

Name: _____

Homeostasis and Response part 5 AQA Triple Biology

Class: _____

Date: _____

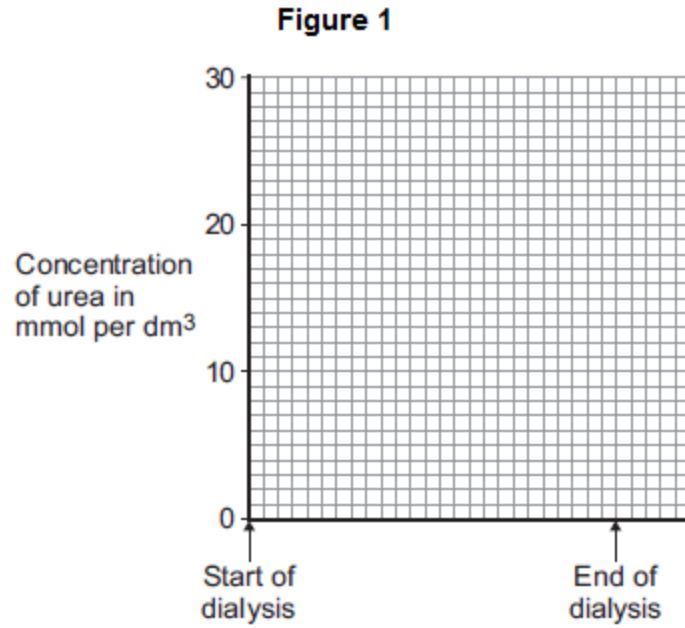
Time: **77 minutes**

Marks: **77 marks**

Comments:

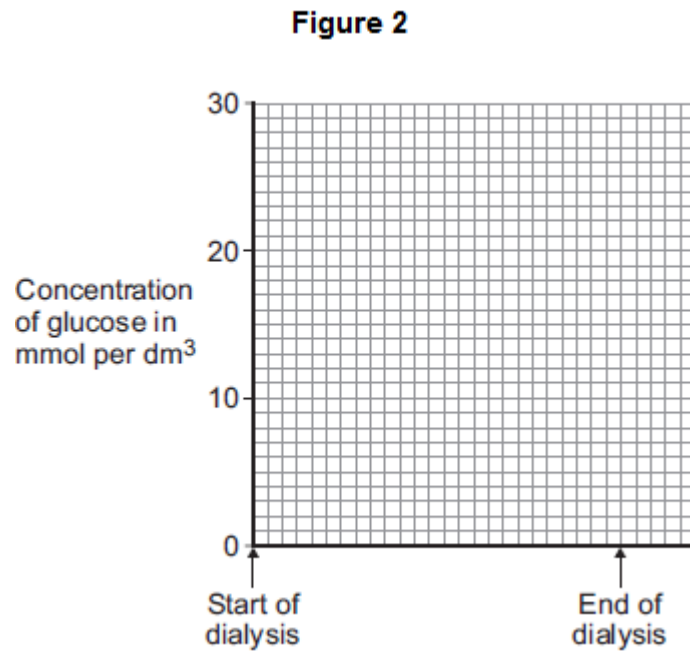
The child has a normal blood glucose concentration.

- (i) Sketch a graph on **Figure 1** to suggest what will happen to the concentration of urea in the blood during dialysis.



(1)

- (ii) Sketch a graph on **Figure 2** to suggest what will happen to the concentration of glucose in the blood during dialysis.



(1)

(c) (i) Another way of treating kidney failure is with a kidney transplant.

A transplanted kidney can be rejected.

Explain why the new kidney may be rejected.

(3)

(ii) Describe **one** way in which doctors try to prevent kidney rejection.

