



YUYING SECONDARY SCHOOL
PRELIMINARY EXAMINATION
Secondary 4

NAME

CLASS

REG. NO

BIOLOGY**6093/1**

Paper 1

22 August 2024**1 hour**

Additional Materials: Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Write your name, class and register number on this question booklet and the separate Answer Sheet.

There are **forty** questions on this paper. Answer **all** questions.For each question there are four possible answers **A, B, C and D**.Choose the one you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.**Read the instructions on the Answer Sheet very carefully.**

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

The use of an approved calculator is expected, where appropriate.

For Examiner's Use	
Total	

This document consists of 14 printed pages.

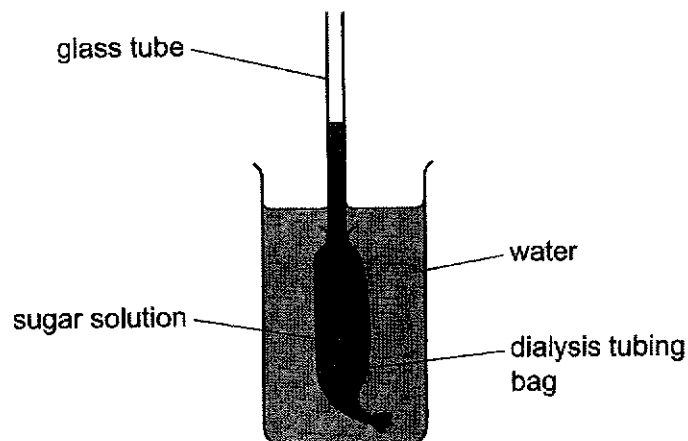
- 1 Which organelle is **not** correctly paired with its cellular function?

	organelle	function
A	endoplasmic reticulum	transports proteins to the Golgi body
B	Golgi body	stores proteins and carbohydrates
C	mitochondrion	releases energy
D	ribosome	joins amino acids together

- 2 Which statement about the muscle cells is **incorrect**?

- A They contain few mitochondria.
 B They contain many nuclei.
 C They contract and relax to produce movement.
 D They have contractile protein fibres.

- 3 The diagram shows an experiment demonstrating osmosis using a dialysis tubing bag.



After 30 minutes, the level of the liquid in the glass tube goes1..... because the water had a2..... water potential than the sugar solution.

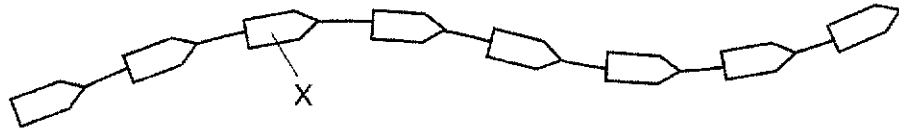
Which words correctly complete the statement?

	1	2
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3

A	down	lower
B	down	higher
C	up	lower
D	up	higher

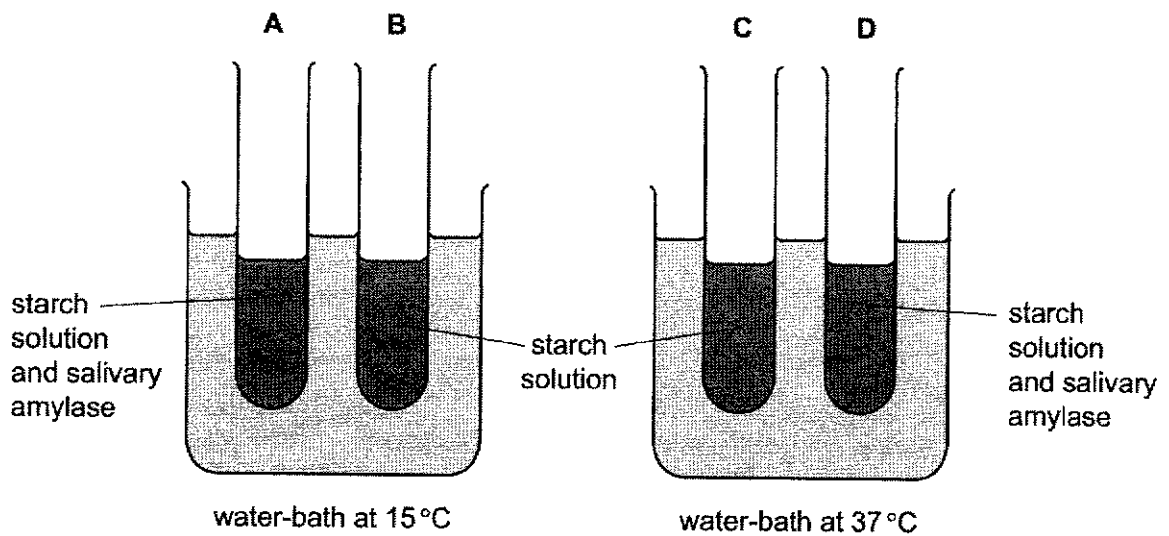
- 4 The diagram shows part of a protein molecule.



