for a clinical trial of a new vaccine.

One group was given the new vaccine and the second group was given a placebo.

The subjects were allocated to the two groups in a randomised way, taking account of age and gender, in order to

A reduce bias

B reduce experimental error

C establish significant differences

D ensure the comparison was reliable.

[END OF QUESTION PAPER]