

# SCIENCE COORDINATE

0654 | Paper 4

2020 — 2024

## Chapter 1- BIOLOGY

Page 1

CH 1 - B1. Characteristics Of Living Organisms

CH 2 - B2. Cells

CH 3 - B3. Biological Molecules

CH 4 - B4. Enzymes

CH 5 - B5. Plant Nutrition

CH 6 - B6. Animal Nutrition

CH 7 - B7. Transport

CH 8 - B8. Gas Exchange And Respiration

CH 9 - B9. Coordination And Response

CH 10 - B10. Reproduction

CH 11 - B11. Inheritance

CH 12 - B12. Organisms And Their Environment

CH 13 - B13. Human Influences On Ecosystems

## Chapter 2 - CHEMISTRY

Page 328

CH 14 - C1. The Particulate Nature Of Matter

CH 15 - C2. Experimental Techniques

CH 16 - C3. Atoms, Elements And Compounds

CH 17 - C4. Stoichiometry

CH 18 - C5. Electricity And Chemistry

CH 19 - C6. Energy Changes In Chemical Reactions

CH 20 - C7. Chemical Reactions

CH 21 - C8. Acids, Bases And Salts

CH 22 - C9. The Periodic Table

CH 23 - C10. Metals

CH 24 - C11. Air And Water

CH 25 - C12. Sulfur

CH 26 - C13. Carbonates

CH 27 - C14. Organic Chemistry

## Chapter 3 - PHYSICS

Page 771

CH 28 - P1. Motion

CH 29 - P2. Work, Energy And Power

CH 30 - P3. Thermal Physics

CH 31 - P4. Properties Of Waves, Including Light And Sound

CH 32 - P5. Electricity And Magnetism

CH 33 - P6. Electric Circuits

CH 34 - P7. Electromagnetic Effects

CH 35 - P8. Atomic Physics

## ANSWERS

Page 1249

1 - (0654/41\_Summer\_2020\_Q10) - B9. Coordination And Response, B1. Characteristics Of Living Organisms, B5. Plant Nutrition

(a) Plant shoots respond to stimuli such as light.

Fig. 10.1 shows the growth response of a shoot to light.

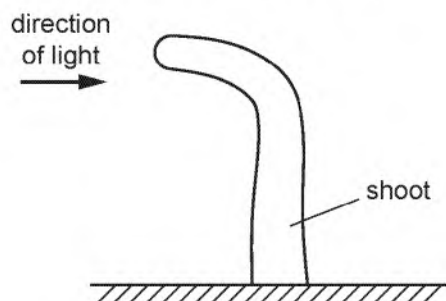


Fig. 10.1

(i) Name the response shown in Fig. 10.1.

..... [1]

(ii) Draw an **X** on Fig. 10.1 to show the area with the greatest cell elongation. [1]

(iii) Name the hormone that controls cell elongation.

..... [1]

(b) Fig. 10.2 shows a plant shoot with the tip removed.

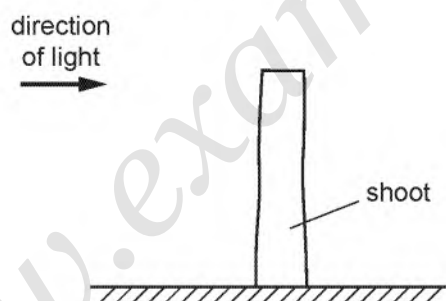


Fig. 10.2

State why the shoot in Fig. 10.2 did **not** bend.

.....  
..... [1]

(c) Explain why plants need magnesium ions for photosynthesis and healthy growth.

Use ideas about energy in your answer.

.....

.....

.....

.....

.....

..... [3]

(d) Growth is one of the characteristics of living things.

(i) Complete the definition of the term *growth*.

Growth is a ..... increase in size and dry .....  
by an increase in cell number or cell size or both. [2]

(ii) State the name of two other characteristics of living things.

1 .....

2 ..... [2]

[Total: 11]

2 - (0654/42\_Winter\_2020\_Q10) - B9. Coordination And Response, B1. Characteristics Of Living Organisms

- (a) The temperature of a person's skin is recorded in different environmental temperatures.

Fig. 10.1 shows the **two** parts of the skin where the readings are taken.