What does X represent?

- A amino acid
 - B fatty acid
 - C glycerol
 - D sugar
- 5 Which food-testing solution shows a positive result when it turns from blue to purple?
- A Benedict's solution
 - B biuret solution
 - C ethanol
 - D iodine solution
- 6 The apparatus shown is used for an experiment on starch digestion.

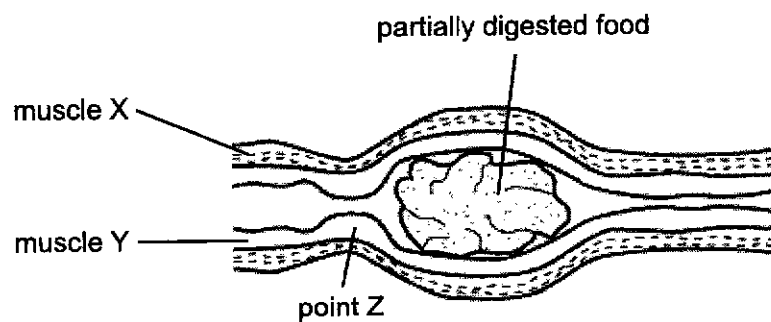
Which test-tube contains the most sugar after 20 minutes?



- 7 Which of the following is **not** an effect of alcohol consumption on the body?
- A brain damage
 B decreased reaction time
 C decreased self-control
 D liver disease
- 8 Which row correctly indicates the structural properties of a villus that allow the rate of absorption in the small intestine to increase?

	rich network of capillaries	folding of the cell membrane	thick surface epithelium	
A	✓	✓	✓	key = yes = no
B	✓	✓	x	
C	✓	x	✓	
D	x	✓	x	

- 9 The diagram shows a section of the alimentary canal pushing along partially digested food.



Muscle Y is contracting at point Z.

Which row correctly identifies the muscles and direction of movement of the partially digested food?

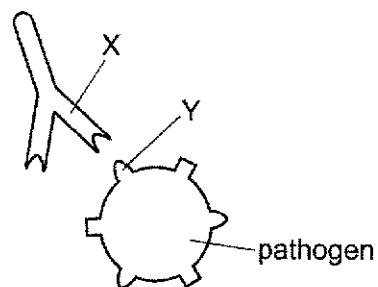
	muscle X	muscle Y	direction of movement
A	circular	longitudinal	left to right
B	circular	longitudinal	right to left
C	longitudinal	circular	left to right
D	longitudinal	circular	right to left

10 Which statements describe how the structures in the circulatory system function?

- 1 has a muscular pump to push blood into vessels
- 2 valves ensure one-way blood flow
- 3 veins to take blood away from the heart
- 4 has vessels to return blood to the heart

