Homeostasis and Response part 7 AQA Triple Biology

Name: _____

Class: _____

Date: _____

Time: **79 minutes**

Marks: **75 marks**

Comments:

1. The nervous system allows humans to:

- respond to stimuli
- coordinate their behaviour.

(a) Complete the order of structures to link a stimulus to a response.

Choose answers from the box.

coordinator	**effector**	**receptor**

stimulus → _____ → _____ → _____ → response

(2)

(b) Some human actions are reflex actions.

What is a reflex action?

_____

_____

_____

_____

(2)

(c) Which is an example of a reflex action?

Tick (✓) **one** box.

Blinking in sudden bright light ☐

Kicking a ball in a game ☐

Writing a message to a friend ☐

(1)

(d) Many reflex actions are movements.

What type of tissue causes movement?

Tick (✓) **one** box.

Blood ☐

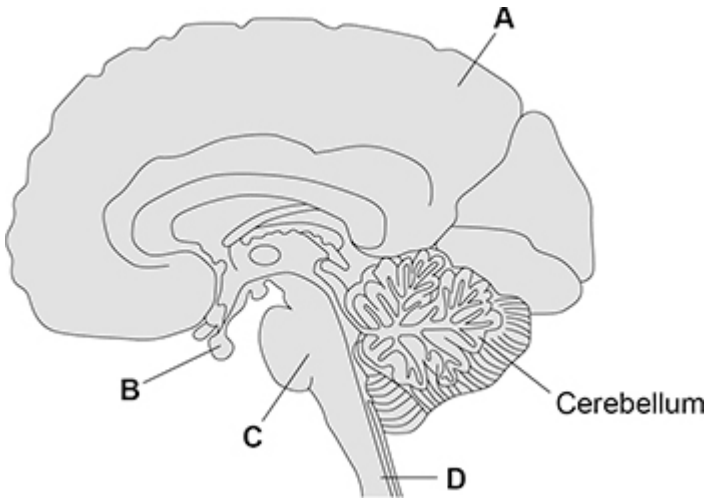
Gland ☐

Muscle ☐

(1)

Many human activities are coordinated by the brain.

The figure below shows the human brain.



(e) Which structure in the figure above is the pituitary gland?

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

(1)

(f) Which structure in the figure above is the cerebral cortex?

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

(1)

(g) What is the function of the cerebellum?

Tick (✓) **one** box.

Balance ☐

Hearing ☐

Sight ☐

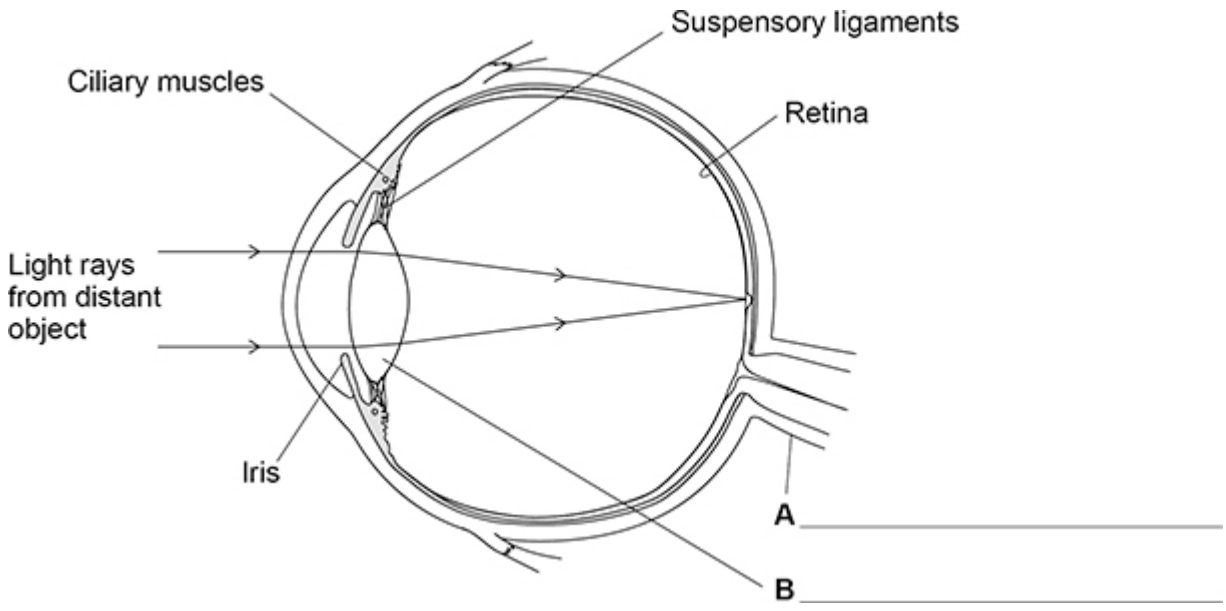
(1)

(Total 9 marks)

2. The human eye can make clear images of objects.

Figure 1 shows how the human eye focuses light rays from a distant object onto the retina.