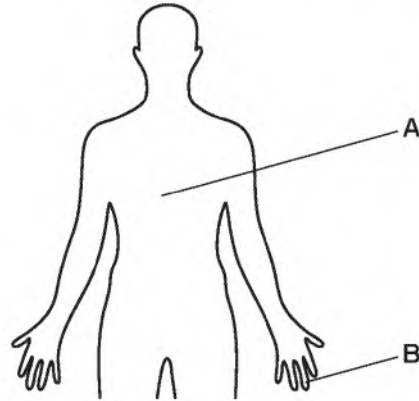


Fig. 10.1

Table 10.1 shows the results.

Table 10.1

| part of body | temperature of the skin / °C |                             |                            |
|--------------|------------------------------|-----------------------------|----------------------------|
|              | cold environment<br>(15 °C)  | warm environment<br>(27 °C) | hot environment<br>(47 °C) |
| <b>A</b>     | 30.1                         | 34.4                        | 35.8                       |
| <b>B</b>     | 23.7                         | 33.8                        | 36.7                       |

- (i) Describe how the skin responds to **cold** temperatures in order to maintain a constant internal body temperature.

.....

.....

.....

.....

..... [3]

- (ii) Suggest why the temperature range of the skin on part **A** is less than on part **B**.

.....

.....

.....

..... [2]

- (b) Body temperature is controlled to keep it within set limits.

Name the term used to describe this.

..... [1]

- (c) Temperature control of the body shows that humans have sensitivity to their environment.

Define *sensitivity*.

.....  
.....  
.....  
..... [2]

[Total: 8]

3 - (0654/41\_Summer\_2022\_Q10) - B9. Coordination And Response, B1. Characteristics Of Living Organisms

The control of blood glucose concentration is an involuntary action by the body.

(a) Place ticks (✓) in the boxes to show **two** other involuntary actions.

|          |  |
|----------|--|
| coughing |  |
| cycling  |  |
| reading  |  |
| sneezing |  |
| talking  |  |

[2]

(b) State the characteristic of living things that is defined as the ability to respond to a stimulus.

..... [1]

(c) Fig. 10.1 is a graph that shows the blood glucose concentration after eating a meal.

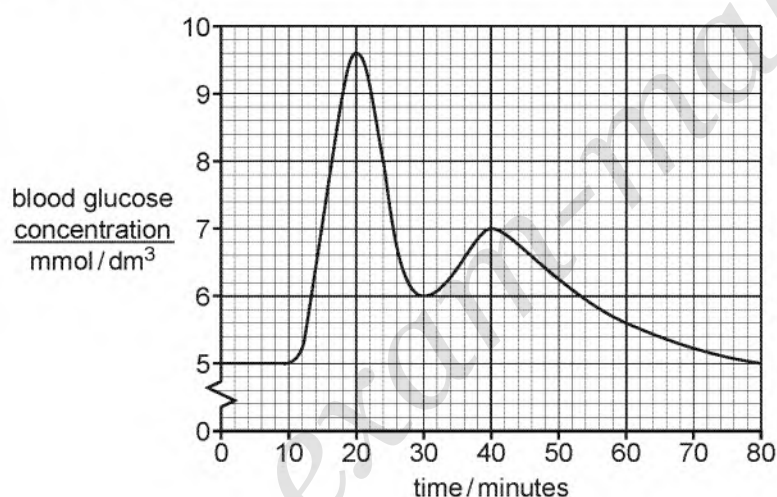


Fig. 10.1

(i) Calculate the length of time it takes for the blood glucose concentration to return to its starting concentration from its maximum.

..... minutes [1]

(ii) Explain the results between **20–30 minutes** in Fig. 10.1.

.....  
.....  
.....  
.....  
..... [3]

(iii) State the type of response shown by the control of blood glucose concentration.

..... [1]

(d) State the names of two hormones that can increase the blood glucose concentration.

1 .....

2 .....

[2]

4 - (0654/43\_Summer\_2023\_Q10) - B8. Gas Exchange And Respiration, B1. Characteristics Of Living Organisms, B2. Cells

- (a) The pH of the fluid in muscles changes during vigorous exercise due to the changing concentrations of lactic acid.

Table 10.1 shows the difference in pH before and immediately after vigorous exercise.