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

11 The diagram shows one of the mechanisms used by the immune system to destroy a pathogen that enters the body.



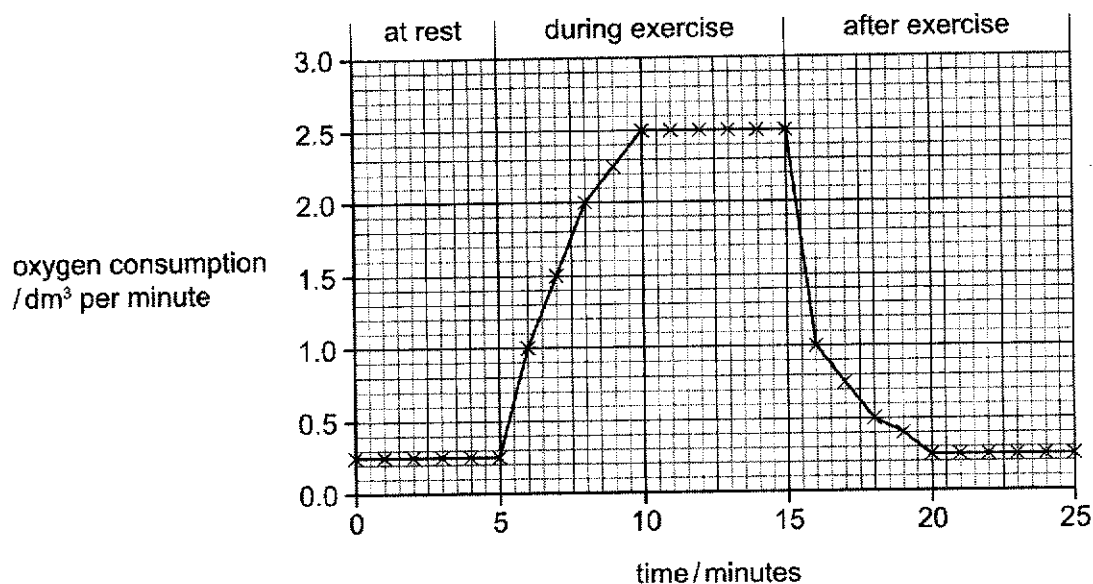
Which row describes the structures involved?

	structure X	X is made by	structure Y
A	antigen	lymphocytes	antibody
B	antigen	phagocytes	antibody
C	antibody	lymphocytes	antigen
D	antibody	phagocytes	antigen

12 A student measured his oxygen consumption before, during and after exercise.

The results are shown in the graph.

6



At which time is the oxygen debt being removed?

- A 5–10 minutes
- B 5–15 minutes
- C 15–20 minutes
- D 20–25 minutes

13 During inspiration, the processes listed take place.

- P volume of the chest cavity increases
- Q air rushes into the lungs
- R pressure in the lungs decreases
- S external intercostal muscles contract
- T diaphragm moves down, ribs move upwards and outwards

What is the correct sequence for these processes?

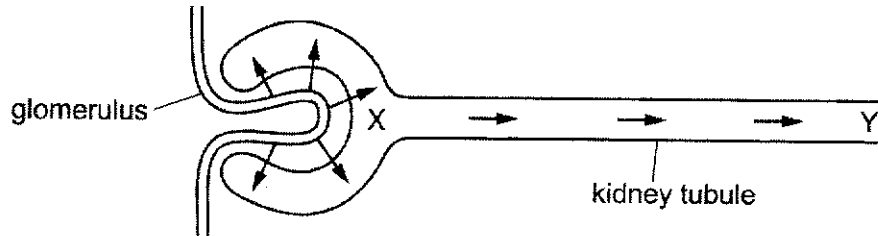
- A Q → P → S → R → T
- B S → T → P → R → Q
- C Q → P → S → T → R
- D S → Q → R → P → T

14 Which row describes the functions of the bladder, kidneys and liver?

	production of urea	excretion of urea	storage of urine
A	liver	bladder	kidneys
B	bladder	kidneys	liver

C	liver	kidneys	bladder
D	kidneys	liver	bladder

- 15 Which statement correctly explains the difference in amino acid concentration in the kidney tubule between X and Y?



- A Amino acid concentration is higher at X than at Y because amino acids move out of the kidney tubule by osmosis.
 - B Amino acid concentration is higher at X than at Y because amino acids have been actively transported out of the kidney tubule.
 - C Amino acid concentration is higher at Y than at X because amino acids diffuse into the kidney tubule.
 - D Amino acid concentration is higher at Y than at X because amino acids have been actively transported into the kidney tubule.
- 16 Which row shows where glucose will be found in the body of a healthy human after eating a meal?

	renal artery	renal vein	glomerulus	nephron	ureter
A	yes	no	yes	yes	yes
B	yes	yes	no	no	no
C	yes	yes	yes	yes	no
D	no	yes	no	no	yes

- 17 Which statement best describes dialysis fluid entering a dialysis machine?

- A It has a higher concentration of urea than the blood entering the dialysis machine.
- B It has a higher concentration of urea than the blood leaving the dialysis machine.
- C It has a lower concentration of urea than the blood entering the dialysis machine.
- D It has a lower concentration of urea than the blood leaving the dialysis machine.

