



**Cardiff Sixth Form College**  
1-3 Trinity Court, 21 – 27 Newport Road  
Cardiff, UK, CF24 0AA  
Tel: +44 02920 493121  
admissions@ccoex.com

## Biology 60 Minutes

For examiner use only		
Maximum mark	Mark awarded	% achieved
50		

### ADDITIONAL MATERIALS

In addition to this paper you may require a calculator and a ruler

### INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen

Write your answers in the spaces provided in this booklet. For section A please underline the correct answers

### INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question

STUDENT NAME:	
NATIONALITY:	
DATE OF TEST:	
LOCATION OF TEST:	
ADMINISTERED UNDER EXAMINATION CONDITIONS BY: <i>(Please state your full name and position)</i>	
<b>STUDENT DECLARATION:</b> I declare that I completed the entrance test under exam conditions and without any use of unauthorised materials. I confirm that all the submitted answers are my own work.  STUDENT SIGNATURE: _____ DATE: _____	
<b>INVIGILATOR DECLARATION:</b> I declare that the above named student was fully supervised during the test. The assessment was completed under strict exam conditions and in the time allowed, in accordance with the instructions on the test paper.  INVIGILATOR SIGNATURE: _____ DATE: _____	

## Section A

Underline the correct answer

1. Which one of the following does not describe Meiosis
  - A. Daughter cells are identical
  - B. It produces gametes
  - C. Four daughter cells are formed
  - D. Nuclear division occurs twice in one complete cycle
  
2. Which statement most accurately describes the movement of water molecules between two plant cells?
  - A. Up the water potential gradient by osmosis
  - B. Down the water potential gradient by osmosis
  - C. Along the water potential gradient by diffusion
  - D. Through the water potential gradient by diffusion
  
3. Plant cells may have the following structures that are not found in animal cells
  - A. Plasma membrane, sap vacuole and cell wall
  - B. Chloroplasts, mitochondria, and plasma membrane
  - C. Chloroplasts, cell wall and sap vacuole
  - D. Mitochondria, plasma membrane and cell wall
  
4. Osmosis occurs in living organisms as water moves across the cellular membrane. An environment is isotonic when the concentration of solutes in the environment is equal to the concentration of solutes inside the cell.  
In isotonic environments, water flows
  - A. Inside and outside the cell at equal rates.
  - B. From the environment into the cell.
  - C. From the cell into the environment.
  - D. From the cytoplasm into the cell membrane.
  
5. The process by which substances enter a cell without the use of energy is called ...
  - A. Active transport
  - B. Passive transport
  - C. Endocytosis
  - D. Exocytosis

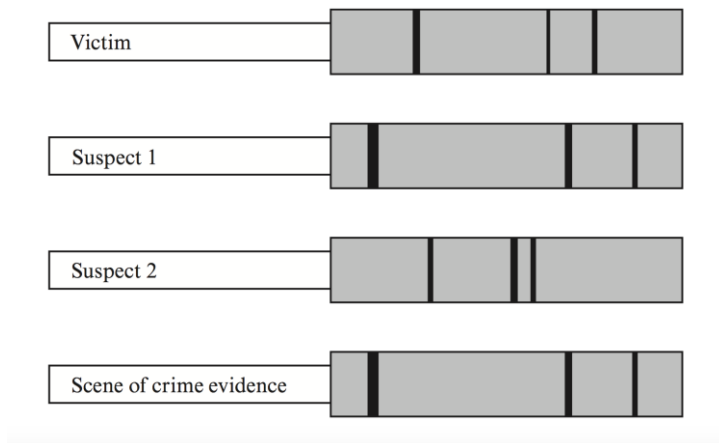
6. The following shows some processes which occur during a withdrawal reflex. They are not shown in the correct order.

1. An impulse passes along the motor nerve to the effector.
2. An impulse passes along the relay nerve.
3. An impulse passes from the receptor to the co-ordinator.
4. The receptor reacts to a stimulus.
5. The impulse passes across a synapse between the relay nerve and the motor nerve.

Which numbers are in the correct order in which they take place.