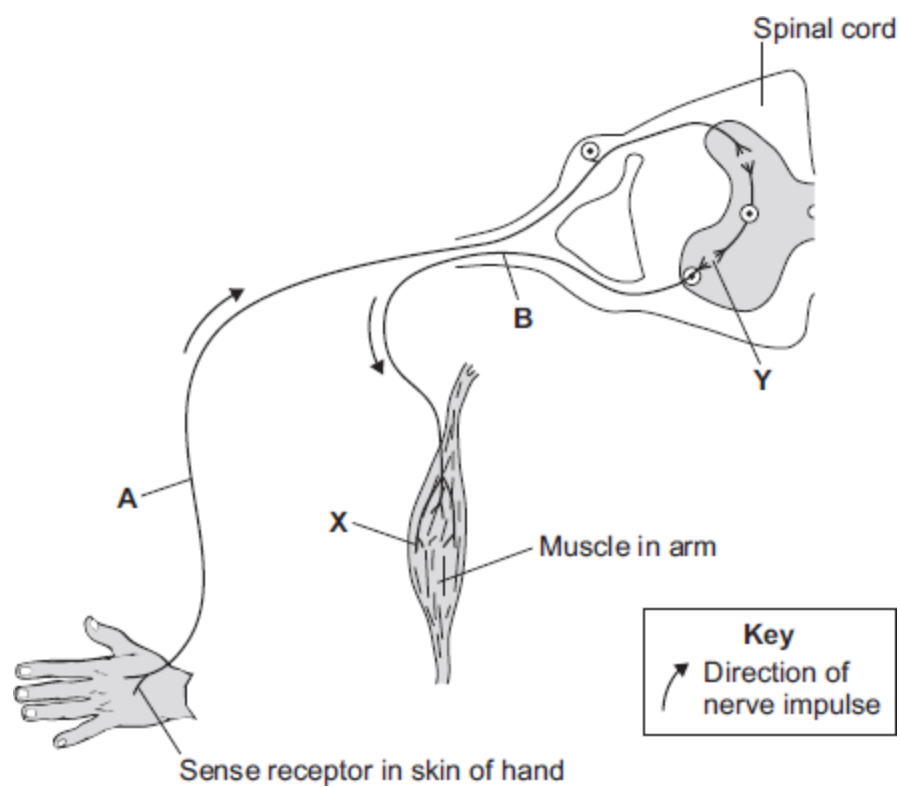
(1)

(Total 11 marks)

3.

(a) **Diagram 1** shows the neurones and parts of the body involved in a response to touching a hot object.

Diagram 1



A neurone is a nerve cell. Neurones carry impulses around the body.

(i) Draw a ring around the correct answer to complete each sentence.

Neurone **A** is a

- motor neurone.
- relay neurone.
- sensory neurone.

At point **Y** there is a tiny gap between two neurones called

- an effector.
- a receptor.
- a synapse.

(2)

(ii) The hand touches a hot object. An impulse travels through the nervous system to the muscle (point **X**). The muscle moves the hand away from the hot object.

What does the muscle do to move the hand away from the hot object?

Tick (✓) **one** box.

contract

relax

stretch

(1)

(iii) The action described in part **(a) (ii)** is a reflex action.

How can you tell that this action is **not** a conscious action?

Use information from the diagram.

(1)

(iv) Reflex actions like this are useful.

Explain why.

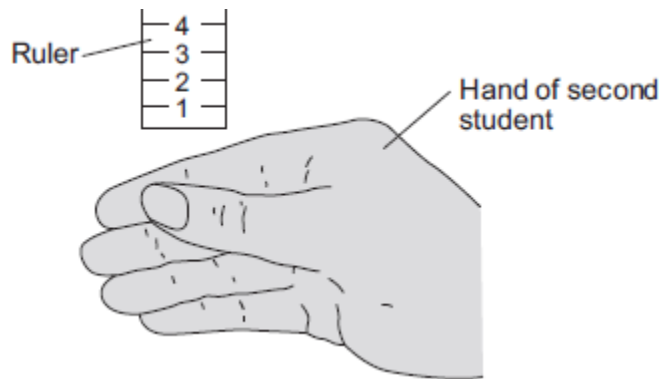
(2)

(b) Some students investigated the effect of caffeine on a person's reaction time.

The students used the following steps.