Figure 1



(a) Label structures **A** and **B** on **Figure 1**.

Choose answers from the box.

cornea	**lens**	**optic nerve**	**sclera**

(2)

The eye in **Figure 1** is focused on a distant object.

(b) Complete the sentence.

Choose the answer from the box.

contract	**expand**	**stretch**

To focus on a **near** object the ciliary muscles _____.

(1)

(c) Complete the sentence.

Choose the answer from the box.

longer	**thicker**	**thinner**

To focus on a **near** object structure **B** in **Figure 1**

becomes _____ .

(1)

(d) The eye in **Figure 1** is looking at an object in dim light.

Complete the sentence.

Choose the answer from the box.

iris	**retina**	**suspensory ligaments**

When the eye looks at an object in **bright** light the pupil gets smaller.

The size of the pupil is controlled by the _____ .

(1)

(e) The retina is sensitive to light.

How does information from the retina reach the brain via structure **A** in **Figure 1**?

_____

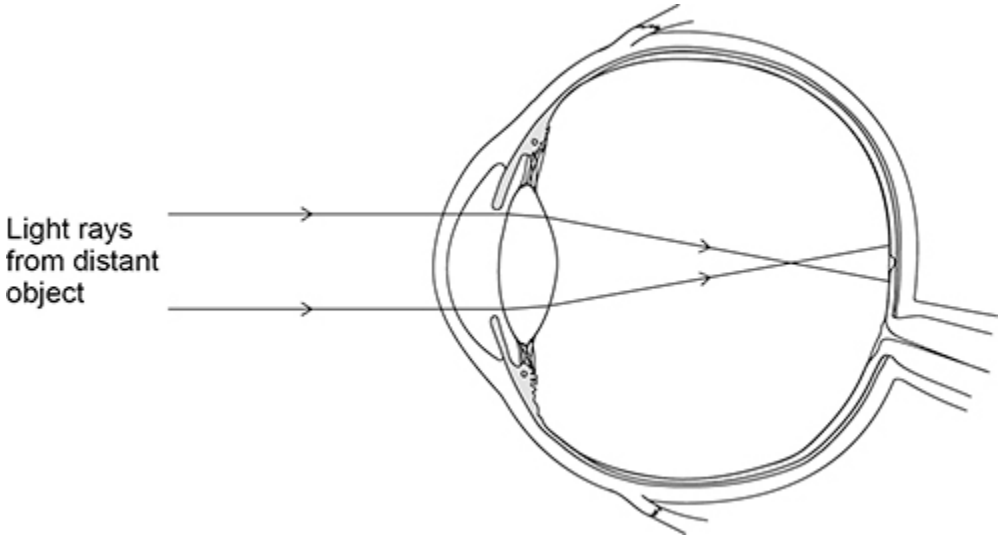
_____

(1)

Figure 2 shows the eye of a person who is short sighted looking at a distant object.

The person **cannot** see the object clearly.

Figure 2



(f) Give the reason why the person **cannot** see the object clearly.

_____

_____

(1)

(g) Short sightedness can be corrected using spectacle lenses.

Give **one** other way short sightedness can be corrected.

Do **not** refer to spectacles in your answer.

_____

_____

(1)

(Total 8 marks)

3. The hormone insulin helps to control the concentration of glucose in the blood.

(a) Which organ produces insulin?

Tick (✓) **one** box.

Adrenal gland ☐

Pancreas ☐

Thyroid ☐

(1)

People with Type 2 diabetes:

- produce insulin
- have body cells that do **not** respond to insulin
- often have a high concentration of glucose in their blood.

(b) Why do people with Type 2 diabetes often have a high concentration of glucose in their blood?

Tick (✓) **one** box.

The body cells change glucose into glycogen for storage. ☐

The body cells have a high rate of respiration to release energy. ☐

The body cells take in a low amount of glucose from the blood. ☐

(1)

Drug **X** is used for treating people who have Type 2 diabetes.

