

Biology Exam

Tuesday May 5th

09:00 – 10:30 (ET:10:52)

Instructions

1. Please ensure you have registered using [this Google question](#) (click for link).
2. A teacher will remotely 'invigilate' the exam via Google Meet you have been sent.
Please click on the Meet link you have been sent, but switch off your microphone and camera.
3. If you have a specific question during the exam please post it on the Meet chat.
4. The exam is 90 minutes long and a total of 80 marks.
5. There are 2 sections, A and B, each worth 40 marks.
5. Section A consists of 40 multiple choice questions and should be answered on the **Google Form** you have been sent.
Section B is 5 structured questions and should be answered using a Google Doc **which you must 'turn in' at the end.**

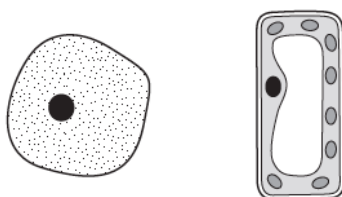
Section A: Multiple Choice

Please answer the 40 multiple choice questions using the **Google Form** provided.

1 Which row correctly shows the function of a cell structure and its location?

	cell structure	function	location
A	cell membrane	controls the passage of molecules into and out of cells	both plant and animal cells
B	cell membrane	maintains turgor	both plant and animal cells
C	cell wall	controls the passage of molecules into and out of cells	plant cells only
D	cell wall	maintains turgor	animal cells only

2 The diagram shows two cells.



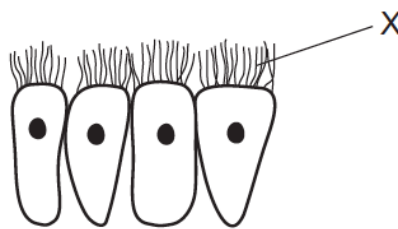
Which process can be carried out by only one of these cells?

- A controlling the chemical reactions in the cell
 - B controlling the movement of substances into the cell
 - C making starch inside the cell
 - D using glucose inside the cell
- 3 A plant cell is placed in a solution with a higher solute concentration than the cell contents. What will happen to the plant cell?
- A Absorb water until it bursts.
 - B Absorb water until it is turgid.
 - C Lose cytoplasm and shrink.
 - D Lose water and become flaccid.
- 4 Which of these structures is found in eukaryotic but not prokaryotic cells?
- A Cell wall
 - B Cytoplasm
 - C Nucleus
 - D Plasmid

- 5 What are the approximate percentages of oxygen and carbon dioxide in inspired air?

	percentage of oxygen	percentage of carbon dioxide
A	16	0.08
B	16	8.00
C	20	0.04
D	20	4.00

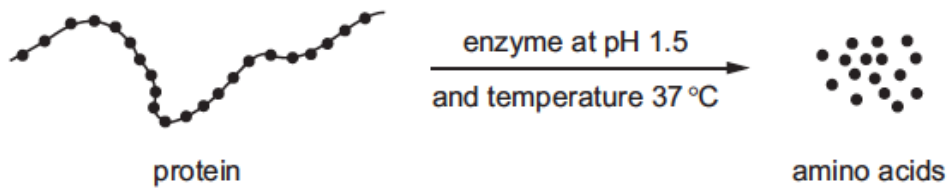
- 6 The diagram shows some cells from the lining of the trachea (windpipe) in the respiratory tract.



What is the function of the structures labelled X?

- A absorbing oxygen
 - B killing micro-organisms
 - C moving mucus
 - D trapping bacteria
- 7 Which disease is strongly associated with cigarette smoking?
- A anaemia
 - B bronchitis
 - C rickets
 - D scurvy
- 8 Which biological molecule is composed of amino acids?
- A Amylase
 - B DNA
 - C Nucleotide
 - D Starch