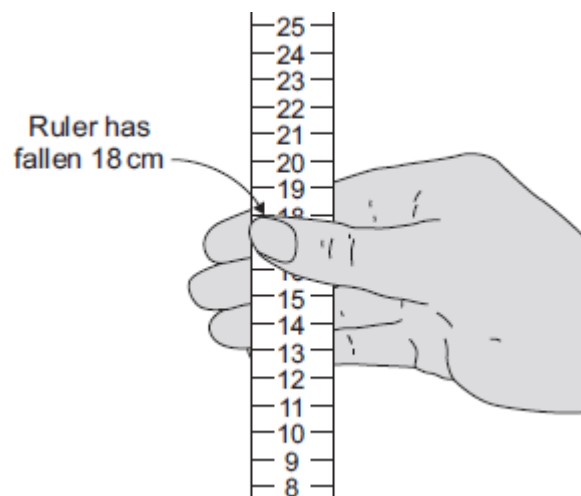
1. One student held a ruler just above a second student's hand, as shown in **Diagram 2**.

Diagram 2



2. The student let go of the ruler. The second student caught it as soon as possible, as shown in **Diagram 3**.

Diagram 3



- The students repeated this experiment seven more times.
- The student catching the ruler then drank a cup of strong coffee.

Coffee contains caffeine.

- Fifteen minutes after drinking the coffee the students repeated steps 1 to 3.

Table 1 and **Table 2** show the students' results.

Distance ruler fell before it was caught in cm
Before drinking coffee
18
21
25
15
19
16
12
21
Mean = 18.4

Distance ruler fell before it was caught in cm
After drinking coffee
8
13
11
17
10
14
13
13
Mean = 12.4

- (i) The students used the reading on the ruler as a measure of the reaction time.

What do the results show about the effect of caffeine on reaction time?

(1)

(ii) Look carefully at **all** the data in **Table 1** and **Table 2**.

Using the data in **Table 1** and **Table 2**, give **one** reason why a scientist may **not** accept your conclusion in part **(b) (i)**.

(1)

(iii) How could the students improve their investigation?

Suggest **two** ways.

1. _____

2. _____

(2)

(Total 10 marks)

4.

In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

The human body is kept at a constant internal temperature of about 37 °C.

Body temperature is monitored and controlled by the thermoregulatory centre in the brain.

(ii) Give **two** reasons why it is useful for a young root to grow towards gravity.

1. _____

2. _____

(2)

(iii) The root grows towards gravity due to the unequal distribution of a substance in the root.

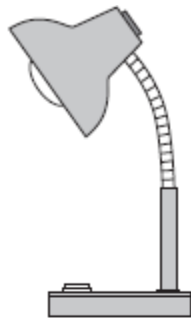
Draw a ring around the correct answer to complete the sentence.

This substance is

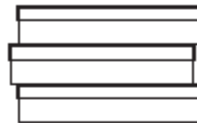
- | |
|--------------|
| auxin. |
| chlorophyll. |
| sugar. |

(1)

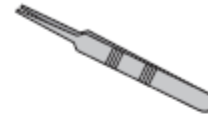
(b) The drawings show some apparatus and materials.