- 18 At which part of the kidney tubule does anti-diuretic hormone (ADH) have its effect and what effect does it have?

	part	effect
--	------	--------

A	glomerulus	less water reabsorbed
B	glomerulus	more water reabsorbed
C	collecting duct	less water reabsorbed
D	collecting duct	more water reabsorbed

- 19** Which changes occur in an eye when it focuses on distant objects?

	ciliary muscle	lens	suspensory ligaments
A	contracts	thicker	slacken
B	relaxes	thinner	tighten
C	contracts	thicker	tighten
D	relaxes	thinner	slacken

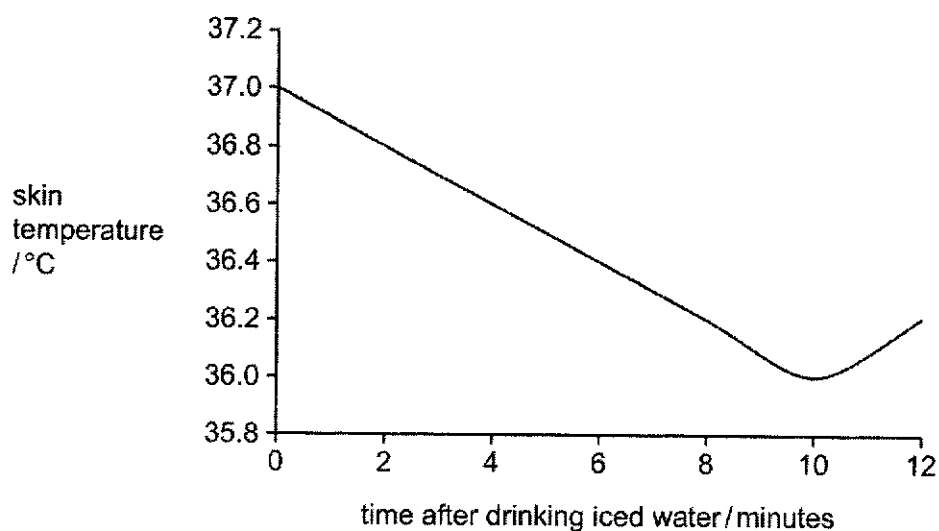
- 20** A boy accidentally touches a very hot object and immediately takes his hand away.

What is the effector in this reflex action?

- A** a heat receptor in his hand
 - B** a motor neurone
 - C** a muscle in his arm
 - D** the spinal cord
- 21** A scientist investigated the effect of drinking iced water on skin temperature. She drank a large volume of iced water and monitored the temperature of her skin.

The results are shown on the graph.

9



Which explanation of the change in skin temperature during the first 10 minutes is correct?

- A Vasoconstriction occurred, increasing blood flow to the skin.
- B Vasoconstriction occurred, reducing blood flow to the skin.
- C Vasodilation occurred, increasing blood flow to the skin.
- D Vasodilation occurred, reducing blood flow to the skin.