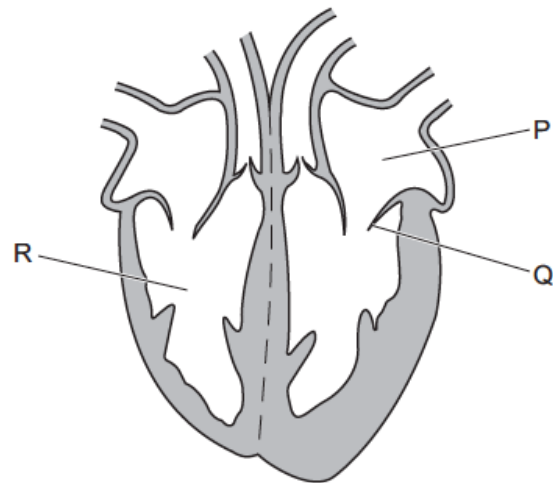
- 9 The diagram shows the effect of an enzyme working in the human digestive system.



What would reduce the rate of production of amino acids?

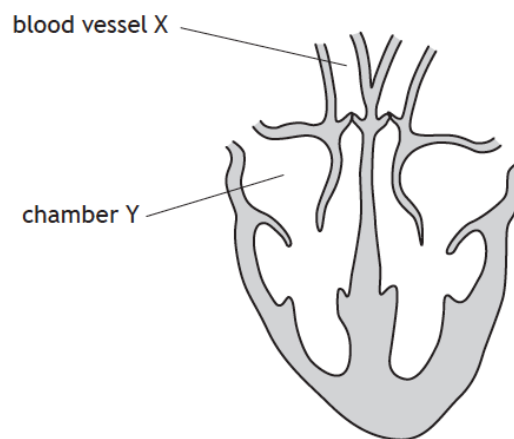
- A removing the amino acids as they are formed
 - B increasing the amount of protein
 - C raising the temperature to 37.1 °C
 - D raising the pH to 7.5
- 10 A young, active woman requires more of which constituent in her diet than a young, active man?
- A fat
 - B iron
 - C protein
 - D vitamin C
- 11 Increased blood flow within an artery is the result of muscle
- A relaxation causing vasodilation
 - B contraction causing vasodilation
 - C relaxation causing vasoconstriction
 - D contraction causing vasoconstriction.
- 12 Which statement about white blood cells is correct?
- A They can ingest bacteria by a process called phagocytosis.
 - B They can produce antigens in response to foreign antibodies.
 - C They convert fibrinogen to fibrin when bleeding happens.
 - D They transport toxins from body tissues to the liver.

- 13 The diagram shows a section of the heart.



What is the function of the structure labelled Q?

- A It controls the amount of blood leaving the heart.
 - B It increases the pressure in part R.
 - C It prevents backflow of blood into part P.
 - D It prevents blood flowing into the vena cava.
- 14 The diagram shows a mammalian heart and associated blood vessels.



Which row in the table identifies blood vessel X and chamber Y?

	blood vessel X	chamber Y
A	pulmonary artery	left atrium
B	pulmonary vein	right atrium
C	pulmonary artery	right atrium
D	pulmonary vein	left atrium

- 15 Which row in the table shows the type of message that is transferred through various structures in a reflex arc?

	sensory neurone	synapse	motor neurone
A	chemical	electrical	chemical
B	electrical	chemical	electrical
C	chemical	chemical	electrical
D	electrical	electrical	chemical

- 16 The eye switches from focusing on a distant television to focusing on a close up newspaper. Which change happens to the suspensory ligaments and to the lens during this switch?

	suspensory ligaments	lens
A	slack to tight	thicker
B	slack to tight	thinner
C	tight to slack	thicker
D	tight to slack	thinner

- 17 Hormones are released by:

- A** endocrine glands
- B** blood cells
- C** receptor cells
- D** target tissues.

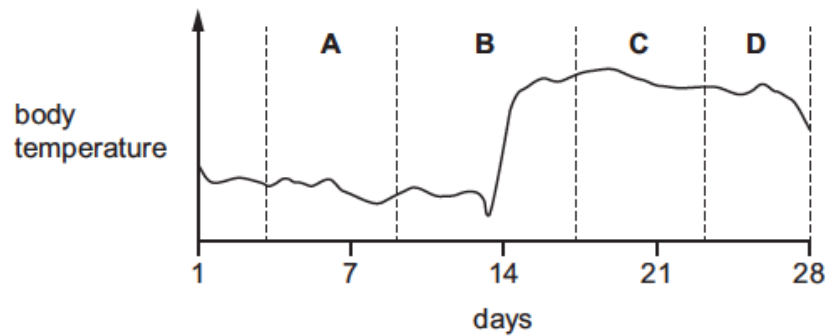
- 18 Which hormone is secreted by the pancreas?