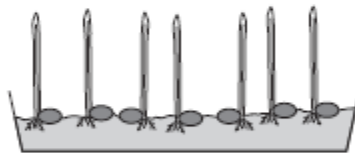
Lamp



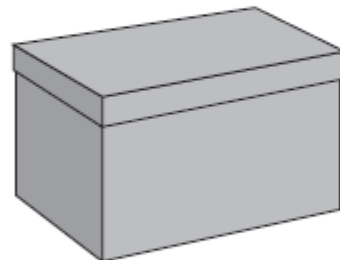
Petri dishes



Forceps



50 maize seedlings
on damp cotton wool



Supply of cardboard boxes with lids



Ruler



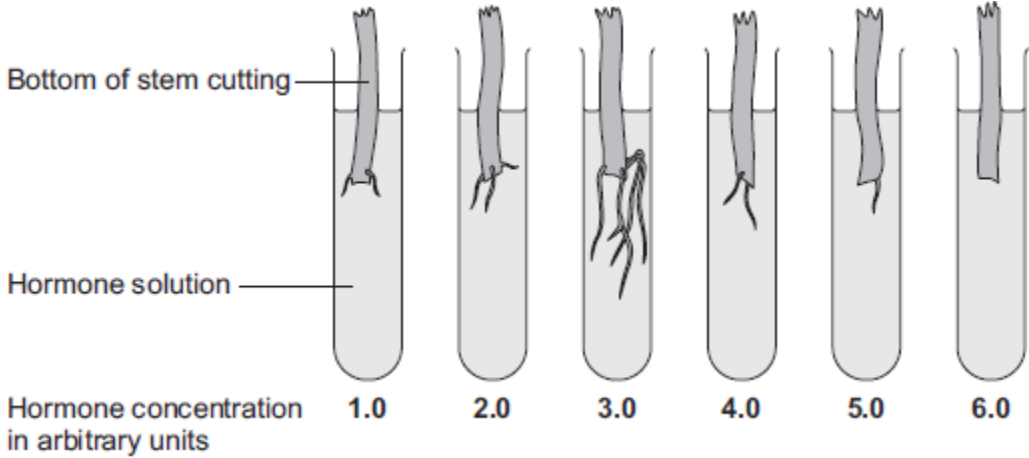
Scissors

6.

(a) A student investigated the effect of a plant hormone on the growth of roots by plant cuttings.

The student took six stem cuttings from the same plant. He put the cuttings in test tubes containing hormone solutions of different concentrations.

The image below shows the six cuttings after 2 weeks.



(i) What is the best concentration of hormone for encouraging root growth?
_____ arbitrary units

(1)

(ii) Give **two** functions of plant roots.
1. _____

2. _____

(2)

(iii) Draw a ring around the correct answer to complete the sentence.

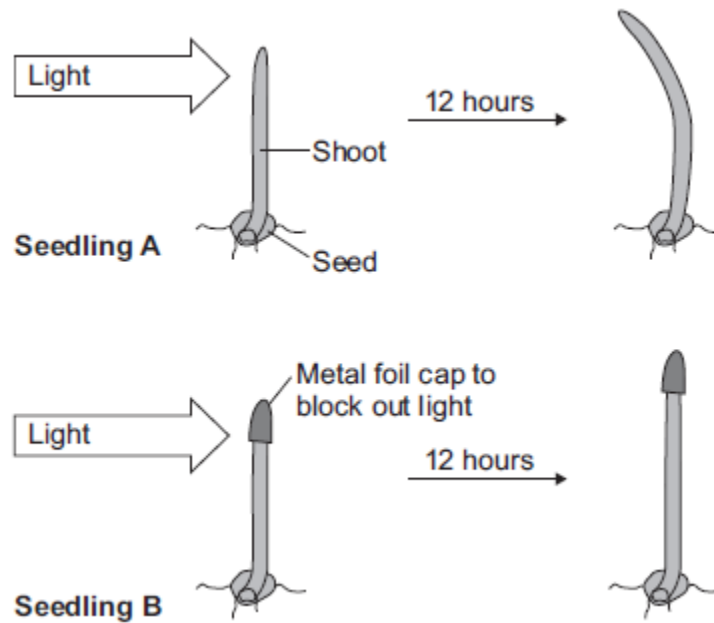
Taking cuttings to produce new plants is an example of

- asexual reproduction.
- genetic engineering.
- sexual reproduction.

(1)

- (b) Another student investigated the effect of light, shining from one side, on the growth of plant shoots.

The diagram below shows how the student treated the shoots and the results she obtained after 12 hours.



- (i) What is the response to light shown by **Seedling A** called?

Tick (✓) **one** box.

cloning

a reflex

a tropism

(1)

- (ii) The student concluded that the shoot **tip** is sensitive to light.

What evidence is there in the diagram above for this conclusion?

(2)

(c) The seedling produces a hormone which helps to control its response to light.

(i) What is the name of the hormone?

Tick (✓) **one** box.

auxin

glucagon

glycerol

(1)

(ii) How does the hormone control the response of **Seedling A** to light shining from one side?

(4)

(Total 12 marks)

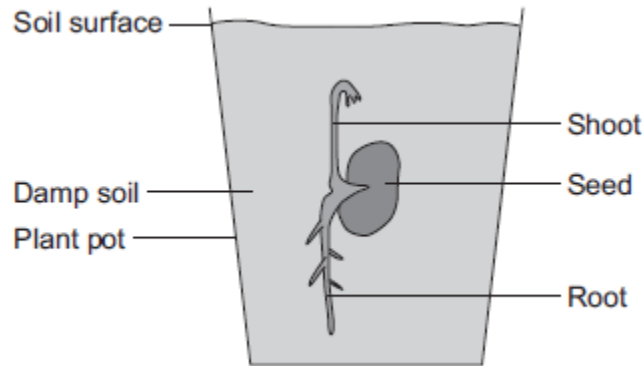
7.