22 Which is a common symptom of both influenza and pneumococcal disease?

- A cough
- B nausea
- C runny nose
- D skin rash

23 Which of the following is present in a virus but **not** in a bacterium?

- A cell wall
- B nucleus
- C protein coat
- D ribosome

24 Which row shows structures that are present in **both** palisade mesophyll cells and root hair cells?

	cell wall	chloroplasts	cytoplasm	vacuole
A	✓	✓	✗	✗

key

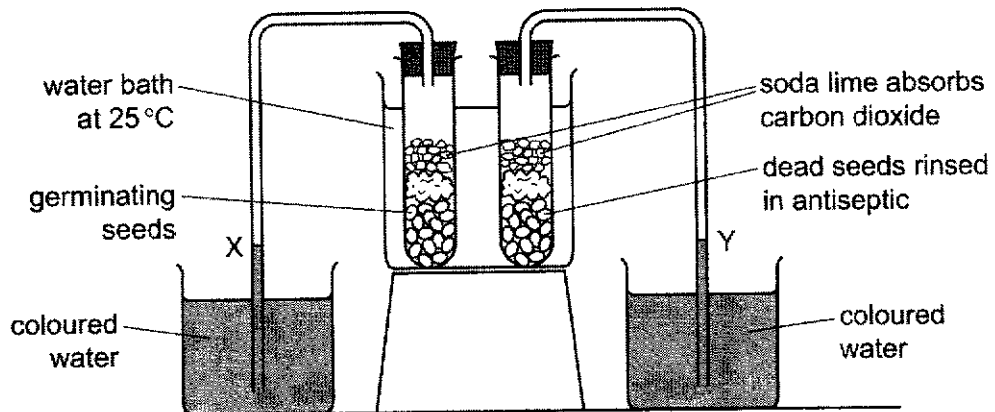
= present

= absent

10

B	x	✓	x	✓
C	x	x	✓	✓
D	✓	x	✓	✓

25 An experiment is set up to investigate the uptake of oxygen by germinating seeds.

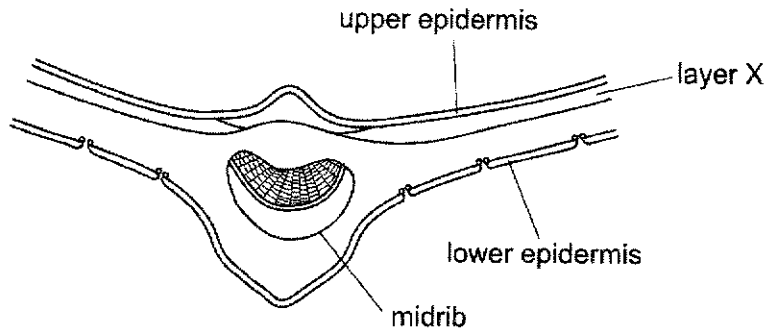


What happens to the levels of the coloured water at X and Y?

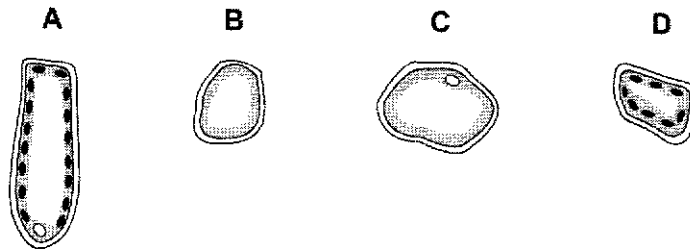
	X	Y
A	falls	rises
B	falls	unchanged
C	rises	falls
D	rises	unchanged

26 The diagram shows a cross-section of part of a leaf.

11

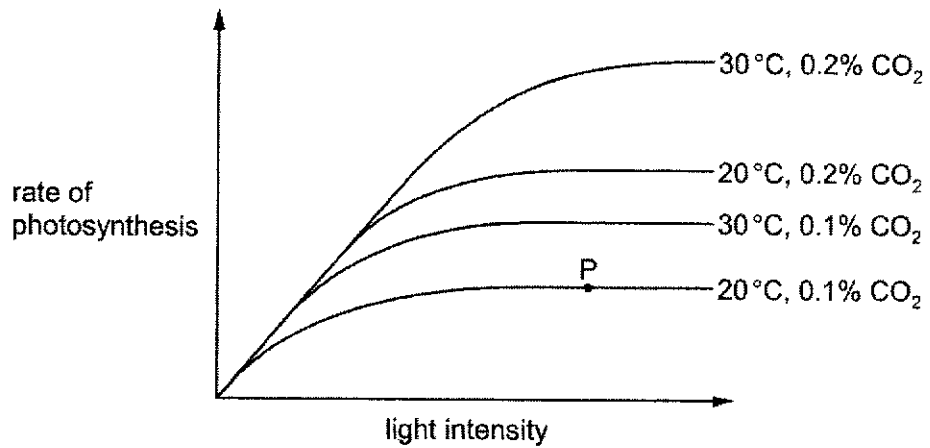


Which type of cell is found in layer X?



27 The diagram shows how the rate of photosynthesis varies with light intensity.

The four curves show different conditions of temperature and carbon dioxide concentration.



What limits the rate of photosynthesis at point P?

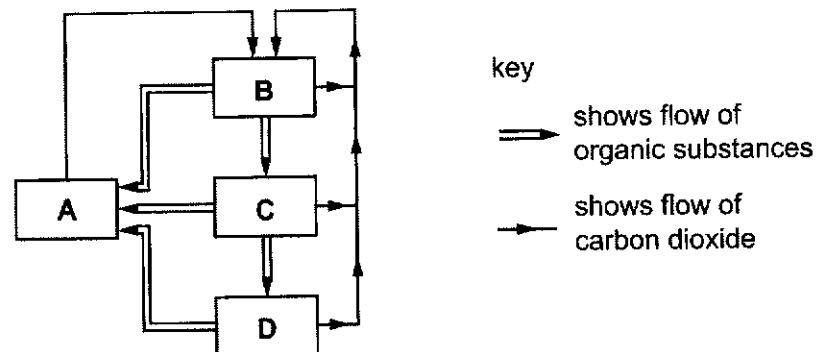
	light intensity	carbon dioxide concentration	temperature
A	✓	✓	x
B	✓	x	x
C	x	✓	✓
D	x	x	✓

key
 = yes
 = no

28 The diagram represents the flow of substances within a balanced ecosystem.

The boxes are various trophic levels.