- A** adrenaline
- B** insulin
- C** oestrogen
- D** testosterone

- 19 Urine produced after vigorous exercise is often much darker in colour than urine produced when at rest. Which reason explains why urine becomes darker in colour?

- A** Increased sweating and decreased ADH production.
- B** Decreased ADH production and increased urea production.
- C** Increased sweating and increased ADH production.
- D** Increased ADH production and decreased urea production.

- 20 The diagram shows a woman's body temperature during a menstrual cycle. Monitoring body temperature is one natural method of birth control. During which part of the menstrual cycle should sexual intercourse be avoided to try to prevent pregnancy?



- 21 Which row correctly pairs a hormone with its function in the menstrual cycle?

	hormone	function
A	FSH	stimulates the release of eggs
B	LH	stimulates the release of eggs
C	oestrogen	maintain uterus lining
D	progesterone	repairs uterus lining

- 22 What crosses the placenta from fetal blood to maternal blood in larger quantities than from maternal blood to fetal blood?

- A amino acids
- B carbon dioxide
- C glucose
- D oxygen

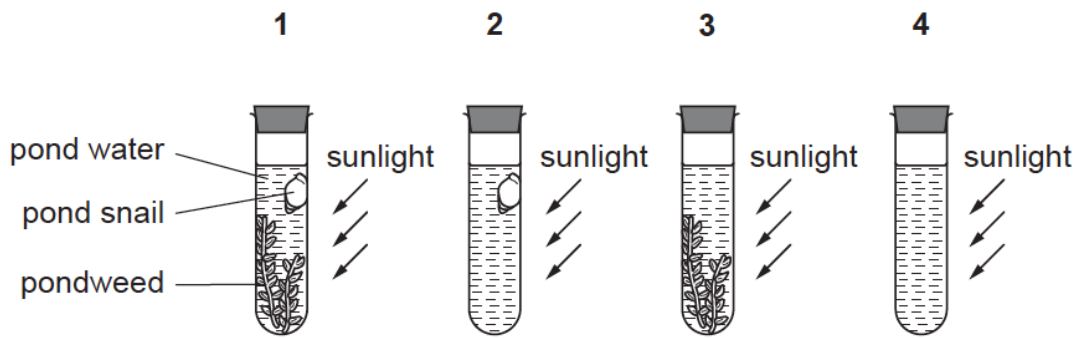
- 23 In which parts of a green leaf would most photosynthesis occur?

- A Palisade mesophyll and lower epidermis
- B Lower epidermis and guard cells
- C Guard cells and spongy mesophyll
- D Spongy mesophyll and palisade mesophyll

- 24 A lack of magnesium in plants leads to yellowing of the leaves. This is because magnesium is needed for:

- A carbohydrate synthesis.
- B chlorophyll synthesis.
- C protein synthesis.
- D respiration

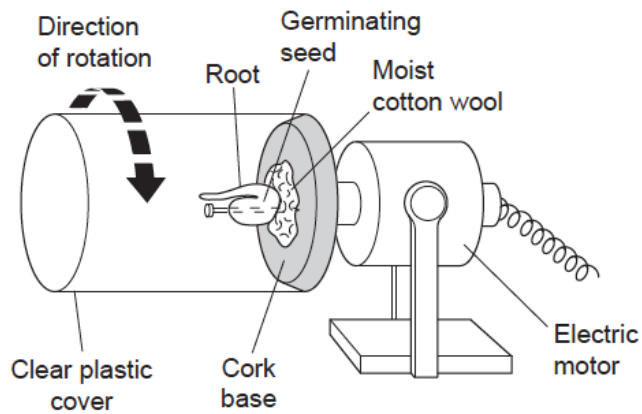
- 25 Pond snails and pondweed are living in water in sealed test tubes.



