

Name: _____

Homeostasis and Response part 6 AQA Triple Biology

Class: _____

Date: _____

Time: **80 minutes**

Marks: **75 marks**

Comments:

1.

Some human responses are reflex actions.

(a) Give **two** features of a reflex action.

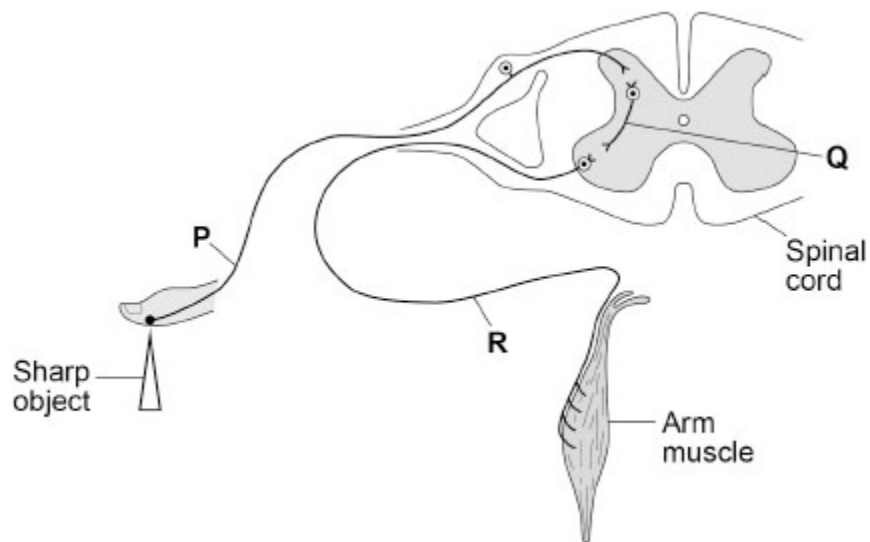
1 _____

2 _____

(2)

Figure 1 shows the nerve pathway for moving a hand away from a sharp object.

Figure 1



(b) Complete the sentences.

Choose answers from the box.

coordinator	effector	receptor	stimulus
--------------------	-----------------	-----------------	-----------------

When the finger touches the sharp object, the point stimulates the

_____.

Nerve impulses reach the arm muscle which is the _____.

(2)

(c) **P, Q and R** in **Figure 1** are three types of neurone.

Draw **one** line from each letter to the type of neurone.

Letter	Type of neurone
<input type="text" value="P"/>	<input type="text" value="Motor"/>
<input type="text" value="Q"/>	<input type="text" value="Reflex"/>
<input type="text" value="R"/>	<input type="text" value="Relay"/>
	<input type="text" value="Sensory"/>

(3)

(d) The gap between two neurones is called a synapse.

How does information travel across the synapse?

Tick (✓) **one** box.

As a chemical

As pain

As sound

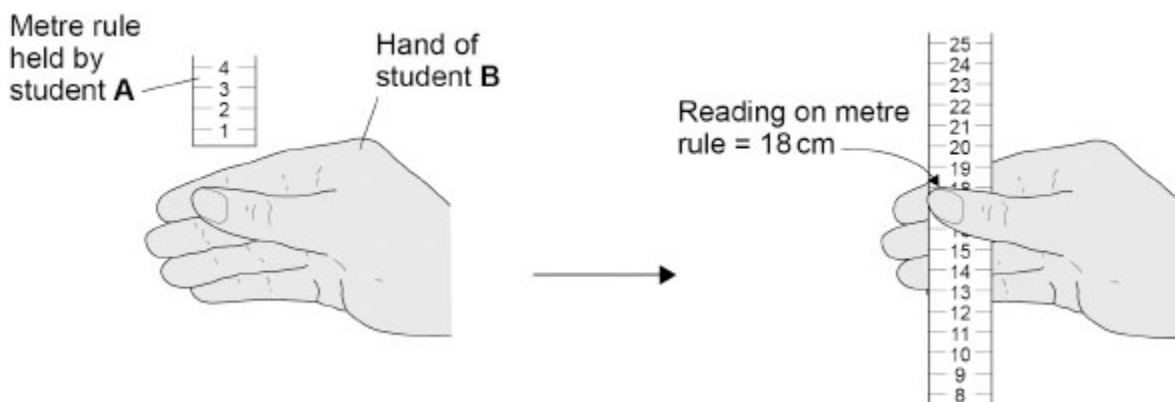
(1)

Two students investigated reaction time.

This is the method used.

1. Student **A** holds a metre rule just above student **B**'s hand, as shown in **Figure 2**.
2. Student **A** lets go of the metre rule.
3. Student **B** catches the metre rule as quickly as possible.
4. Student **A** writes down the reading from the scale on the metre rule.
5. Students **A** and **B** repeat steps 1 to 4 two more times.

Figure 2



The table below shows the results.

Test	Reading on metre rule in cm
1	18
2	17
3	13
Mean	X

(e) Calculate mean value **X** in the table above.

X = _____ cm

(2)

(f) The students concluded:

'Practice improved the speed of student B's reaction.'

Give evidence for the students' conclusion.