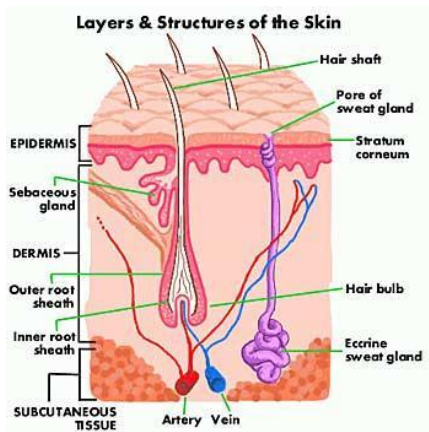
- A 4 5 3 2 1
- B. 4 2 1 3 5
- C 4 3 2 1 5
- D 4 3 2 5 1

7. The genetic fingerprints below were made from forensic samples taken from a murder scene. Which statement best interprets this evidence?



- A. The victim was related to suspect 2
- B. Suspect 2 was not at the murder scene
- C. Suspect 1 is the murderer
- D. Suspect 1 was at the murder scene

8. The diagram below show skin structure in cross section

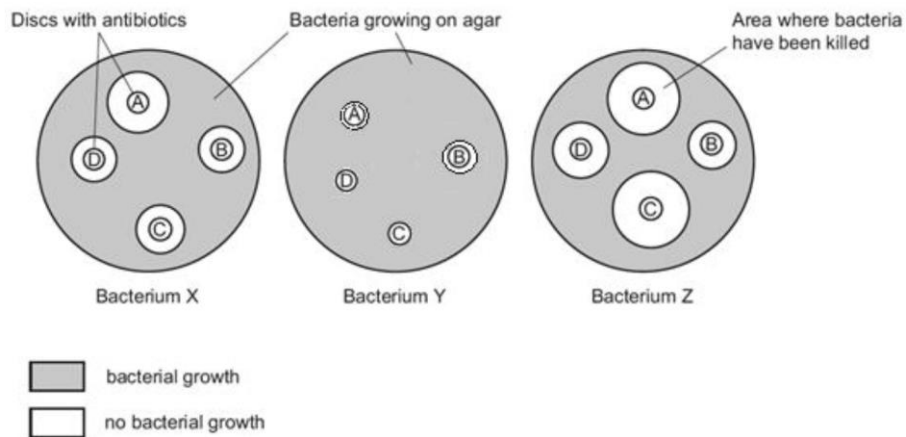


Which statement best describes the thermoregulation of skin on a cold day.

- A. Vasoconstriction of surface arterioles and erection of hairs
- B. Vasodilation of surface arterioles and erection of hairs
- C. Vasoconstriction of surface arterioles and flattening of hairs
- D. Vasodilation of surface arterioles and flattening of hairs

9. Scientists investigated the effects of different antibiotics on disease-causing bacteria.

They prepared cultures of three types of bacteria on agar plates and added discs containing four antibiotics, A, B, C and D. The agar plates were incubated for 24 hours at 25 °C. The results are shown in the diagrams below.



Which statement best describe the results?

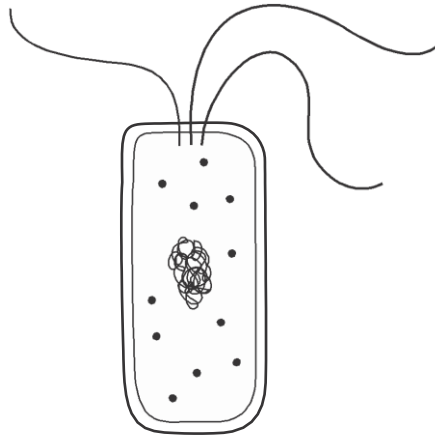
- A. Bacterium X is most sensitive to antibiotic A. Bacterium Y is least sensitive to all of the antibiotics and bacterium Z is most sensitive to antibiotic B
- B. Bacterium X is equally sensitive to C, B and D. Bacterium Y is resistant to C and D and bacterium Z is more sensitive to C than D
- C. Antibiotic A is the most effective and antibiotic C is the least effective in all cases
- D. Antibiotic C is the most effective and antibiotic D is the least effective in all cases