A student investigated growth in plants.

The student:

- planted a seed in damp soil in a plant pot
- put the plant pot in a dark cupboard.

The image below shows the result after 5 days.



(a) Draw a ring around the correct answer to complete each sentence.

(i) After the 5 days, the root had grown

away from water.
in the direction of the force of gravity.
towards light.

(1)

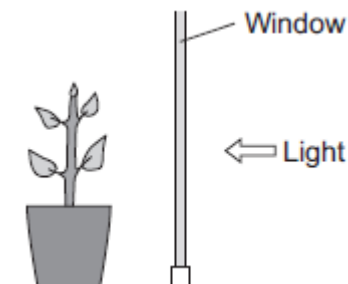
(ii) After the 5 days, the shoot had grown

against the force of gravity.
away from light.
towards water.

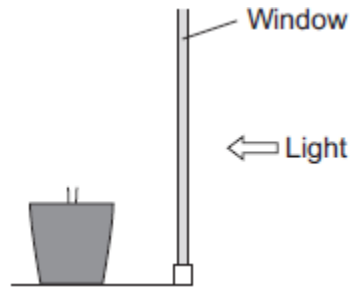
(1)

(b) After the plant had grown, the student put the plant pot by a window with lots of light.

The illustration below shows this.



- (i) Complete the diagram below to show the appearance of the student's plant after 20 days by the window.



(1)

- (ii) Explain the advantage to the plant of growing in the way that you have drawn in part (b)(i).

(2)

(Total 5 marks)

8.

It is important that the amount of water in the body is controlled.

- (a) The table below shows the main ways that a person takes in and loses water in one day.

Water taken in		Water lost	
Method	Volume in cm ³	Method	Volume in cm ³
Drink	1450	Urine	1500
Food	800	Sweat	600
Metabolic water	350	Breath	
		Faeces	100
Total	2600	Total	2600

- (i) Calculate the volume of water lost from the body through breathing.

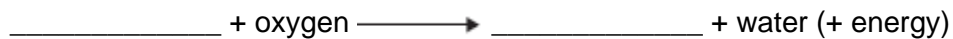
Use information from the table above.

Volume of water lost through breathing = _____ cm³

(2)

- (ii) Metabolic water is water produced by aerobic respiration.

Complete the equation for aerobic respiration.



(2)

- (iii) If the water intake stays the same, what will happen to the volumes of sweat and urine lost from the body on a much hotter day?

Draw a ring around the correct answer to complete each sentence.

The volume of sweat will

decrease.
increase.
stay the same.

The volume of urine will

decrease.
increase.
stay the same.

(2)

- (b) The kidneys help to control the water content of the body and the concentrations of substances dissolved in the body fluids. The kidneys do this by filtering the blood and then reabsorbing back into the blood the substances needed by the body.

The table above shows typical concentrations of some of the substances dissolved in a person's blood plasma, in the kidney filtrate, and in the urine.

Substance	Blood plasma in g per dm ³	Kidney filtrate in g per dm ³	Urine in g per dm ³
Protein	70	0	0
Glucose	1	1	0
Urea	0.3	0.3	20
Sodium ions	3	3	6

- (i) The table below shows that sodium ions are twice as concentrated in the urine as in the blood plasma.

Calculate how many times more concentrated **urea** is in the urine compared to the blood plasma.

Use information from the table.

Answer = _____ times more concentrated

(2)

- (ii) What is the main cause of this increase in concentration of urea between the blood plasma and the urine?

Tick (✓) **one** box.

Increased urea production by the kidney

Reabsorption of water by the kidney

Increased deamination of amino acids by the liver

(1)

- (iii) The table shows that both protein and glucose are found in the blood plasma but **not** in the urine.

Use your knowledge of kidney functioning to explain why.

Protein _____

Glucose _____

(4)

Mark schemes

1.

Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5, and apply a 'best-fit' approach to the marking.

0 marks

No relevant content.

Level 1 (1 – 2 marks)

There is a brief description of kidney function including a mention of pituitary gland **or** hormones but roles may be confused.