Use the table above.

(1)

(g) Suggest **one** way to improve the investigation.

(1)

(Total 12 marks)

2.

Human growth hormone (hGH) is made by the pituitary gland.

(a) Name **one other** hormone made by the pituitary gland.

(1)

(b) hGH is a protein.

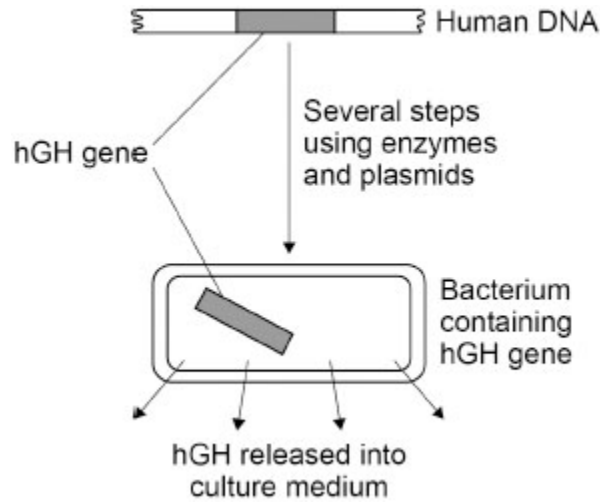
A child with a deficiency of hGH can be given injections of hGH.

What would happen to the hGH if it was given as a tablet that was swallowed?

(1)

Scientists can use genetic engineering to make hGH.

The figure below shows a summary of the process.



(c) Describe how scientists can transfer the gene for hGH from human cells to bacterial cells.

Use information from the figure above.

(4)

(d) Growth hormone (GH) can be extracted from the urine of farm animals.

It is better to use hGH made by genetic engineering than to use GH from the urine of farm animals.

Suggest **two** reasons why.

Do **not** refer to ethical reasons or religious beliefs in your answer

1 _____

2 _____

(2)

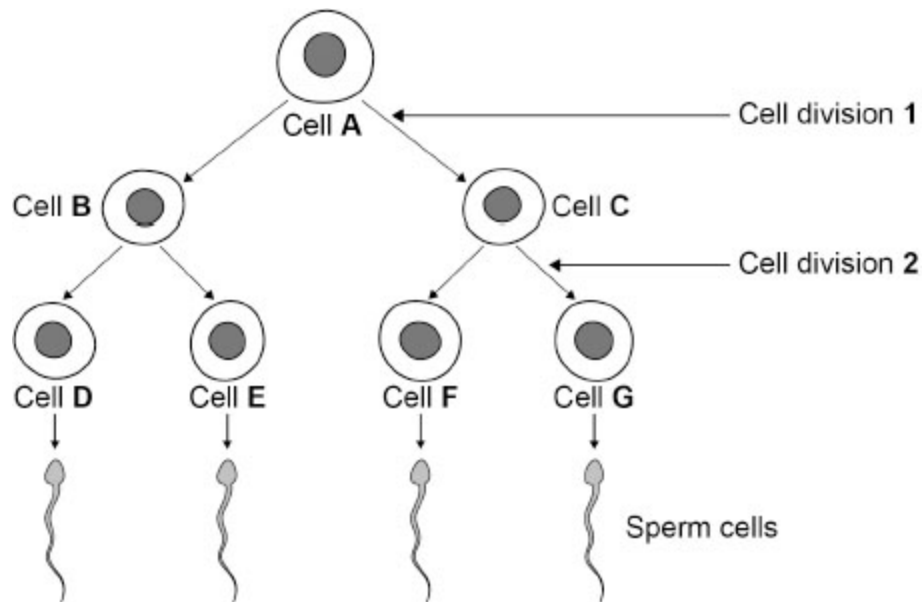
(Total 8 marks)

3.

New cells are produced by cell division.

Figure 1 shows sperm formation in a human.

Figure 1



(a) Where in the body are sperm cells produced?

(1)

(b) How many chromosomes are there in cell **A** and in cell **D**?

Choose answers from the box.

23	24	46	92
----	----	----	----

Cell **A** _____

Cell **D** _____

(2)

(c) Complete the sentence.

Choose the answer from the box.

differentiation	evolution	fertilisation
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A sperm cell joins with an egg cell in a process called _____.