Which box represents decomposers?



29 150 MJ of energy enters a consumer through its food.

Which row shows what happens to this energy?

	energy used in tissue growth / MJ	energy lost to the environment / MJ
A	10	140
B	15	135
C	30	120
D	60	90

30 When a river is polluted by fertilisers, the following processes may occur.

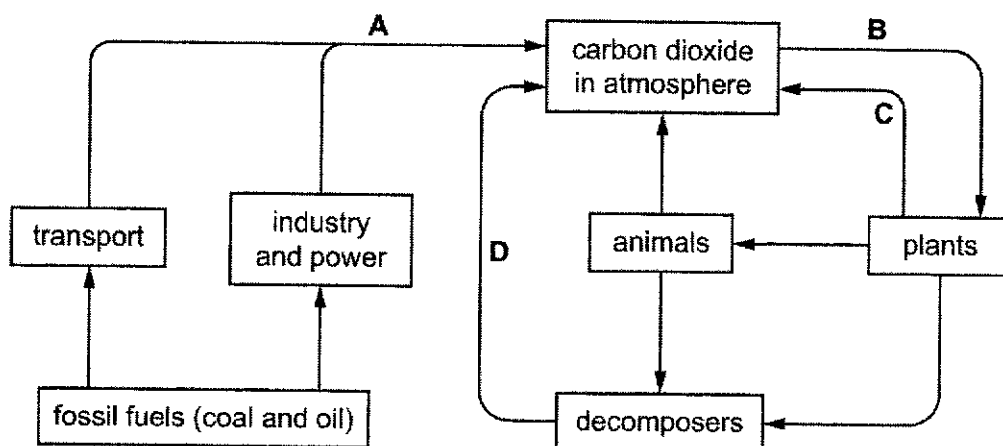
- 1 growth of decomposers
- 2 growth of surface producers
- 3 death of submerged producers

What is the correct sequence for these processes?

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

- 31 The diagram shows part of the carbon cycle.

Which process reduces the carbon dioxide content of the atmosphere?

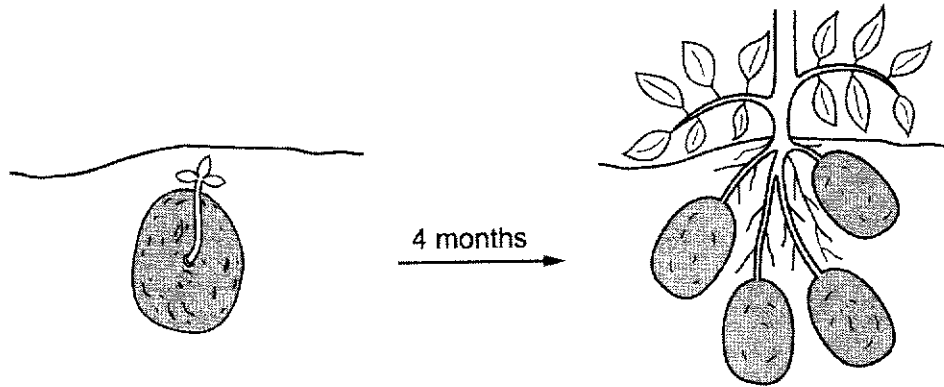


- 32 Which human activity contributes most to global warming?
- A air pollution by insecticides
 B reducing global meat production
 C emissions from burning fossil fuels
 D water pollution by sewage
- 33 The structure of DNA involves two strands coiled together to form a double helix.

Which pairing of bases between the two strands is correct?

- A A and G
 B A and T
 C C and A
 D C and T
- 34 Which statement describes human male gametes?
- A large, few and non-motile
 B large, numerous and motile
 C small, few and non-motile
 D small, numerous and motile

- 35 Potatoes are stem tubers. A tuber can be placed in the ground to grow into another plant, which can grow many more tubers.