Scientists investigated the effect of drug **X** on the concentration of glucose in the blood of mice.

This is the method used.

1. Give two groups of mice the same diet for 8 weeks.
2. Give each mouse in group **A** 2 cm^3 of water to drink.
3. Give each mouse in group **B** 2 cm^3 of drug **X** to drink.
4. After 30 minutes, give each mouse 1 cm^3 of glucose solution to drink.
5. Measure the concentration of glucose in the blood of each mouse at intervals for 3 hours.

(c) Give **two** control variables used in the investigation.

1 _____

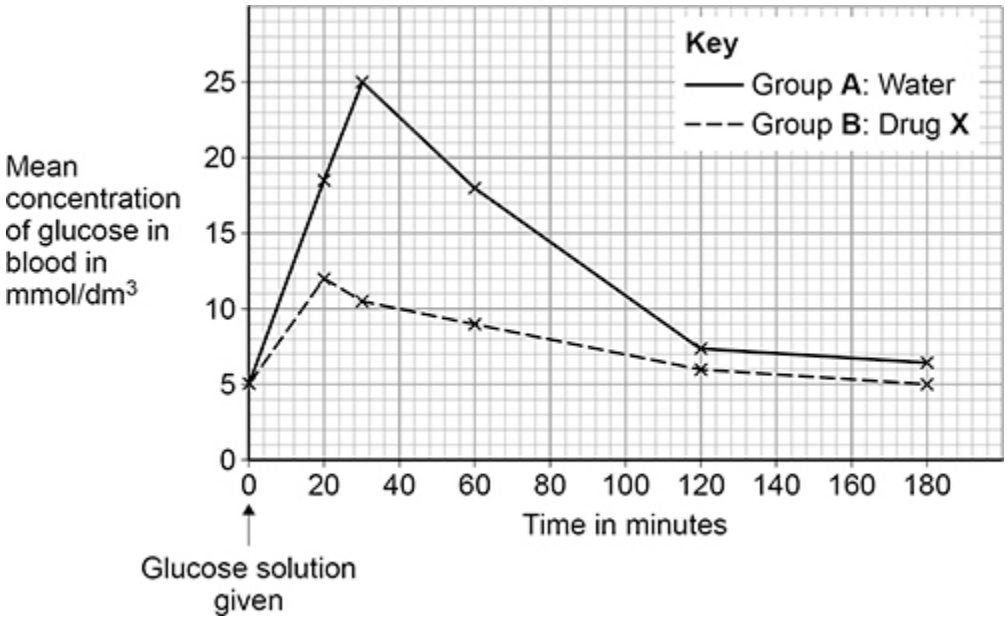
_____

2 _____

_____

(2)

The figure below shows the results.



In each group of mice, the concentration of glucose increases to a maximum value and then decreases.

(d) Group **B** reached a maximum value earlier than group **A**.

Determine how many minutes earlier.

_____

_____

Number of minutes earlier = _____

(2)

(e) Give **two** conclusions about the effect of drug **X** on the concentration of glucose in the blood.

Do **not** refer to reaching the maximum value earlier.

1 _____

_____

2 _____

_____

(2)

(f) How could scientists find the best **dose** of drug **X** for controlling blood glucose concentration?

Tick (✓) **one** box.

Repeat the investigation twice more.	☐
Use different concentrations of drug **X**.	☐
Use more mice in the investigation.	☐

(1)

(Total 9 marks)

4. Plants grow in response to the direction of light and to gravity.

(a) What name is given to a plant's growth response?

Tick (✓) **one** box.

Accommodation	☐
Adaptation	☐
Tropism	☐

(1)

(b) Which substance controls the response to light in plant shoots?

Tick (✓) **one** box.

Amylase	☐
Auxin	☐
Lactic acid	☐

(1)

(c) A plant root grows downwards in response to gravity.

Which **two** substances can the root absorb in larger amounts when it grows downwards?

Tick (✓) **two** boxes.

- Carbon dioxide ☐
- Glucose ☐
- Nitrate ions ☐
- Protein ☐
- Water ☐

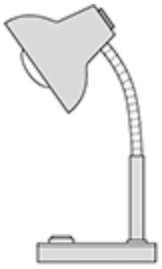
(2)

(d) Plan an investigation to show the effect of light from one direction on the growth of plant seedlings.