Carbon dioxide dissolves in water and forms an acid. In which test tube would the water become most acidic?

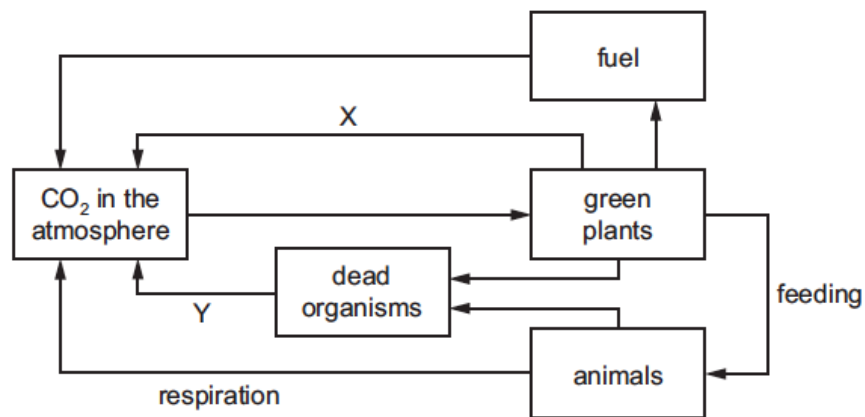
- A 1
 - B 2
 - C 3
 - D 4
- 26 Sieve plates are structures found in plants. What is their location and function?
- A Found in phloem and allow movement of sucrose
 - B Found in phloem and allow movement of water
 - C Found in xylem and allow movement of sucrose
 - D Found in xylem and allow movement of water
- 27 A student uses a simple potometer to study the effect of different temperatures on the cut shoot of a plant. What does the potometer actually measure?
- A Volume of water evaporating from the leaves of the shoot
 - B Volume of water produced by respiration in the shoot
 - C Volume of water taken up by the shoot
 - D Volume of water used in photosynthesis in the shoot

- 28 The diagram shows apparatus used in experiments on tropisms.



- When the apparatus rotates, the root grows horizontally. Which tropism is not showing its usual effect on the root?
- A Negative geotropism
 - B Positive geotropism
 - C Negative phototropism
 - D Positive phototropism
- 29 What must always be available to allow seeds to germinate?
- A carbon dioxide
 - B light
 - C mineral salts
 - D water
- 30 What eventually happens to all the energy in an ecosystem?
- A It is lost from the system as heat
 - B It is recycled by the decomposers
 - C It is used by the producers
 - D It is used by the top carnivore

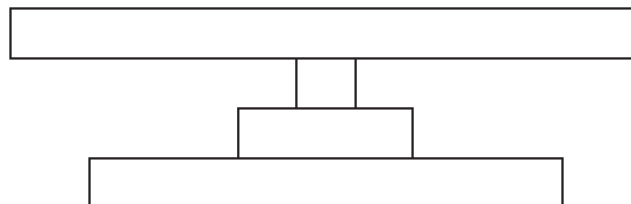
31 The diagram shows part of the carbon cycle.



What are the processes X and Y?

	X	Y
A	photosynthesis	decomposition
B	photosynthesis	excretion
C	respiration	photosynthesis
D	respiration	respiration

32 The diagram shows a pyramid of numbers.



Which food chain is represented by this pyramid of numbers?

- A grass → antelope → lion → flea
- B mahogany tree → caterpillar → finch → hawk
- C microscopic plants → microscopic animals → small fish → shark
- D pond plant → snail → large beetle → fish

- 33 Which of the following could occur as a result of fertiliser leaching into a fresh water pond?

	algae population	bacterial population	oxygen concentration
A	increases	increases	increases
B	decreases	decreases	decreases
C	decreases	decreases	increases
D	increases	increases	decreases

- 34 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

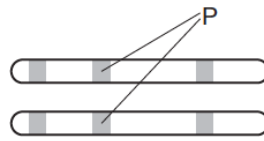
How many different amino acid molecules are coded for by this segment of mRNA?

- A** 6
 - B** 7
 - C** 8
 - D** 24
- 35 The following are stages in mitosis.
- 1 The nuclear membrane forms.
 - 2 The nuclear membrane breaks down.
 - 3 Chromosomes separate.
 - 4 Chromosomes line up on the equator.