Table 10.1

| measurement taken          | pH   |
|----------------------------|------|
| before exercise            | 7.08 |
| immediately after exercise | 6.58 |

- (i) Calculate the decrease in pH shown in Table 10.1.

..... [1]

- (ii) Explain why there was a decrease in pH of the muscles during vigorous exercise.

.....  
.....  
.....  
.....  
..... [3]

- (b) Muscle cells are adapted for movement as they are able to contract.

- (i) Define the term movement.

.....  
.....  
..... [2]

- (ii) State the name of the cell adapted for:

antibody production .....  
movement of mucus .....  
photosynthesis. .... [3]



# ANSWERS

**1** - (0654/41\_Summer\_2020\_Q10) - B9. Coordination And Response, B1. Characteristics Of Living Organisms, B5. Plant Nutrition

|          |                                                                                                                                                                                                                                                                  |   |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| (a)(i)   | phototropism ;                                                                                                                                                                                                                                                   | 1 |
| (a)(ii)  | X drawn on the upper side of the shoot bend ;                                                                                                                                                                                                                    | 1 |
| (a)(iii) | auxin ;                                                                                                                                                                                                                                                          | 1 |
| (b)      | auxin / hormone / chemical, produced at the shoot tip ;                                                                                                                                                                                                          | 1 |
| (c)      | magnesium ions required to make chlorophyll ;<br>chlorophyll absorbs light energy (and converts this to chemical energy) ;<br>(chemical) energy used to synthesise, carbohydrates or glucose / carbohydrates or glucose are used to make proteins (for growth) ; | 3 |
| (d)(i)   | permanent ;<br>mass ;                                                                                                                                                                                                                                            | 2 |
| (d)(ii)  | any two from:<br>movement<br>reproduction<br>sensitivity<br>excretion<br>nutrition<br>respiration<br>..                                                                                                                                                          | 2 |

**2** - (0654/42\_Winter\_2020\_Q10) - B9. Coordination And Response, B1. Characteristics Of Living Organisms

|         |                                                                                                                                                                                                    |   |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| (a)(i)  | ref to vasoconstriction ;<br>arterioles narrow ;<br>blood flow to, surface capillaries / skin surface, reduced ;<br>less heat lost by radiation ;<br>hair stands on end ;<br>AVP ;<br><b>max 3</b> | 3 |
| (a)(ii) | part A covers vital organs ;<br>a suitable temperature is required for body / AW to function ;<br>ref to enzymes ;<br>AVP ;                                                                        | 2 |
| (b)     | homeostasis ;                                                                                                                                                                                      | 1 |
| (c)     | ability to detect, stimuli / changes to the environment / surroundings ;<br>and respond ;                                                                                                          | 2 |

**3** - (0654/41\_Summer\_2022\_Q10) - B9. Coordination And Response, B1. Characteristics Of Living Organisms

|          |                                                                                                                                                                                             |   |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| (a)      | coughing ticked ;<br>sneezing ticked ;                                                                                                                                                      | 2 |
| (b)      | sensitivity ;                                                                                                                                                                               | 1 |
| (c)(i)   | 60 (minutes) ;                                                                                                                                                                              | 1 |
| (c)(ii)  | any three from:<br>increase in blood glucose concentration is detected by pancreas ;<br>insulin released ;<br>glucose converted to glycogen ;<br>glycogen stored in liver ;<br><b>Max 3</b> | 3 |
| (c)(iii) | negative feedback / homeostasis ;                                                                                                                                                           | 1 |
| (d)      | glucagon ;<br>adrenaline ;<br>AVP ;                                                                                                                                                         | 2 |

4 - (0654/43\_Summer\_2023\_Q10) - B8. Gas Exchange And Respiration, B1. Characteristics Of Living Organisms, B2. Cells

|         |                                                                                                                              |   |
|---------|------------------------------------------------------------------------------------------------------------------------------|---|
| (a)(i)  | 0.50 ;                                                                                                                       | 1 |
| (a)(ii) | not enough oxygen (for aerobic respiration) ;<br>ref to anaerobic respiration ;<br>increasing lactic acid (reduces the pH) ; | 3 |
| (b)(i)  | (an action by,) an organism / part of an organism ;<br>(causing a) change of, position / place ;                             | 2 |
| (b)(ii) | white blood (cell) ;<br>ciliated (cell) ;<br>palisade (mesophyll cell) ;                                                     | 3 |