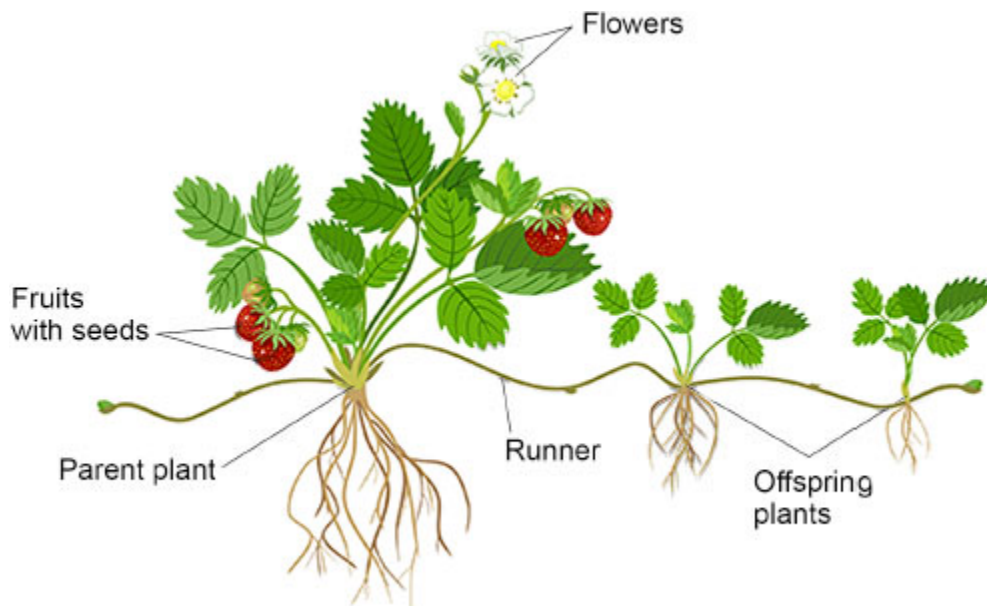
(1)

Strawberry plants can reproduce both sexually and asexually.

Figure 2 shows a strawberry plant reproducing:

- sexually, using flowers, fruits and seeds
- asexually, using horizontal stems called runners.

Figure 2



(d) Meiosis produces gametes.

What is the name of the male gamete in a flower?

Tick (✓) **one** box.

Embryo

Ovum

Pollen

(1)

(e) Which process produces new cells in runners?

Tick (✓) **one** box.

Binary fission

Evolution

Mitosis

(1)

- (f) Substances used for growth pass through the runners from the parent plant to the offspring plants.

Which **two** substances pass through the runners?

Tick (✓) **two** boxes.

Carbon dioxide	<input type="checkbox"/>
DNA	<input type="checkbox"/>
Insulin	<input type="checkbox"/>
Sugar	<input type="checkbox"/>
Water	<input type="checkbox"/>

(2)

Sexual reproduction and asexual reproduction each have different advantages for the strawberry plant.

- (g) Give **one** advantage of reproducing **sexually**.

(1)

- (h) Give **one** advantage of reproducing **asexually**.

(1)

(Total 10 marks)

4.

It is important to maintain the water balance of the body.

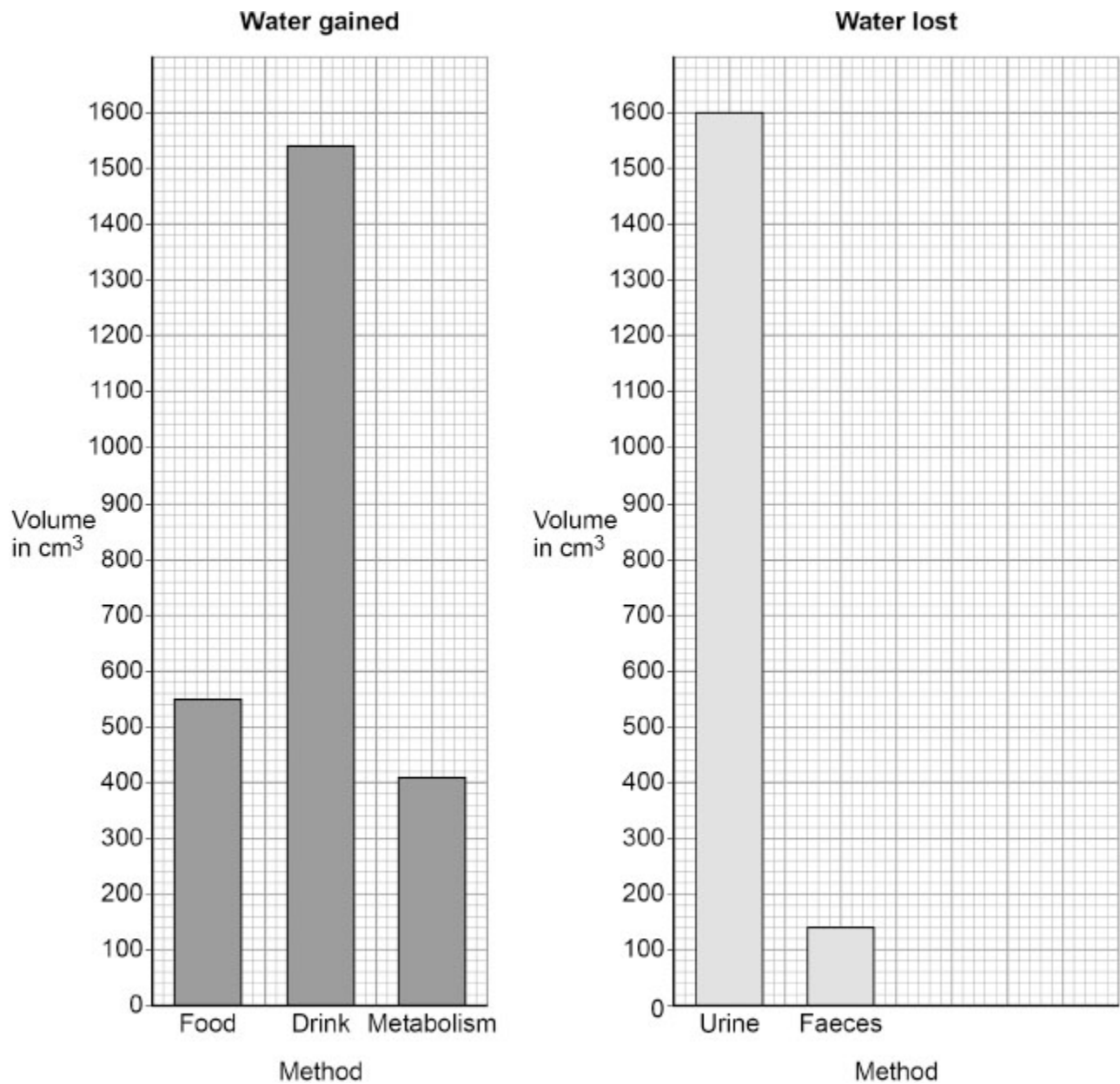
The volume of water a person gained and lost was measured on a day the person did no exercise.