What is the correct order of these stages during mitosis?

- A** 1 3 2 4
 - B** 1 4 3 2
 - C** 2 4 3 1
 - D** 3 2 4 1
- 36 Two heterozygous individuals are crossed. Some of the offspring show the recessive characteristic. What is the probability that one of these offspring that shows the recessive characteristic is homozygous?
- A** 0.00
 - B** 0.25
 - C** 0.50
 - D** 1.00

37 The diagram shows a pair of chromosomes from the same cell.



What do the lines labelled P point to?

- A the site of alleles made up of two or more genes which are always the same
- B the site of alleles made up of two or more genes which might be different
- C the site of genes made up of two or more alleles which are always the same
- D the site of genes made up of two or more alleles which might be different

38 Which of the following statements describe the possible effects of a mutation on the survival of an organism?

1. It has no effect
2. It gives the organism an advantage
3. It disadvantages the organism

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

39 Why are bacteria useful in biotechnology and genetic engineering?

- A They can reproduce rapidly
- B They live in soil
- C They may be pathogens
- D They need complex nutrients

40 Waste products from microorganisms are used in the production of bread and yoghurt.

Which waste products from microorganisms are used in these two processes?

	bread-making	yoghurt production
A	carbon dioxide	carbon dioxide
B	carbon dioxide	lactic acid
C	lactic acid	carbon dioxide
D	lactic acid	lactic acid

End of Section A

Section B: Structured Answer Questions

- Please write your answers to Section B in the **Google Doc**.
- The number of marks for each question part is indicated in brackets.
- There are 5 questions in section B, with a total of 40 marks.

- 1 A student had solutions of four different foods labelled W, X, Y and Z. Each solution was tested for starch and protein. The colour of the solutions after the tests are shown in Table 1.1.

Table 1.1

solution	colour after testing for starch	colour after testing for protein
W	orange	purple
X	blue/black	purple
Y	blue/black	blue
Z	orange	blue

- (a) Which solution contains starch but not protein? (1)
- (b) Describe how a solution of food can be tested for reducing sugars. (2)

Figure 1.1 shows a calorimeter.

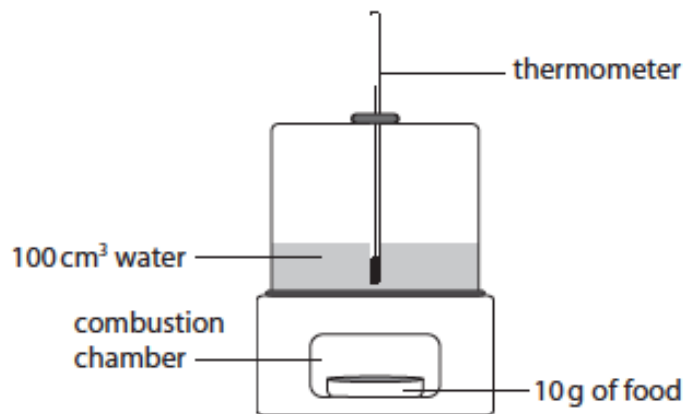


Fig. 1.1

- (c) Describe how this calorimeter can be used to find the energy content of 10 g of food. (4)

Total marks for Q1: 7

2 *Clostridium tetani* is a bacterium that can be found in soil. It causes the infection tetanus. Children are vaccinated against tetanus.

(a) Explain why these children do not get tetanus if the bacteria enter their body through a cut in the skin. **(3)**

Colistin is an antibiotic used to treat infections in the bloodstream. Some bacteria are resistant to Colistin.

(b) Explain how these bacteria have become resistant to Colistin. **(4)**

Total marks for Q2: 7

- 3** Figure 4.1 shows a plasmid containing the human insulin gene.