10. Proteins produced and released by white blood cells as part of an immune response to a bacterial infection are called
- A. Antigens
  - B. Antibiotics
  - C. Antiseptics
  - D. Antibodies
11. Which of the following statements is the most accurate?
- A. Sucrose is transported up through phloem
  - B. Sucrose is transported up through xylem
  - C. Sucrose is transported up and down through phloem
  - D. Sucrose is transported up and down through xylem
12. Pulmonary veins carry
- A. Red oxygen rich blood
  - B. Bluish oxygen depleted blood
  - C. Bluish oxygen rich blood
  - D. Red oxygen depleted blood
13. When an enzyme and substrate combine what is the combined molecule correctly called?
- A. Enzyme/Substrate Complex
  - B. Intermediate stage
  - C. Lock with key inserted
  - D. Induced fit molecule.
14. Which of the following structures are not built from carbohydrates?
- A. Glycogen
  - B. Cellulose
  - C. Starch
  - D. Collagen
15. A test to show there is starch in a sample would be
- A. Add Benedict's solution and heat to give a brick red colour positive result.
  - B. Add Benedict's solution and heat to give a pale blue colour positive result
  - C. Add Iodine solution to give a pale blue positive result
  - D. Add Iodine solution to give a blue/black positive result.
16. The following is an accurate description of Mitosis
- A. Nuclear division to provide two identical nuclei
  - B. Cell division that provides two identical daughter cells
  - C. Nuclear division that provides four varied gamete nuclei
  - D. Cell division that provided four varied gametes

17. Which of the following is correct: When inhalation takes place

- A. intercostal muscles contract and our ribs move down
- B. diaphragm muscles contract and the ribs move up
- C. diaphragm muscles contract and the ribs move down
- D. intercostal muscles contract and the diaphragm muscles relax.

18. The diagram shows the structure of a bacterium.



In what way does this differ from a cell of a fungus?

- A. The bacterium has a cell membrane.
- B. The bacterium has a cell wall.
- C. The bacterium has cytoplasm.
- D. The bacterium has no true nucleus.

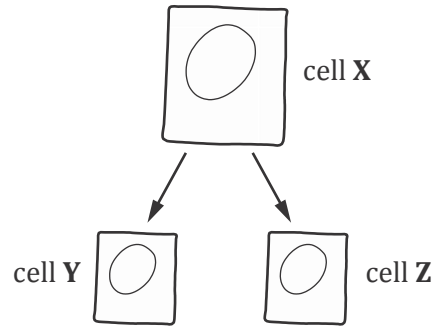
19. Glycogen is which of the following

- A. The storage carbohydrate of animals and fungi
- B. The storage carbohydrate of all living things
- C. A hormone
- D. A protein

20. Which of the following have both cytoplasm and cell walls?

- A liver cells
- B red blood cells
- C root hair cells
- D xylem vessels

21. Cell X contains 24 chromosomes. It divides by mitosis to produce cells Y and Z.



How many chromosomes does cell Z contain?

- A 12                      B 24                      C 46                      D 48

22. Which one of the following best describes the function of a cell membrane?

- (a) It keeps the cell in shape.
- (b) It controls the substances entering and leaving the cell.
- (c) It controls the substances entering the cell.
- (d) It supports the cell structures.

23. Which of the following statements is **incorrect**?

- A. Anaerobic respiration uses oxygen to release energy from food.
- B. Aerobic respiration uses oxygen from air during oxidation.
- C. Aerobic respiration converts food to carbon dioxide and water.
- D. Anaerobic respiration releases energy from food without using oxygen.