The table below shows how much water the person gained and lost by different methods on the day.

Water gained	
Method	Volume in cm³
Food	550
Drink	1540
Metabolism	410
Total	2500

Water lost	
Method	Volume in cm³
Urine	1600
Faeces	140
Sweat	420
Breathing	340
Total	2500

The figure below shows some of the data from the table above.



(a) Complete the figure above.

You should:

- plot the data for sweat and for breathing from the table above
- label each bar.

(2)

(b) On another day, the person ran in a long-distance race.

What would happen to the volume of water lost by sweating on the day of the race?

Tick (✓) **one** box.

Decrease

No change

Increase

(1)

(c) The kidneys control the amount of water in the body.

Draw **one** line from each process in the kidneys to the name of that process.

Process in the kidneys

Name of process

Removes water from the blood

Takes excess water out of the body

Takes water back into the blood

Coordination

Excretion

Filtration

Reabsorption

(3)

(d) A person with kidney failure can be treated by dialysis or by a kidney transplant.

For dialysis:

- a person needs 3 dialysis sessions each week
- each session can last 6 to 8 hours
- each session has to happen in a hospital.

For a kidney transplant:

- a suitable donor is needed
- a surgical operation is needed.

Evaluate the use of a kidney transplant instead of dialysis for treating kidney failure.

Include your own knowledge in your answer.

(4)

(Total 10 marks)

5.

Tropisms help plants survive.

(a) What is geotropism?

(2)

Plant responses are controlled by hormones.

(c) Which hormone controls a plant's response to the direction of light?

(1)

(d) How does the hormone you named in part (c) control the plant's response to the direction of light?

Tick (✓) **one** box.

All parts of the plant have the same concentration of hormone.

The hormone has an effect when it breaks down.

There is an uneven distribution of the hormone.

(1)

(e) Explain how a plant's response to light helps the plant survive.

(3)

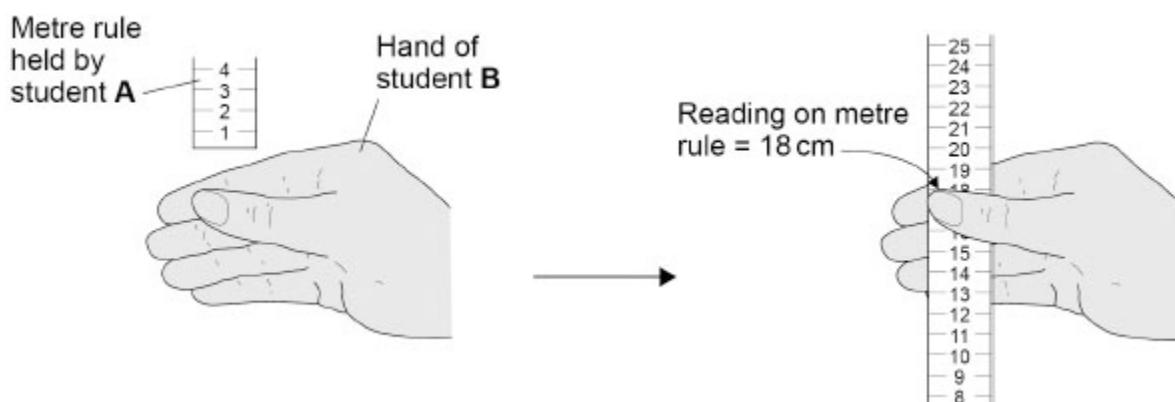
(Total 13 marks)

6.

Two students investigated reaction time.

This is the method used.

1. Student **A** holds a metre rule just above student **B**'s hand, as shown in the figure below.
2. Student **A** lets go of the metre rule.
3. Student **B** catches the metre rule as quickly as possible.
4. Student **A** writes down the reading from the scale on the metre rule.
5. Students **A** and **B** repeat steps 1 to 4 another six times.