Level 2 (3 – 4 marks)

There is a clear description of kidney function in relation to fluctuations in blood water levels and the roles of the pituitary gland **or** hormone is mentioned with correct role.

Level 3 (5 – 6 marks)

There is a clear and detailed scientific description of kidney function in relation to fluctuations in blood water levels and of the roles of the pituitary gland and ADH.

examples of biology points made in the response:

- if water content too low, ADH released
- from pituitary gland
- into the blood
- (causing) kidney reabsorbs more water
- more concentrated / small volume urine produced
- if water content too high, ADH lowered / not produced
- less water reabsorbed by kidney
- more dilute / larger volume urine produced

full marks may be awarded for detailed description of either water loss or gain

[6]

2.

(a) (the kidney) filters the blood

ignore refs to hormones and drugs

1

(and then) reabsorbs all of the glucose

1

reabsorbs some of the ions

allow salts

ignore minerals

1

reabsorbs some of the water

1

releases urea (in urine)

1

- (b) (i) should fall from 28 (to the end of dialysis)
ignore any line drawn after end of dialysis
allow + / - 0.5 square
graph line must fall to / below
below 15 1
- (ii) should stay level at about 6 throughout
ignore slight variations
allow + / - 1 square
ignore any line drawn after end of dialysis 1
- (c) (i) immune system
allow white blood cells / lymphocytes 1
- (produces) antibodies 1
- (which) attack the antigens (on the transplanted kidney)
non-matching antigens insufficient 1
- (ii) any **one** from:
 - tissue typing (to find match)
 - treating with drugs that suppress the immune system*accept treat with immunosuppressants.* 1
- [11]
- 3.** (a) (i) sensory neurone 1
- a synapse 1
- (ii) contract 1
- (iii) not connected to brain / coordinated only by spinal cord 1
- (iv) automatic / rapid (response)
allow no thinking / faster / less time 1
- protects body from danger / from damage / from burning 1
- (b) (i) caffeine decreases reaction time
accept caffeine speeds up / quicker reactions 1

- (ii) the two sets of results overlap (considerably)
allow use of appropriate numbers – eg 5 of the ‘after’ results overlap with the ‘before’ results
allow ‘wide spread of results’
allow ‘it was just one person’ or ‘it was a small sample’
accept use of one pair of results only – if meaning is clear
accept use of one pair of overlapping results

1

- (iii) any **two** sensible suggestions: eg
- more repetitions
 - perform investigation on several other people
 - use other (measured) amounts of coffee
 - use different / more time intervals
 - other suggested measure of reaction time – eg computer-generated light flash + time measurement
 - use pure caffeine or caffeine tablets

2

[10]

4.

Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response. Examiners should also apply a ‘best-fit’ approach to the marking.

0 marks

No relevant content.

Level 1 (1 – 2 marks)

There is a description of thermoregulation **or** at least one correct mechanism (skin, sweat glands or muscles) but roles may be confused.

Level 2 (3 – 4 marks)

There is a description of thermoregulation **or** some correct mechanisms (sweating, shivering, blood flow in the skin).

Level 3 (5 – 6 marks)

There is a clear description of thermoregulation by TC or skin **and** some correct control mechanisms.

examples of biology points made in the response:

full marks may be awarded for detailed description of what happens if the core temperature is either too high or too low

- temperature receptors in TC
- the TC detects (core) body / blood temperature
- temperature receptors in the skin send impulses to the TC, giving information about skin temperature
- if the core body temperature is too high: blood vessels / arterioles supplying the skin capillaries dilate / vasodilation

***do not** accept refs to veins instead of arterioles or answers that imply blood vessels have moved up / down through the skin.*

- so that more blood flows (through the skin) and more heat is lost
- sweat glands release more sweat to cool the body
- by evaporation
- if the core body temperature is too low: blood vessels supplying the skin capillaries constrict
- to reduce the flow of blood (through the skin) and less heat is lost
allow idea of blood diverted to vital organs in extreme cold
- muscles may shiver to release (heat) energy
- from respiration, some of which is lost as heat

[6]

5.

- (a) (i) gravitropism / geotropism
not '...trophism'
ignore 'positive' or 'negative'

1

- (ii) any **two** from:

- anchorage
- takes in water
- takes in ions / minerals / salts / correct named example
allow nutrients
do not accept food

2

- (iii) auxin

1

- (b) Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response.
Examiners should also refer to the information on page 5, and apply a best-fit approach to the marking.