You should include:

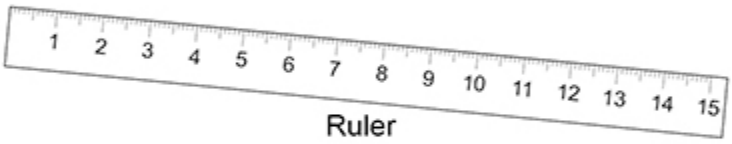
- a control
- the measurements you would record
- any other observations you would make.

You may use the equipment shown in below figure and any other laboratory apparatus.

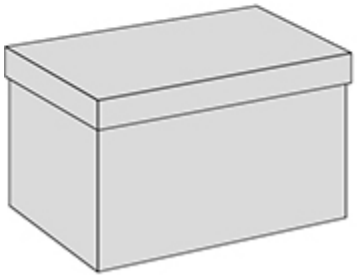


Lamp

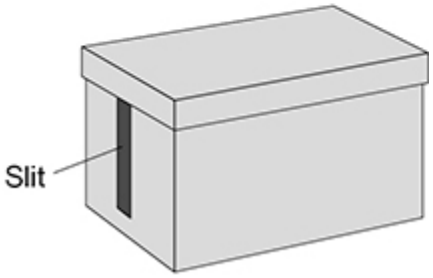
Pots of seedlings



Ruler



Cardboard box



Cardboard box with slit cut in one side

(6)

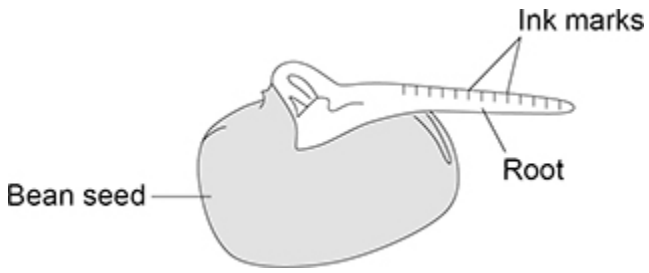
(Total 10 marks)

5. A student investigated the effect of gravity on the growth of bean seedlings.

The student put ink marks on the root of each bean seedling.

Figure 1 shows a bean seedling with ink marks.

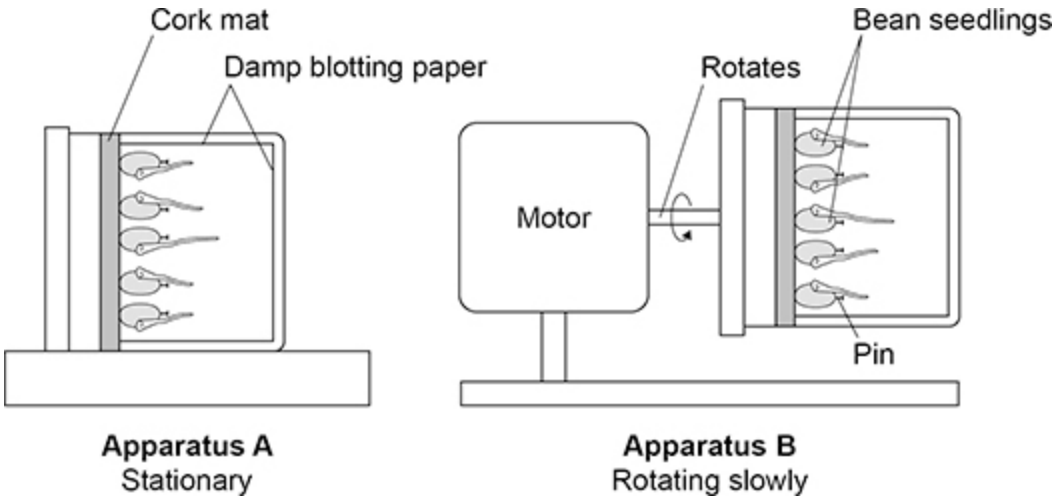
Figure 1



The student set up apparatus **A** and apparatus **B**.

Figure 2 shows both sets of apparatus.

Figure 2



The student left both sets of apparatus in a dark cupboard for 24 hours.

(a) Give the reason why the student placed both sets of apparatus in the dark.

_____

_____

(1)

(b) What are **two** reasons for surrounding the seedlings with damp blotting paper?

Tick (✓) **two** boxes.