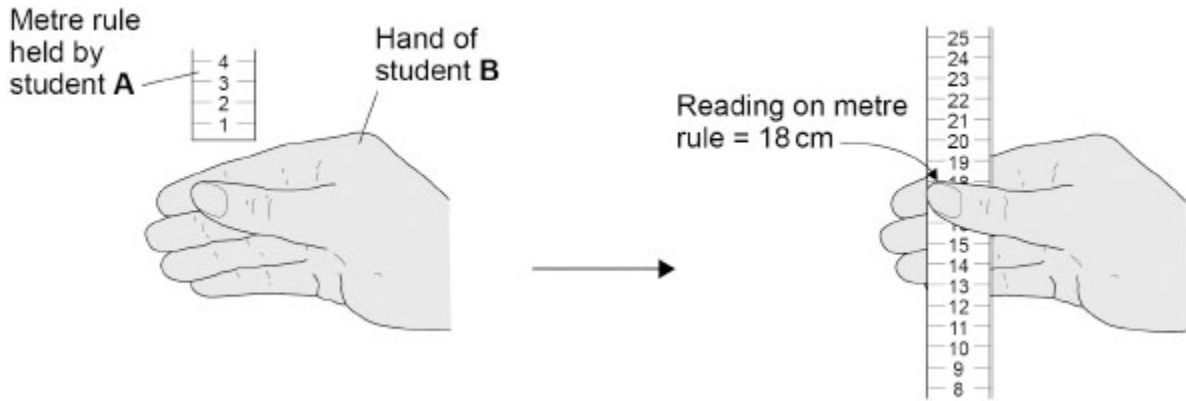


The table below shows the results.

Test	Reading on metre rule in cm
1	18
2	15
3	12
4	16
5	14
6	23
7	14
Mean	16

The method and the figure are repeated below.

1. Student **A** holds a metre rule just above student **B**'s hand, as shown in the figure below.
2. Student **A** lets go of the metre rule.
3. Student **B** catches the metre rule as quickly as possible.
4. Student **A** writes down the reading from the scale on the metre rule.
5. Students **A** and **B** repeat steps 1 to 4 another six times.



(c) Describe **two** ways the students could improve the investigation.

Do **not** refer to repeating results in your answer.

1 _____

2 _____

(2)

7.

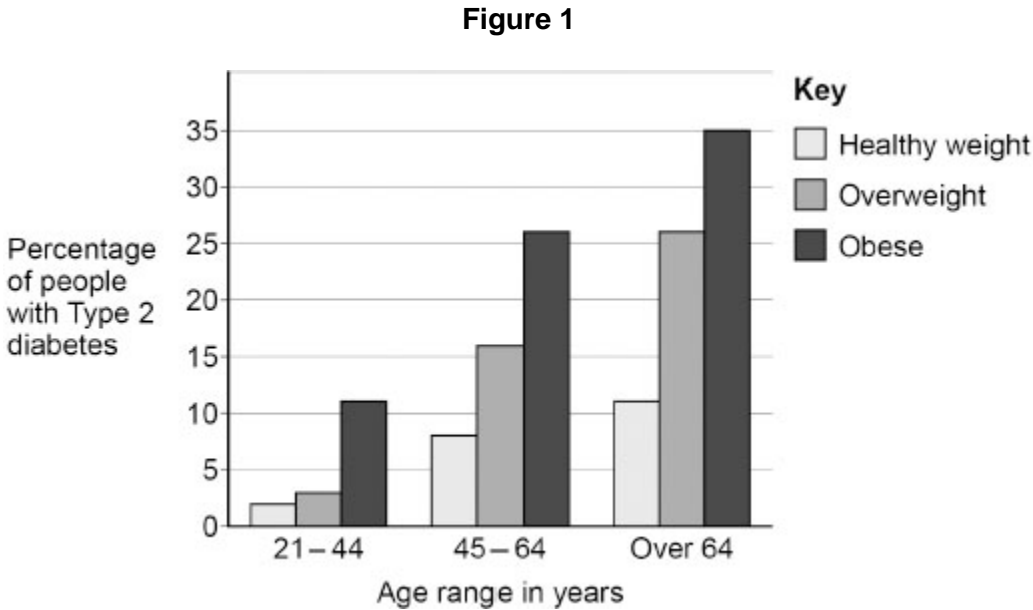
Type 2 diabetes is a condition that has become more common in recent years.

(a) Scientists recorded the percentage of people of different ages who had Type 2 diabetes.

The people were in different weight categories:

- healthy weight
- overweight
- obese.

Figure 1 shows the results.



Give **two** conclusions from the results in **Figure 1**.

1 _____

2 _____

(2)

Two groups of scientists investigated the use of different drugs to treat Type 2 diabetes.

In both investigations, the scientists measured the percentage of haemoglobin with glucose attached (Hb-G).

This showed the long-term concentration of glucose in the blood.

Investigation 1:

The scientists injected drug **A** into 175 patients with Type 2 diabetes once each day for 12 weeks.

The table below shows the results.