0 marks

No relevant content.

Level 1 (1 – 2 marks)

There is a basic description of a simple method involving seedlings and light.

Level 2 (3 – 4 marks)

There is a description of a method involving seedlings in 1-sided light, and a control, with a correct observation.

Level 3 (5 – 6 marks)

There is a description of a method involving groups of seedlings in 1-sided light, and in control conditions. It includes some correct measurements or observations.

examples of Biology points made in the response:

- use of scissors to cut tips from some shoots / cut hole in box
- use of forceps for handling seedlings
- use of ruler to measure lengths of shoots at start and at end
- other factors controlled – eg temperature / water
- use of lamp + box re. one-sided lighting
- repetitions – each treatment ≥ 3 times
- control in total darkness / all-round light
- time taken = several hours to a few days
- sample results: tip exposed to 1-sided light \rightarrow bend to light, tip removed \rightarrow vertical, control \rightarrow vertical

6

[10]

6.

- (a) (i) 3.0

accept 3

1

- (ii) any **two** from:

- take in water
- take in ions / minerals / nutrients
accept salts / named ions
- ignore food*
- anchorage / support

2

- (iii) asexual reproduction

1

- (b) (i) a tropism

1

(ii) if tip exposed / **A** – grows / bends towards light

allow tip of A moves towards light

ignore A responds to light

allow remained 'straight'

1

if tip covered / **B** – did not grow towards light / remained vertical

ignore B does not respond to light

ignore phototropism

only A grows towards the light = 2 marks

1

(c) (i) auxin

1

(ii) hormone comes from the tip

1

more on shady side / moves away from light

allow reference to right-hand side

1

stimulates growth

1

more growth on shady side (than on light side)

answer must be comparative

ignore phototropism

ignore cell division

1

[12]

7.

(a) (i) in the direction of the force of gravity

1

(ii) against the force of gravity

1

(b) (i) diagram completed to show stem bending / leaning towards the window

the bend / lean can be at / from any point above pot level

ignore any leaves

1

(ii) more light (for leaves)

ignore heat

1

more photosynthesis / biomass / glucose

ref to 'more' needed once only, eg 'more light for photosynthesis' =
2 marks

if no other marks given allow 1 mark for 'to get light for
photosynthesis'

1

[5]

8.

(a) (i) 400

correct answer = 2 marks with or without working

$$2600 - (1500 + 600 + 100)$$

or

$$2600 - 2200$$

for 1 mark

2

(ii) LHS: glucose

accept $C_6H_{12}O_6$ / $C_6H_{12}O_6$ / sugar

1

RHS: carbon dioxide

accept CO_2 / CO_2

do **not** accept CO^2 / CO

1

(iii) (sweat) increase

1

(urine) decrease

1

(b) (i) 66.7 / 66.67 / $66\frac{2}{3}$ / $66.\dot{6}$ / 67

accept answers in range

correct answer = 2 marks with **or** without working

or

$$\frac{20}{0.3} \text{ for 1 mark}$$

or 66 / 66.6 / 66.66 / $66.\dot{6}$ / 67.0 for 1 mark

(penalise excessive number of sig. figs. -1 mark) (eg no more than
2 decimal places)

2

(ii) reabsorption of water by the kidney

1

(iii) (protein) (too) big

1

cannot pass through filter / stays in blood / cannot enter kidney tubule

1

(glucose) small / can pass through filter

1

all taken back into blood / all reabsorbed

allow the glucose is reabsorbed

1

(c) any **four** from:

- transplant is permanent / dialysis is repetitive treatment / dialysis only short term
- kidney works all the time / dialysis intermittent
- concentrations in blood kept (\pm) constant / substances build up in blood between dialysis sessions
- poisoning / damage to body by build-up of substances (with dialysis)
- danger of infection / damage to blood vessels by needles (with dialysis)
- risk of blood clots with dialysis or anticlotting drugs (can lead to blood loss)
- long term expense of dialysis / excessive use of health service resources
- social point – inconvenience of dialysis described – can eat or drink without constraint with transplant

4

[17]