To prevent photosynthesis in the roots ☐

To prevent the growth of mould on the roots ☐

To prevent water affecting the direction of root growth ☐

To provide enough water for root growth ☐

To provide the roots with mineral ions ☐

(2)

(c) Apparatus **B** is a control.

Explain why apparatus **B** is needed.

_____

_____

_____

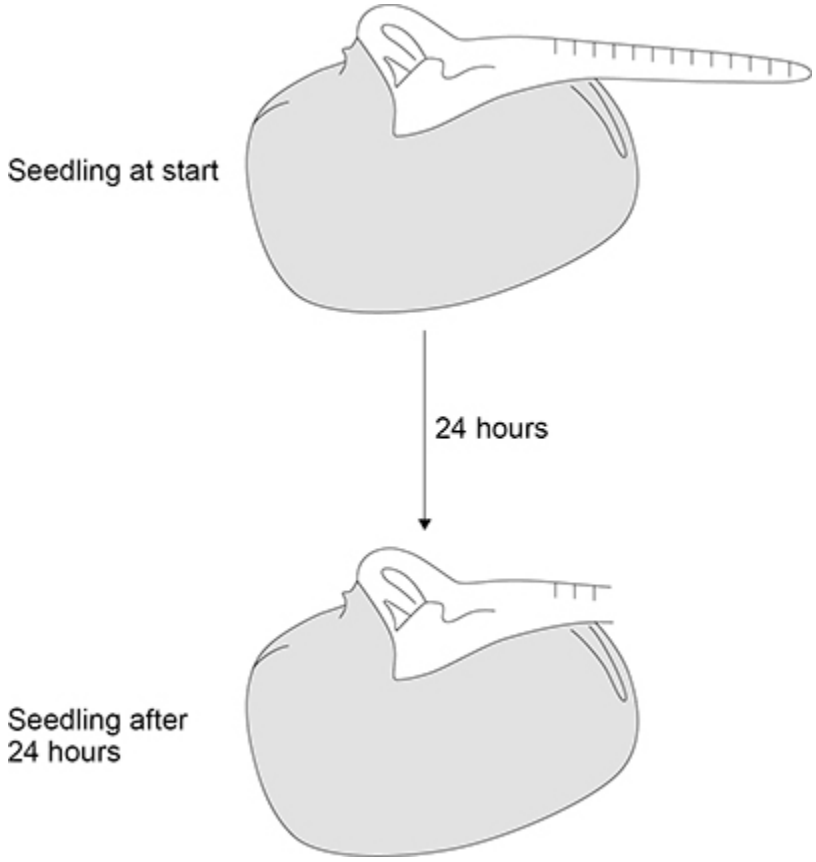
_____

(2)

(d) **Figure 3** shows one seedling from apparatus **A** at the start of the investigation and after 24 hours.

The drawing of the seedling after 24 hours is **not** complete.

Figure 3



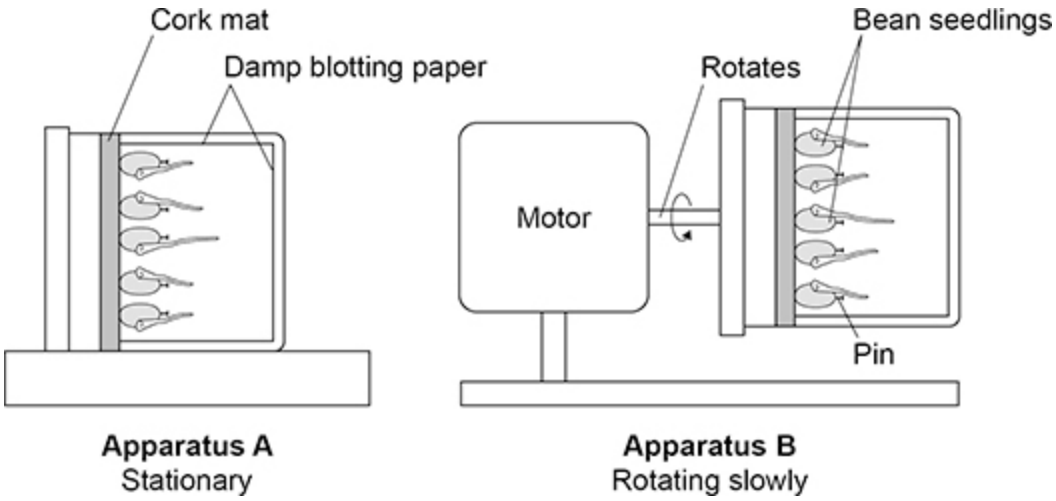
Complete **Figure 3** to show:

- the appearance of the root after 24 hours
- the ink marks on the root after 24 hours.