24. Which one of the following would be the best evidence that some form of respiration was taking place in a living tissue

- A oxygen being taken up
- B oxygen being given out
- C water vapour being produced
- D food being used up

25. What ions must a plant obtain from the soil in order to make (a) ATP, (b) chlorophyll?

- A. Iron and Magnesium
- B. Phosphate and Iron
- C Potassium and Magnesium
- D Phosphate and Magnesium

## Section B

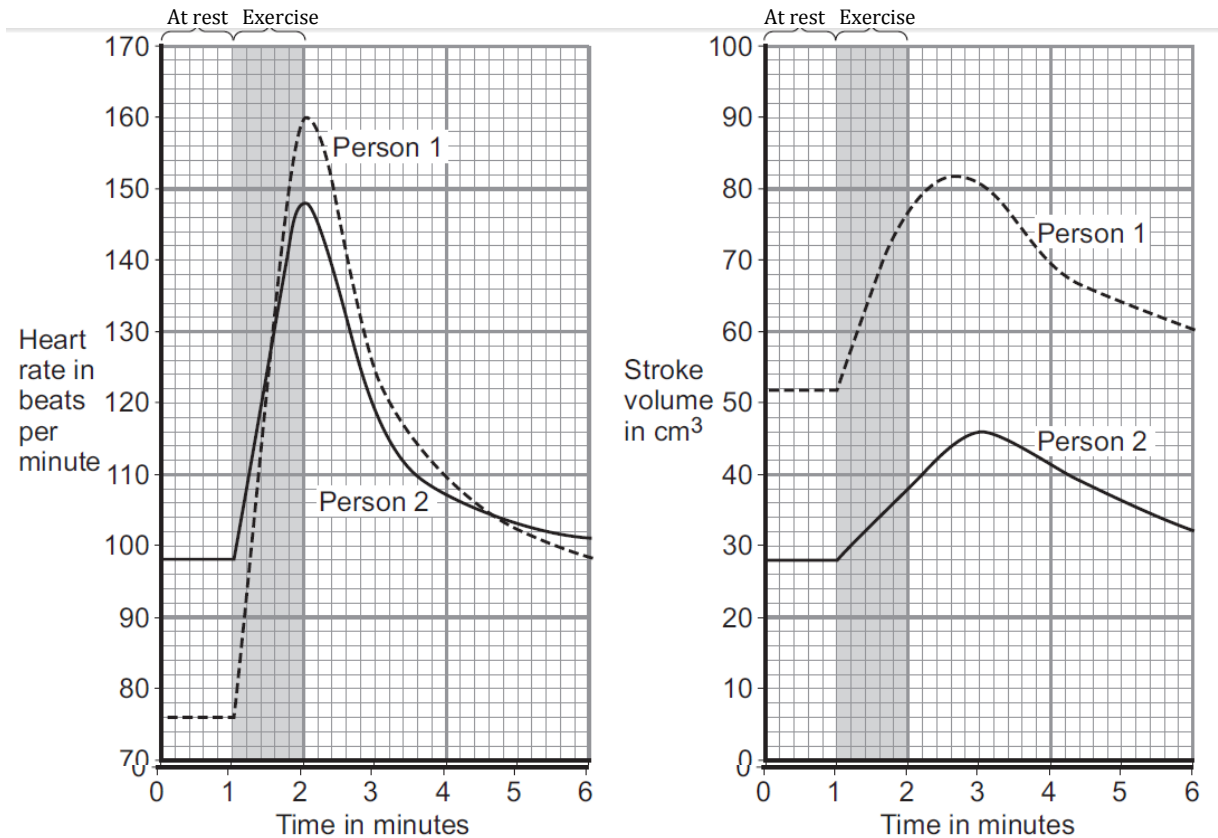
Answer **all** the questions in this section.

Write your answers in the spaces provided.

1.

During exercise, the heart beats faster and with greater force. The 'heart rate' is the number of times the heart beats each minute. The volume of blood that travels out of the heart each time the heart beats is called the 'stroke volume'.

In an investigation, Person 1 and Person 2 ran as fast as they could for 1 minute. Scientists measured the heart rates and stroke volumes of Person 1 and Person 2 at rest, during the exercise and after the exercise. Figure 7 shows the scientists' results.



- (a) The 'cardiac output' is the volume of blood sent from the heart to the muscles each minute.

$$\text{Cardiac output} = \text{Heart rate} \times \text{Stroke volume}$$

At the end of the exercise, **Person 1's** cardiac output =  $160 \times 77 = 12\,320 \text{ cm}^3$  per minute.