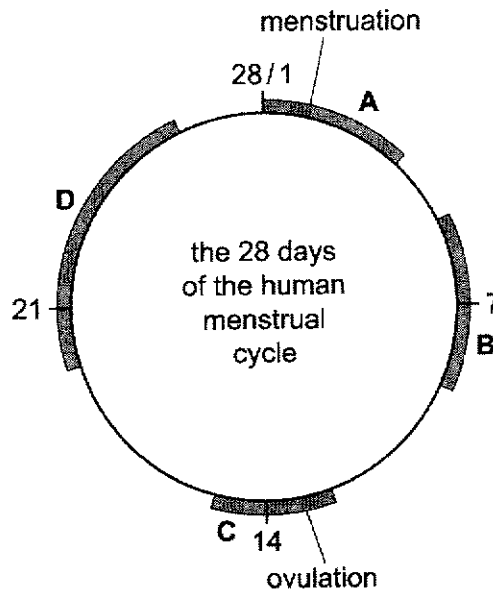
The diploid number of the potato plant is 24.

How many chromosomes will there be in the cells of the stem, the leaf and the pollen?

	stem	leaf	pollen
A	24	24	12
B	24	12	48
C	48	12	24
D	48	48	12

- 36 The diagram shows some events of the menstrual cycle.

In which shaded zone of the cycle would progesterone levels be the highest?



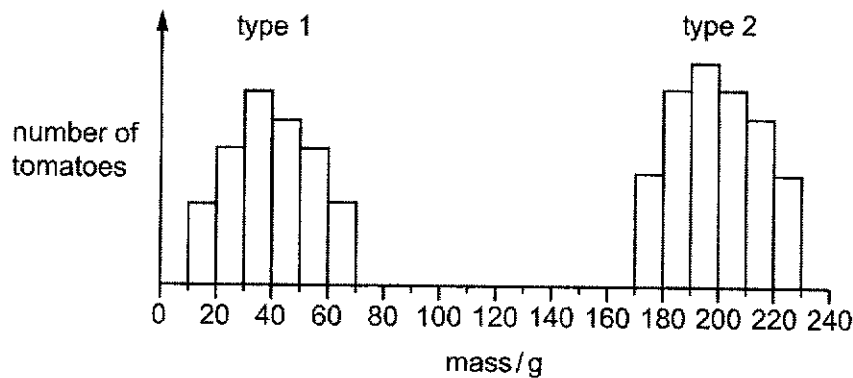
- 37 Which set of conditions is necessary for substances to be transferred across the placenta so that the fetus develops successfully?

	substance	concentration in fetal blood flowing to the placenta	concentration in maternal blood in placenta
A	amino acids	low	high
B	carbon dioxide	low	high
C	glucose	high	low
D	vitamins	high	low

- 38 Which parents could produce offspring with blood group O?

- A heterozygous father with blood group A and heterozygous mother with blood group B
 B heterozygous father with blood group A and homozygous mother with blood group B
 C homozygous father with blood group A and heterozygous mother with blood group B
 D homozygous father with blood group A and homozygous mother with blood group O

- 39 The graph shows the masses of two different types of tomatoes.



What can be concluded from the graph?

- A Genes do not affect the mass of tomatoes.
 B Type 1 tomatoes show continuous variation.
 C Type 2 tomatoes are sometimes smaller than type 1 tomatoes.
 D Type 2 tomatoes show discontinuous variation.
- 40 In areas of the world where the disease malaria is present, the sickle-cell allele is more common. What is the reason for this?
- A Both diseases are caused by the same allele.
 B Heterozygous individuals with the sickle-cell allele are less likely to have malaria.

- C Heterozygous individuals with the sickle-cell allele are more likely to have malaria.
- D These are parts of the world with many diseases.

END OF PAPER

YYSS 2024 Sec 4 Biology Prelim Mark Scheme

Paper 1

1	2	3	4	5	6	7	8	9	10
B	A	D	A	B	D	B	B	C	B
11	12	13	14	15	16	17	18	19	20
C	C	B	C	B	C	C	D	B	C
21	22	23	24	25	26	27	28	29	30
B	A	C	D	D	A	C	A	B	D
31	32	33	34	35	36	37	38	39	40
B	C	B	D	A	D	A	A	B	B