(3)

Figure 2 is repeated below.

Figure 2



The student left both sets of apparatus in a dark cupboard for 24 hours.

(e) Describe how a root from apparatus **B** would look different from the root you drew in part (d).

_____

_____

(1)

(f) Auxin is a plant hormone.

Explain how auxin causes the results in apparatus **A**.

_____

_____

_____

_____

(2)

Farmers can use plant hormones to control the growth of plants.

(g) Give **two** uses of auxin.

1 _____

_____

2 _____

_____

(2)

(h) A farmer sprayed an apple tree with gibberellin.

Suggest **two** reasons why the farmer sprayed the apple tree with gibberellin.

1 _____

_____

2 _____

_____

(2)

(Total 15 marks)

6. The human body has two coordination systems:

- the nervous system
- the endocrine system.

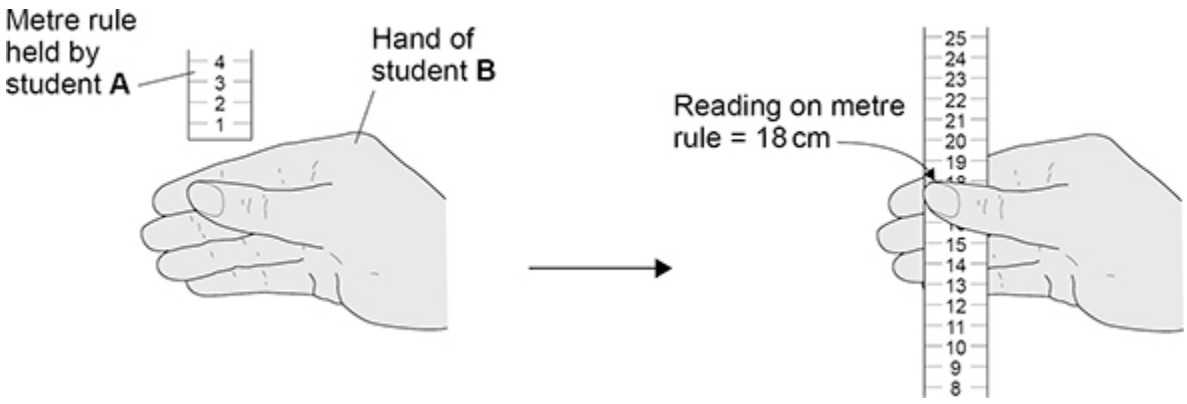
(a) Two students investigated human reaction time.

Student **A** held a metre rule above student **B**'s hand.

Student **A** then released the metre rule and student **B** caught the rule as quickly as possible.

Figure 1 shows the method used.

Figure 1



Suggest **two** ways to improve the students' method for measuring human reaction time.

1 _____

_____

2 _____

_____

(2)

(b) Student **B**'s reaction is coordinated by the nervous system.

Give **two** ways that coordination by the endocrine system is different from coordination by the nervous system.

1 _____

_____

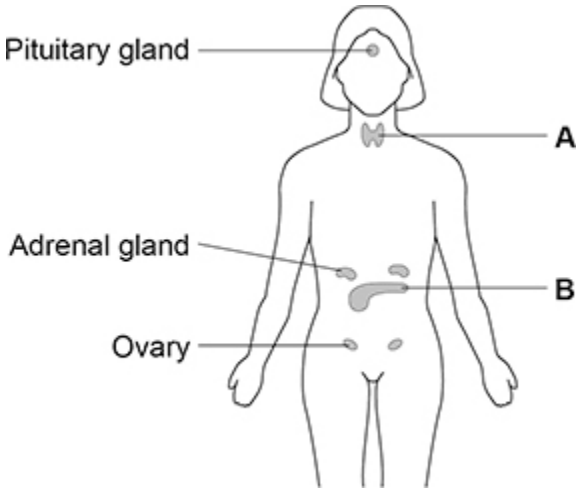
2 _____

_____

(2)

Figure 2 shows endocrine glands in a female.

Figure 2



(c) Name **one** hormone produced by gland **A**.

_____

(1)

(d) Name **one** hormone produced by gland **B**.

_____

(1)

(e) The adrenal gland produces the hormone adrenaline.

Describe **two** effects of adrenaline on the human body.