	Mean value	
	At start	At 12 weeks
Percentage (%) of haemoglobin with glucose attached (Hb-G)	9.2	7.6

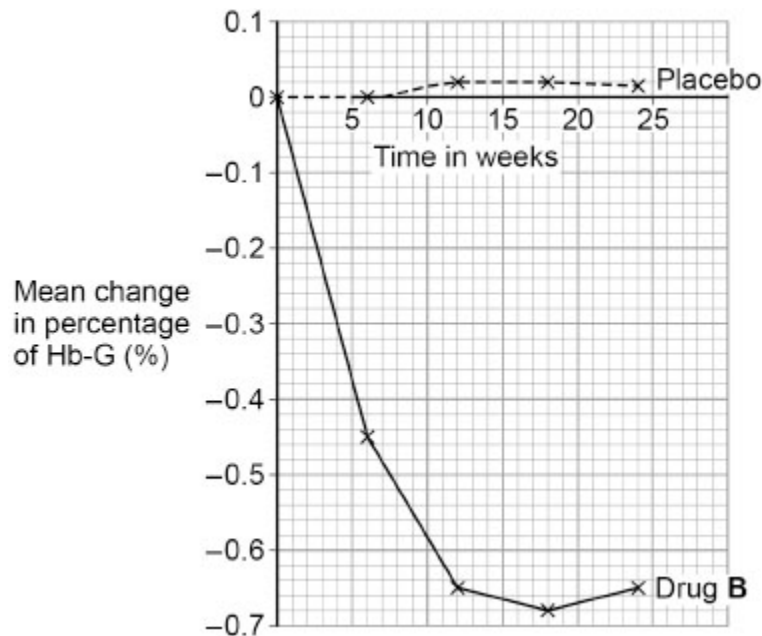
Investigation 2:

631 patients with Type 2 diabetes took one tablet containing drug **B** each day. A control group of 630 patients took a placebo tablet each day.

The scientists measured the Hb-G in each patient’s blood at the start of the investigation and at 6-week intervals up to 24 weeks.

Figure 2 shows the results.

Figure 2



Mark schemes

1.

(a) any **two** from:

- fast / rapid
- protects (from danger / harm)
allow prevents harm
- a response / reaction
ignore action
- automatic / involuntary
or
not under conscious control
allow not coordinated by the conscious part of the brain
or
allow does not involve thought / thinking

2

(b) receptor

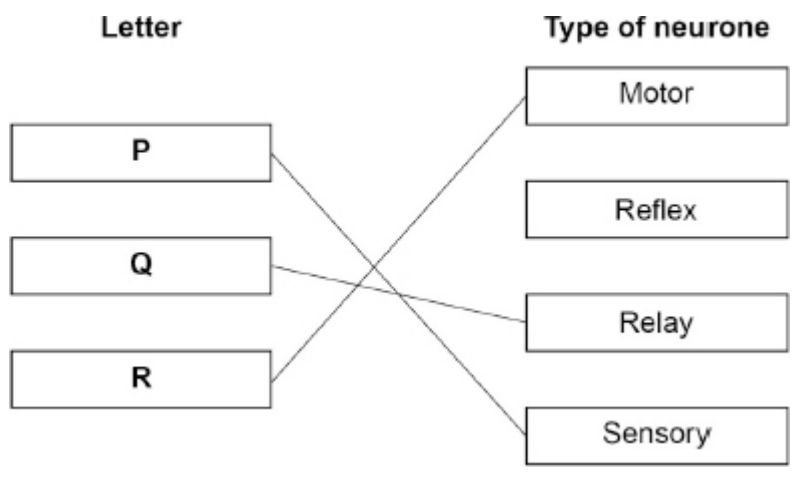
1

effector

in this order only

1

(c)



do **not** accept more than one line from a box on the left

3

(d) as a chemical

1

(e)

$$\frac{18 + 17 + 13}{3}$$

allow $\frac{48}{3}$

1

16 (cm)

1

- (f) shorter time in each (successive) test
or
shorter distance in each (successive) test
ignore speed / it improved

1

(g) any **one** from:

- use more repetitions
- test more students
- use ruler with smaller / mm divisions
allow use a ruler with a more precise scale
allow use a ruler with a better resolution
ignore use a more accurate ruler
- same starting position of ruler (above student **B**'s hand)
- same distance between finger(s) and thumb
- student **B** supports arm / hand / wrist / elbow on bench / table
*allow make sure student **B**'s hand is stationary*
*allow use dominant **or** non-dominant hand each time*
- use same hand (each time)
allow drop ruler without warning
allow drop ruler at random time intervals
- use of mechanical / electronic device to hold and drop ruler
allow idea of controlling distraction / caffeine / sleep / alcohol
allow use a computer program

1

[12]

2.