Use information from **Figure 7** to complete the following calculation of **Person 2's** cardiac output at the end of the exercise.

**[3 marks]**

At the end of the exercise:

**Person 2's** heart rate = ..... beats per minute

**Person 2's** stroke volume = .....  $\text{cm}^3$

**Person 2's** cardiac output = .....  $\text{cm}^3$  per minute



(b) **Person 2** had a much lower cardiac output than **Person 1**.

(b) (i) Use information from **Figure 7** to suggest the **main** reason for the lower cardiac output of **Person 2**.

[1 mark]

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(b) (ii) **Person 1** was able to run much faster than **Person 2**.

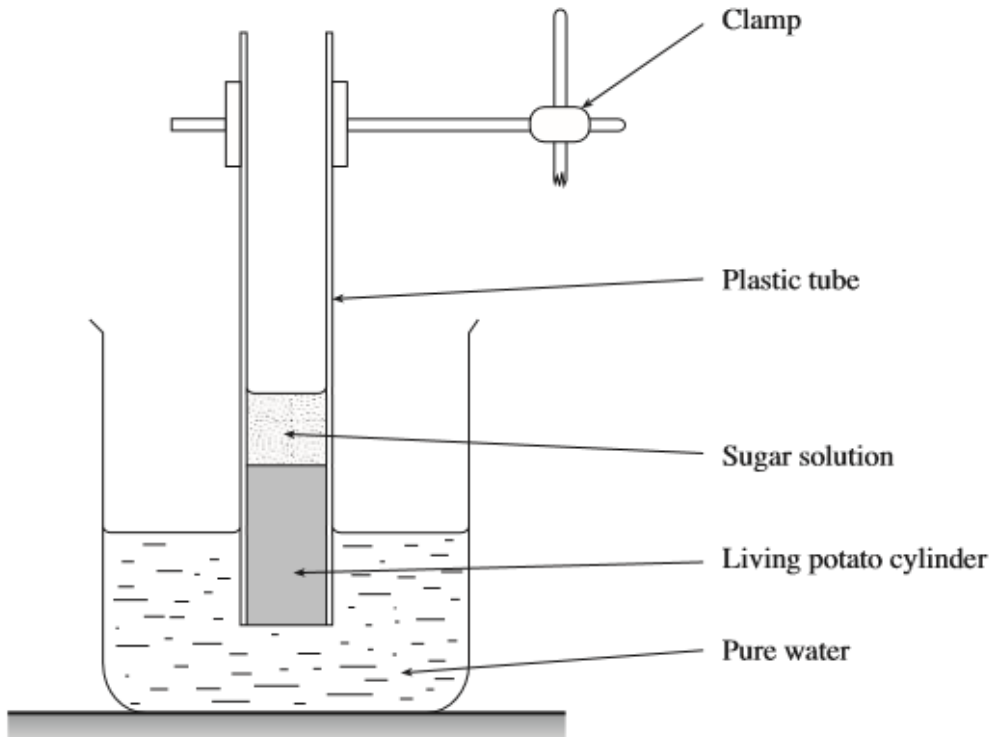
Use information from **Figure 7** and your own knowledge to explain why.

[5 marks]

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2.

A cylinder of peeled potato was placed in a clear plastic tube as shown in the diagram. The tube was clamped with its end in a beaker of pure water, so that the exposed end of the potato cylinder was in contact with the water. A 15% sugar solution was poured into the plastic tube above the potato cylinder as shown.



(a) Describe the changes that are likely to occur in the levels of the liquid in the apparatus after two hours.

Change in level of

sugar solution, .....

pure water. ....

[1]

(b) Give a complete explanation of your answer to (a).

[5]

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**Section C**

**Answer one of the questions from this section**

**Write your answer in the spaces provided**

**1.**

a) Outline the basic structure of DNA and explain the meaning and importance of the genetic code in the production of proteins. (5)

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b) Describe how Darwin's theory of evolution can lead to a change in genes within a population. (5)

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OR

2.

a) Define the term enzyme and describe the theory of enzyme action (6)

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b) Describe and explain the effect of temperature on the rate of enzyme activity (4)

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