IGCSE Cambridge Topical Past Papers

SCIENCE COORDINATE

0654 | Paper 4

2020 — 2025

Chapter 1- BIOLOGY

Chapter 2 - CHEMISTRY

Chapter 3 - PHYSICS

ANSWERS

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.

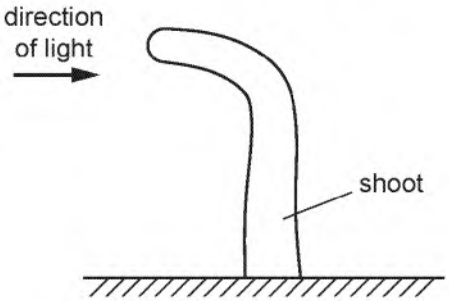

Fig. 10.1

(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.

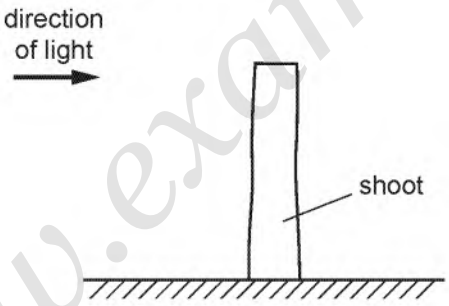

Fig. 10.2

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.

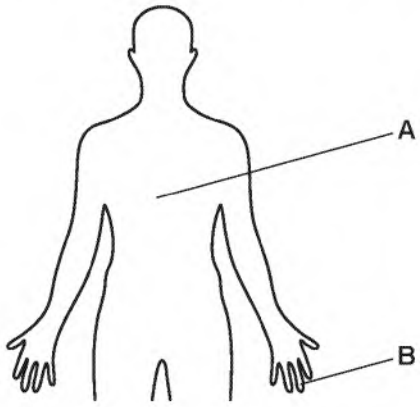

Fig. 10.1

Table 10.1 shows the results.

Table 10.1

	temperature of the skin / °C		
part of body	cold environment (15 °C)	warm environment (27 °C)	hot environment (47 °C)
A	30.1	34.4	35.8
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.

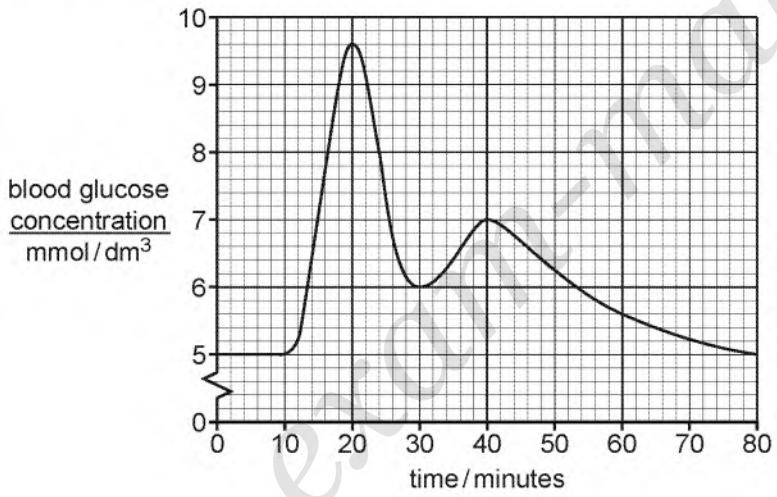

Fig. 10.1

(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]

5 - (0654/42_Summer_2025_Q3) - *B2. Cells, B1. Characteristics Of Living Organisms*

(a) Table 3.1 shows the diameter of a flu virus and different types of cells.

Table 3.1

	diameter / μm
flu virus	0.1
bacterial cell	1.0
red blood cell	7.0
lymphocyte	15.0
plant cell	50.0
human egg cell	120.0

(i) Calculate the difference in size between the largest and smallest **animal** cells in Table 3.1.

..... μm [2]

(ii) State the name of the cell in Table 3.1 that contains haemoglobin.

..... [1]

(b) Complete the sentences about an immune response to a flu virus infection.

Use words from the list.

active **antibodies** **enzymes**

lymphocytes **passive** **pathogens** **phagocytes**

The flu virus has antigens on its surface. Proteins with a specific shape bind to antigens.

These proteins are called ..... .

This causes the virus to be destroyed or marked for engulfing by

..... .

After the infection, a human has ..... immunity to the flu virus.

[3]

(c) Flu vaccinations are used each year to protect people from flu virus infection.

Outline how this vaccine gives protection.

..... [3]

(d) The flu virus reproduces quickly and often mutates.

Suggest why a new vaccine is developed every year.

..... [2]

[Total: 11]

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 ; chlorophyll absorbs light energy (and converts this to chemical energy) ; (chemical) energy used to synthesise, carbohydrates or glucose / carbohydrates or glucose are used to make proteins (for growth) ;	3
(d)(i)	permanent ; mass ;	2
(d)(ii)	any two from: movement reproduction sensitivity excretion nutrition respiration ;;	2

2 – (0654/42_Winter_2020_Q10) – *B9. Coordination And Response, B1. Characteristics Of Living Organisms*

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

3 – (0654/41_Summer_2022_Q10) – *B9. Coordination And Response, B1. Characteristics Of Living Organisms*

(a)	coughing ticked ; sneezing ticked ;	2
(b)	sensitivity ;	1
(c)(i)	60 (minutes) ;	1

(c)(ii)	*any three from:* increase in blood glucose concentration is detected by pancreas ; insulin released ; glucose converted to glycogen ; glycogen stored in liver ; **Max 3**	3
(c)(iii)	negative feedback / homeostasis ;	1
(d)	glucagon ; adrenaline ; 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) ; ref to anaerobic respiration ; increasing lactic acid (reduces the pH) ;	3
(b)(i)	(an action by,) an organism / part of an organism ; (causing a) change of, position / place ;	2
(b)(ii)	white blood (cell) ; ciliated (cell) ; palisade (mesophyll cell) ;	3

5 – (0654/42_Summer_2025_Q3) – *B2. Cells, B1. Characteristics Of Living Organisms*

(a)(i)	120.0 – 7.0 ; 113 μm ;	2
(a)(ii)	red blood cell ;	1
(b)	antibodies ; phagocytes ; active ;	3
(c)	*any* ***three*** *from:* *idea that* weakened / dead, pathogens / virus OR antigens, given ; antigens stimulate an immune response ; lymphocytes produce antibodies ; *correct ref* to memory cells / *ref to* long-term OR active, immunity ; *idea of* antibodies destroy, (flu) virus or (flu) pathogens in future infections ;	3
(d)	ref to changes in (shape of) antigen (of flu virus) ; *idea of* new antibodies are required (to match antigen) ;	2

6 – (0654/43_Summer_2025_Q2) – *B7. Transport, B9. Coordination And Response, B1. Characteristics Of Living Organisms*

(a)(i)	any **three** from: increased respiration; increased energy requirement; increased muscle contraction; (muscles) need more oxygen / glucose; increase in carbon dioxide concentration (detected by brain); blood pumped faster;	3
(a)(ii)	any **three** from: (blood temperature) detected by brain; (increase in) sweat; vasodilation / widening of arterioles; increased blood flow to capillaries / skin **surface**; relaxation of hair muscles / hair lies flat;	3
(b)(i)	a substance/chemical taken into the body; that, affects/modifies/changes, chemical reactions;	2
(b)(ii)	balanced diet / less stress / stop smoking;	1