- (a) ADH **or** antidiuretic hormone
allow other correct pituitary hormone eg FSH / LH / TSH
ignore functions of hormones

1

(b) any **one** from:

- (it would) be digested to amino acids
- (it would) be digested by protease
- (it would) be digested (by enzymes) in the stomach
- (it would) be digested (by enzymes) in the small intestine
- (it would) be digested so (hGH is) not absorbed
allow 'broken down' for digested throughout

1

- (c) isolate (hGH) gene from human DNA / chromosome
allow cut (hGH) gene from human DNA / chromosome 1
- join (hGH) gene to (cut) plasmid 1
- put plasmid (containing gene) into bacteria 1
- enzyme used at a suitable stage:*
- to cut (hGH) gene from human DNA
or
 to insert / join (hGH) gene to plasmid
allow reference to named enzyme used in genetic engineering
allow to insert / join (hGH) gene to bacterial DNA 1
- (d) any **two** from:
- (hGH) easier to isolate / purify / extract
 - made in larger quantities
ignore reference to speed of production
 - no / less chance of immune reaction
allow no / less chance of rejection
ignore reference to side effects
 - no / less chance of passing on disease / pathogens (from animals to humans)
or
 no / less chance of infection (of humans)
allow named (animal) disease eg BSE
 - no / less chance of containing antibiotics / urea / drugs
 - it is the specific human hormone so may be more effective (in human body)
allow animal GH may not be the correct shape
ignore ethical / religious reasons
ignore reference to cost
allow converse if clearly referring to GH

2

[8]

3.

- (a) testis / testes / testicle(s) 1

(b) **A** = 46

1

D = 23

*if no other mark awarded allow 1 mark for **A** = 92 **and** **D** = 46*

1

(c) fertilisation

1

(d) pollen

1

(e) mitosis

1

(f) sugar

1

water

1

(g) any **one** from:

- produces (genetic) variation (in offspring)
allow offspring are not (genetically) identical
allow description of an advantage of variation
eg not all killed by one pathogen / disease
- (seeds / fruits) can be dispersed (to new areas)
- many seeds / offspring produced
- offspring not competing (for light / water / ions)
- can survive in a new environment
- enables evolution

1

(h) any **one** from:

- fast
- many offspring produced
- (genetically) identical offspring
allow they are clones
- only one parent needed
- offspring less vulnerable (as attached to parent)
- offspring receive water from parent
allow offspring receive named example of nutrient from parent
- can out-compete other species
- can colonise local area
- less energy is needed
allow pollinators / bees not required

1

[10]

4.

- (a) bars plotted at 420 **and** 340
allow a tolerance of $\pm \frac{1}{2}$ a small square
allow bars touching
ignore width of bars
ignore shading

1

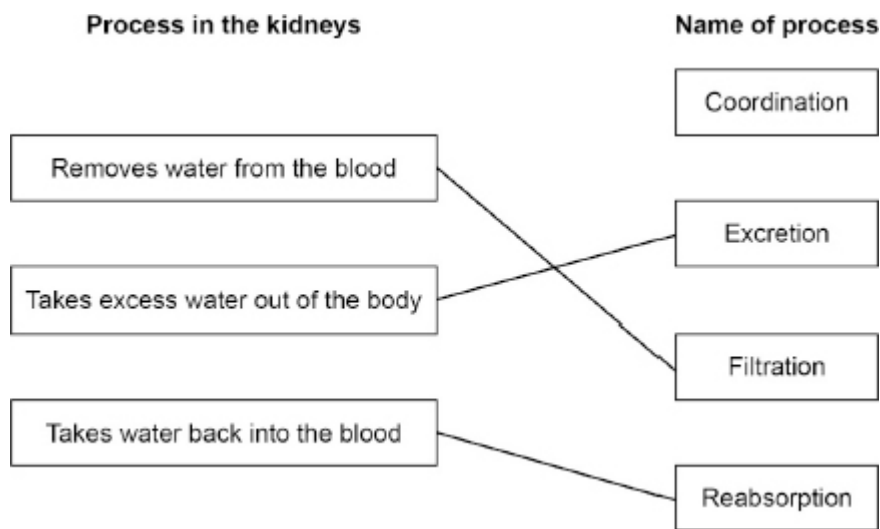
bars correctly labelled

1

- (b) increase

1

- (c)



do **not** accept more than one line from a box on the left

3

- (d) **Level 2:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.

3-4

Level 1: Relevant points are made. They are not logically linked.

1-2

No relevant content

0

Indicative content

in favour of a kidney transplant

- no need for regular / long hospital visits
- could last for rest of lifetime
- flexible lifestyle eg as can go on holidays
- may not live near a hospital **or** reference to transport costs
- no risk of infection from frequent piercing of skin

or

no risk of infection from blood exposed to equipment

- no need for controlled diet
- maintains correct concentration of substances in blood / body
- cheaper in long term

against a kidney transplant

- may be rejected
- need to keep taking anti-rejection drugs **or** immunosuppressants
- (suitable) donor may not be available

or

donor may need tissue matching

- risk from surgery (anaesthetic or infection)
- recovery from surgery may take a long time
- may need replacing eventually

For **Level 2**, points for and against a kidney transplant must be given.

[10]

5.

(a) growth (response)

ignore direction of growth

1

due to gravity

1

(b) **Level 3:** The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.

5-6

Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the plan is not fully logically sequenced.

3-4

Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.