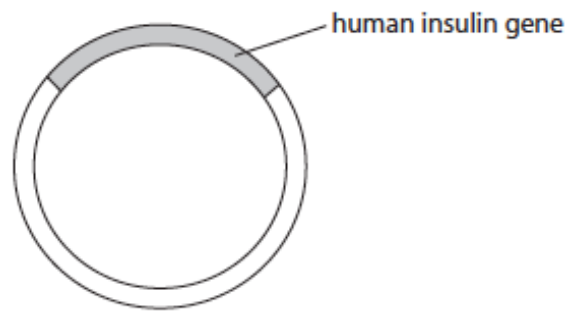


Fig. 3.1

- (a)** Explain how the human insulin gene can be inserted into a plasmid. **(3)**

Transcription and translation are stages in the synthesis of proteins.

A gene coding for a protein has two alleles. The first 5 codons of an mRNA strand for these alleles is shown below:

Allele 1 – AUG CCA CAG GAG UUC

Allele 2 – AUG CCA GAG GAG UUC

- (b)** How does messenger RNA differ from DNA? **(2)**
- (c)** Explain how the mutation in allele 2 could affect the functioning of this protein. **(2)**
- (d)** Mitosis and meiosis are processes that produce new cells. Compare the outcomes of mitosis and meiosis. **(3)**

Total marks for Q3: 10

4 Lactase is an enzyme that breaks down lactose into glucose and galactose.

A student made some alginate beads containing lactase. The student added 10 beads to 20 cm³ of a solution of lactose, as shown in Fig. 4.1.

The student timed how long it took for glucose to be produced. The experiment was repeated using 15, 20 and 25 beads.

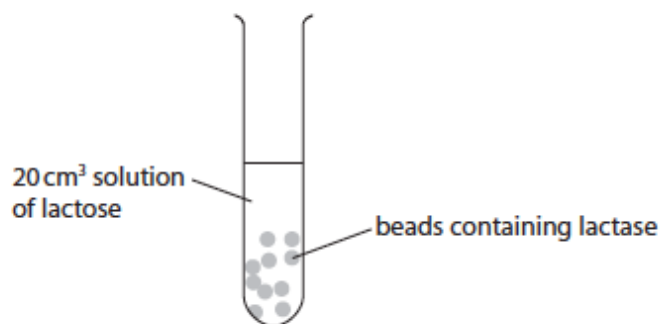


Fig. 4.1

The results are shown in Table 4.1.

Table 4.1

number of beads containing lactase	time taken to produce glucose in seconds
10	240
15	210
20	150
25	120

- (a) Describe and explain what conclusions can be made from these results. (2)
- (b) Explain why the same volume of lactose solution was used for each test. (2)
- (c) Describe a method to find the optimum temperature for the enzyme lactase. (3)

Total marks for Q4: 7

5 Figure 5.1 shows a sensory neurone.

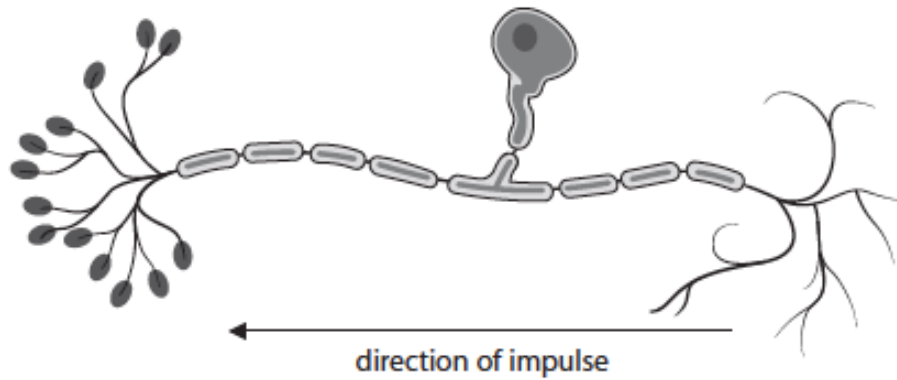


Fig. 5.1

- (a) Describe the role of sensory neurones. **(2)**
- (b) Explain how impulses are transmitted at synapses. **(4)**
- (c) Most neurones in the brain are unmyelinated whereas motor neurones are myelinated.

Explain why myelination is needed on motor neurones but not on neurones in the brain. **(3)**

Total marks for Q5: 9

End of Section B