Paper 2

1ai	40 minutes	[1]										
1aii	<p>Describe 1 – As <u>temperature increased from 20°C to 40°C</u>, the time taken for washing powder B to remove the stain <u>decreased from 58 to 20</u>.</p> <p>Explain 1 – As temperature increased, the <u>rate of effective collisions</u> between the <u>enzymes</u> in the washing powder and <u>substrates</u> in the stain <u>increased</u>, resulting in a higher rate of enzyme-substrate complex formation and hence increased rate of reaction. Hence, the <u>washing powder became more effective as temperature increased</u>.</p> <p>Describe 2 – At 40°C, the <u>time taken</u> for washing powder B to remove the stain <u>was the lowest at 20 minutes</u>.</p> <p>Explain 2 – 40°C was the optimum temperature of the <u>enzyme</u>, hence <u>rate of effective collisions</u> between the enzymes of the washing powder and the substrates in the stain was the <u>highest</u>. Hence, the washing was the <u>most effective at this temperature</u>.</p>	[1] [1] [1] [1]										
1aiii	<table border="1"> <tbody> <tr> <td>Washing powders A and B do not work at 50 °C.</td><td></td></tr> <tr> <td>Washing powders A and B have the same activity at 37 °C.</td><td>✓</td></tr> <tr> <td>Washing powder A can remove the stain in 15 minutes.</td><td></td></tr> <tr> <td>Washing powder A is more effective at lower temperatures than washing powder B.</td><td>✓</td></tr> <tr> <td>Washing powder B is active over a greater range of temperatures than washing powder A.</td><td></td></tr> </tbody> </table>	Washing powders A and B do not work at 50 °C.		Washing powders A and B have the same activity at 37 °C.	✓	Washing powder A can remove the stain in 15 minutes.		Washing powder A is more effective at lower temperatures than washing powder B.	✓	Washing powder B is active over a greater range of temperatures than washing powder A.		[1] ea
Washing powders A and B do not work at 50 °C.												
Washing powders A and B have the same activity at 37 °C.	✓											
Washing powder A can remove the stain in 15 minutes.												
Washing powder A is more effective at lower temperatures than washing powder B.	✓											
Washing powder B is active over a greater range of temperatures than washing powder A.												

1b	substrate – V enzyme – Z	[1] [1]
2a	cell A – phagocyte. It is responsible for <u>engulfing foreign particles through phagocytosis.</u> cell B – red blood cell. contains haemoglobin which binds to <u>oxygen and transports it from the lungs to the rest of the body</u>	[1] [1] [1] [1]
2bi	P – pulmonary artery Q – pulmonary vein R – aorta	[1] [1] [1]
2bii	X is the pulmonary valve. When the <u>right ventricle contracts</u> , the <u>pulmonary valve opens</u> , allowing blood to move <u>from the right ventricle to the pulmonary artery.</u> When the right ventricle <u>begins to relax</u> , the <u>pulmonary valve closes</u> , <u>preventing the backflow of blood into the right ventricle.</u>	[1] [1] [1]
3ai	Cell X has <u>hair-like structures</u> on the surface of the cell known as <u>cilia.</u> Mucus from the goblet cell <u>trap dust and bacteria</u> which enter the trachea. The cilia on cell X helps to <u>sweep the mucus towards the pharynx</u> to be removed from the trachea.	[1] [1] [1]
3aii	Cigarette smoker contains <u>tar</u> which <u>paralyses cilia</u> in found in the <u>air passages</u> , causing them to be unable to sweep mucus. This <u>increases risk of the smoker developing chronic bronchitis/emphysema/causes breathing difficulties/chronic coughing.</u>	[1] [1]
3b	Describe 1 – pH in muscles <u>decreased rapidly from pH 7.07 to 6.55 during the 2 minutes of exercise.</u> Explain 1 – When <u>energy demand exceeds the energy supply from aerobic respiration</u> , <u>anaerobic respiration occurs</u> at the same time to release more energy. <u>Lactic acid is formed</u> in the process, causing pH in the muscles to drop. At the same time, an <u>oxygen debt is incurred.</u> Describe 2 – pH in muscles then <u>gradually increased from 6.55 to 7.07 between 2 to 35 minutes</u> , reaching back to the original pH before exercise. Explain 2 – After exercise and <u>during rest</u> , <u>lactic acid is transported to the liver</u> , where lactic acid is <u>removed from the blood</u> , causing pH of blood to gradually increase back to normal	[1] [1] [1] [1] [1]
4a	Any 3 A hormone is a <u>chemical substance produced by an endocrine gland</u> <u>secreted directly into the bloodstream</u> which carries it to <u>one or more target organ to alter their activities</u>	[1] [1] [1]