1-2

No relevant content

0

Indicative content

- place a seedling in box with slit
- place a seedling in darkness **or** in all-round light
- measure initial heights of shoots
- measure final heights of shoots **or** measure shoots with a ruler **or** measure the growth of shoots
- record a named feature of appearance of seedlings
- detail of how bent shoots are measured eg use thread or straighten them out

- repeat with several seedlings
- calculate mean height increase for each condition
- compare results (for each condition)

control variable(s)

- same number of seedlings (per pot / condition)
- same temperature
- same volume of water
- same soil type / volume
- same age of seedlings
- same species / type of plant
- same time left for

For **Level 3**, a method comparing the growth of plants in light from one direction with plants in full light / darkness along with control variables is required.

(c) auxin 1

(d) there is an uneven distribution of the hormone 1

(e) leaves / plant receive(s) / absorb(s) more light 1

(so) more photosynthesis 1

(which produces) more glucose

allow (which produces) more starch / carbohydrate / sugar

allow (which produces) more (named) organic material / other named organic substance

if no other marks awarded allow 1 mark for any two of the mark points with no reference to 'more'

1

[13]

6. (a) 15 cm

1

(b) *substitution*

$$t = \sqrt{\frac{2 \times 16}{980}} \text{ (seconds)}$$

allow correct conversion to milliseconds at any point in the calculation

$$\text{allow } t = \sqrt{\frac{32}{980}} \text{ (seconds)}$$

1

correct answer

$$t = 0.18070... \text{ (seconds)}$$

all subsequent marks can be awarded using an incorrectly calculated value

1

conversion to milliseconds

$$t = 180.7 \text{ (milliseconds)}$$

1

rounding to 3 significant figures

$$181 \text{ (milliseconds)}$$

allow student's incorrectly / not converted answer correctly rounded to 3 significant figures

1

(c) any **two** from:

- use ruler with smaller / mm divisions
allow use a ruler with a more precise scale
allow use a ruler with a better resolution
ignore use a more accurate ruler
- align 0 cm on ruler with **top** / **bottom** of (student's **B**'s) thumb
*allow same starting position of ruler above (student **B**'s) hand*
- same distance between (student **B**'s) finger(s) and thumb
- (student **B**) supports arm / hand / wrist / elbow on bench / table
*allow make sure (student **B**'s) hand is stationary*
- use same hand (each time)
*allow use dominant **or** non-dominant hand each time*
- convert distance to time

- allow drop ruler without warning
or
drop ruler at random time intervals
allow use of mechanical / electronic device to hold and drop ruler
allow idea of controlling distraction / caffeine / sleep / alcohol
allow use a computer program (to measure reaction time)

2

- (d) receptor (in eyes) detect stimulus / movement
allow retina detects stimulus / movement

1

impulses generated / transmitted / travel
allow electrical signals generated / transmitted / travel
ignore messages / information

1

(from) sensory neurone (to relay neurone) to motor neurone

1

(along) optic nerve to brain
ignore CNS / spinal cord

1

chemical crosses synapses between neurones

1

effector / muscle in fingers / hand / arm contracts (to catch the ruler)

1

[13]

7.

- (a) (percentage of people with Type 2) diabetes increases with age
allow converse
allow answers in terms of likelihood of having / getting (Type 2) diabetes
allow more old people have (Type 2) diabetes

1

(percentage of people with Type 2) diabetes increases with increased (body) mass / weight

allow more obese people have (Type 2) diabetes
allow (percentage of people with type 2) diabetes increases with obesity

1

- (b) 7.65 %

1

- (c) **Level 3:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.

5-6

Level 2: Some logically linked reasons are given. There may also be a simple judgement.

3-4

Level 1: Relevant points are made. They are not logically linked.

1-2

No relevant content

0

Indicative content

Allow 'investigation 1' for drug **A** and 'investigation 2' for drug **B** throughout

Methods

Methods are not comparable because:

- different methods are used to administer the drugs - injection (drug **A**) and pill (drug **B**)
or drug **A** acts more quickly (than drug **B**)
- dosage for drug **A** and drug **B** might differ (as dosage is not stated)
- drug **A** and drug **B** are tested for different time periods
or **B** is given for a longer period (24 weeks) (than **A** - 12 weeks)
- placebo / control only included when testing drug **B**
- only drug **B** has intermediate readings
or fewer readings were taken when testing drug **A**
- different sample sizes were used
or greater sample size used when testing drug **B**
(**A** = 175, **B** = 631 / 1261)
- different scientists carried out each investigation
- no double-blind trial for drug **A**

Methods may be similar because:

- neither drug trial was double-blind
- quantitative tests in both trials
- (relatively) large sample size used for both drugs

Usefulness of drug A and drug B

allow 'blood glucose' for Hb-G throughout

- both lower Hb-G (levels)
- both lower Hb-G to similar levels
- drug **A** reduced Hb-G more than drug **B**
- neither drug reduced Hb-G to an acceptable value (<7%)
- Hb-G increases after 18 weeks with drug **B**
- no information on side effects for either drug
- no information on the trend for drug **A**

For **Level 1**, details about the method **or** usefulness of the drugs must be given.

For **Level 3**, details about the method **and** usefulness of the drugs must be given.

[9]