1 _____

_____

2 _____

_____

(2)

(f) Hormones can be used for controlling human reproduction.

Explain the use of hormones in:

- contraception
- the treatment of infertility.

(6)

(Total 14 marks)

7. Conditions inside and outside of the human body often change.

Homeostasis helps the human body to survive changing conditions.

(a) Explain what is meant by the term ‘homeostasis’.

(2)

The kidneys have an important role in homeostasis.

(b) Describe what happens to **glucose**, **protein** and **urea** in the kidneys.

(4)

(c) Explain how ADH affects the production and concentration of urine by the kidneys.

(4)

(Total 10 marks)

1.

(a) (stimulus) → receptor → coordinator → effector → (response)

allow receptor → coordinator for **1** mark

allow coordinator → effector for **1** mark

2

(b) any **two** from:

- fast / rapid
- 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
  ignore not coordinated by the brain
- protects (from danger / harm)

2

(c) blinking in sudden bright light

1

(d) muscle

1

(e) B

1

(f) A

1

(g) balance

1

[9]

2.

(a) (A) optic nerve

1

(B) lens

1

(b) contract

1

(c) thicker

1

(d) iris

1

(e) any **one** from:

- (sent as) impulses

  allow (sent as) electrical signals

  ignore messages

- along sensory neurone(s)

1

(f) the light rays do not meet / focus / converge on the retina

allow the light rays meet / focus / converge before the retina

allow the light rays do not meet / focus / converge at the back of the eye

allow lens is too thick

allow eyeball is too long

1

(g) any **one** from:

- (hard / soft) contact lenses
- (laser) surgery
- replacement lens (in the eye)

  ignore spectacles / glasses

1

[8]

3. (a) pancreas

1

(b) the body cells take in a low amount of glucose from the blood

1

(c) any **two** from:

- (same) diet
- (same diet for same) duration
- (same / 30-minute) time before being given glucose
  if neither point given allow time
- (same) volume of water and drug **X**
  *allow (same) amount of water and drug **X***
  allow 2 cm^3 of drink
- (same) volume of glucose (solution)
  allow (same) amount of glucose (solution)
  allow 1 cm^3 glucose (solution)
  *if neither bp4 nor bp5 awarded, allow **1** mark for (same) volume / amount of drink*

2

(d) 20 **and** 30

*allow an answer in the range 28 to 32 for group **A***

1

(30 – 20 =) 10 (minutes)

*allow an answer consistent with values for **A** between 28 and 32*

1

(e) any **two** from:

(with drug **X**)

- lower **throughout**
- lower maximum (concentration)
- slower increase (in concentration)
- slower decrease (in concentration)
- returns to original (concentration) (sooner)

2

(f) use different concentrations of drug **X**

1

[9]

4. (a) tropism

1

(b) auxin

1

(c) nitrate ions

1

water

1

(d) **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 method 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

- one pot of seedlings placed in box with slit

- one pot of seedlings in dark
- one pot of seedlings in full light

- measure heights of shoots
- remeasure heights of shoots
- record a feature of appearance of seedlings
- detail of how bent shoots were measured eg use thread or straighten them out
- calculate mean height increase for each group
- compare results (for each group of seedlings)

- control variable(s)
  - same temperature
  - same volume of water
  - same soil type
  - 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 a control variable is required

[10]

5.

(a) to prevent (direction of) light affecting the results
or
to prevent (direction of) light affecting growth (of roots)

allow to prevent phototropism
ignore ref to shoot
*allow so **only** gravity affects results / growth*
ignore as a control variable

1

(b) to prevent water affecting the direction of root growth

1

to provide enough water for root growth

1

(c) to compare (with apparatus **A**)

*allow to see the difference (between **B** and **A**)*

1

(so) it shows that gravity caused the results in apparatus **A**
or
(because) gravity acted equally in all directions (in apparatus **B**)
or

to cancel out the (one-sided) effect of gravity

ignore reference to auxin
ignore to cancel out gravity

1

(d) root drawn bending downwards

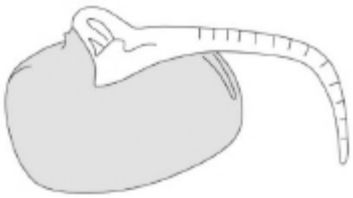
1

root drawn longer than at start

1

ink marks spread out in bent region

*do **not** accept ink marks spread out before the bend*
example:



1

(e) (in B) horizontal

allow (grows) straight (out)
allow not bent (at all)

1

(f) uneven distribution of auxin

allow more auxin on the lower side

ignore more auxin on upper side

1

(so) upper side grows faster / more (than lower)

allow lower side grows slower / less (than upper)

1

(g) any **two** from:

- weed killers
- rooting (powders)

  allow to grow plants from cuttings

  ignore reference to shoots

- (promoting) growth in tissue culture

  allow inhibiting lateral buds

2

(h) any **two** from:

- promote / start / initiate / force flowering

  allow to grow more flowers

- more fruit
- bigger fruits

  if neither given allow bigger yield (of apples)

  allow idea of fruits ripening simultaneously

2

[15]

6. (a) any **two** from:

- same starting position of rule(r)

  allow ensure the starting position of rule(r) is at 0cm

  allow other control variables

  *allow two control variables for **2** marks*

- more precise scale

  allow rule(r) with mm scale

  ignore more accurate scale

- repeat **and** calculate mean
  or
  repeat **and** eliminate anomalies
- convert distance to time
- student (**B**) rests hand / arm on table

2

(b) any **two** from:

endocrine system:

- (hormones) via blood
  - *allow converse if clearly referring to nervous system*
  - *allow not via neurones / cells*
- chemical transmission
  - *allow not (electrical) impulses*
  - *allow not electrical signals*
  - *ignore messages*
  - *ignore hormones*
- slower
- longer-lasting
  - *answers must be comparative*
  - *ignore reference to target organs*

2

(c) thyroxine

- *do **not** accept thyroxide*
- *ignore reference to TSH / TRH*

1

(d) any **one** from:

- insulin
- glucagon

1

(e) any **two** from:

- increases heart rate
  allow increases blood flow
- increases breathing rate
- increases oxygen delivery to cells / tissues / organs
- increases glucose delivery to cells / tissues / organs
  allow examples of cells / tissues / organs
- increases respiration / metabolism
  allow increases energy release
  *do **not** accept energy produced / made / created*
- increases sweat(ing)
  allow dilation of pupils
  *allow vasoconstriction in skin **or** vasoconstriction in digestive system*
  *allow raises blood sugar / glucose level **or** increase conversion of glycogen to glucose*
  *allow vasodilation in (skeletal) muscles **/** brain*
  allow increased blood pressure
  allow slows digestion
  allow other correct effects of adrenaline
  *if no other marks awarded allow **1** mark for prepares for 'fight or flight'*

2

(f) **Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.

5–6

Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.

3–4

Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.

1–2

No relevant content

0

Indicative content contraception:

- use of hormones oestrogen and progesterone **or** progesterone (only)

o inhibition of FSH (production / release)
  - lack of FSH prevents follicle / egg development / maturation
  - therefore there is no egg to fertilise

○ inhibition of LH (production / release)
  - lack of LH prevents ovulation
  - therefore there is no egg to fertilise

- contraceptive methods include oral contraceptive pill, injection, implant, skin patch, IUD / IUS with hormones

treatment of infertility:

- use of FSH

○ (FSH) stimulates **maturation** of (several) egg(s) / follicle(s)
  - (FSH) increases number of eggs matured

- use of LH

○ (LH) stimulates ovulation
  - (LH) allows eggs / follicles to be collected (from ovary)
  - (so) increased chance of fertilising an egg
  - IVF and insertion of embryo(s) into uterus

- use of progesterone

○ (to) maintain uterus lining
  - increased chance of implantation

For **Level 3**, details of both contraception and infertility treatment are required.

[14]

7.

(a) regulation / control / maintenance of internal conditions

allow keeping internal conditions the same

1

for optimum conditions for cell(s) / enzyme(s) (activity)

allow a description of optimum functioning of cell / body

1

(b) glucose **and** urea are filtered (out of the blood)

*allow a description of filtration of glucose **and** urea (out of the blood)*

1

protein is not filtered (out of the blood)

1

all glucose reabsorbed

allow all glucose absorbed back into the blood

1

urea (mostly) not reabsorbed
or
urea passes out in urine

allow urea not absorbed back into the blood

1

(c) (increased / high) ADH increases water reabsorption
or
(increased / high) ADH
increases permeability to water

allow converse for decreased / low / no ADH

1

(water reabsorption) from kidney tubules

1

(so) ADH increases the concentration (of urine)

1

(so) ADH decreases the <u>volume</u> (of urine)

1

[10]