Name: _____

Class: _____

Date: _____

Homeostasis and Response part 10 AQA Triple Biology

Time: **107 minutes**

Marks: **101 marks**

Comments:

1. Reflex actions are coordinated by the nervous system.

(a) What is meant by the term ‘reflex action’?

_____

_____

_____

_____

(2)

(b) A woman’s hand accidentally touches a hot object.

The woman moves her hand away rapidly.

Describe how the woman’s nervous system coordinates the reflex action.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(6)

(c) The endocrine system coordinates many internal functions of the body.

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

1 _____

_____

2 _____

_____

3 _____

_____

(3)

(d) Describe how hormones control the menstrual cycle.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(5)

(Total 16 marks)

2. Human body temperature is controlled within very narrow limits.

Scientists investigated the effect of drinking ice-cold water on:

- internal body temperature
- the rate of sweating.

This is the method used.

1. Sit a person inside a room kept at a constant temperature of 25 °C.
2. Measure the person's internal body temperature near the brain.
3. Measure the person's rate of sweating.
4. After 20 minutes, give the person 500 cm^3 of ice-cold water to drink.
5. Continue to measure the person's internal body temperature and sweating rate for a further 50 minutes.

(a) Give the reason why the person should **not** move during the investigation.

_____

_____

(1)

Figure 1 and **Figure 2** show the scientists' results.

Figure 1

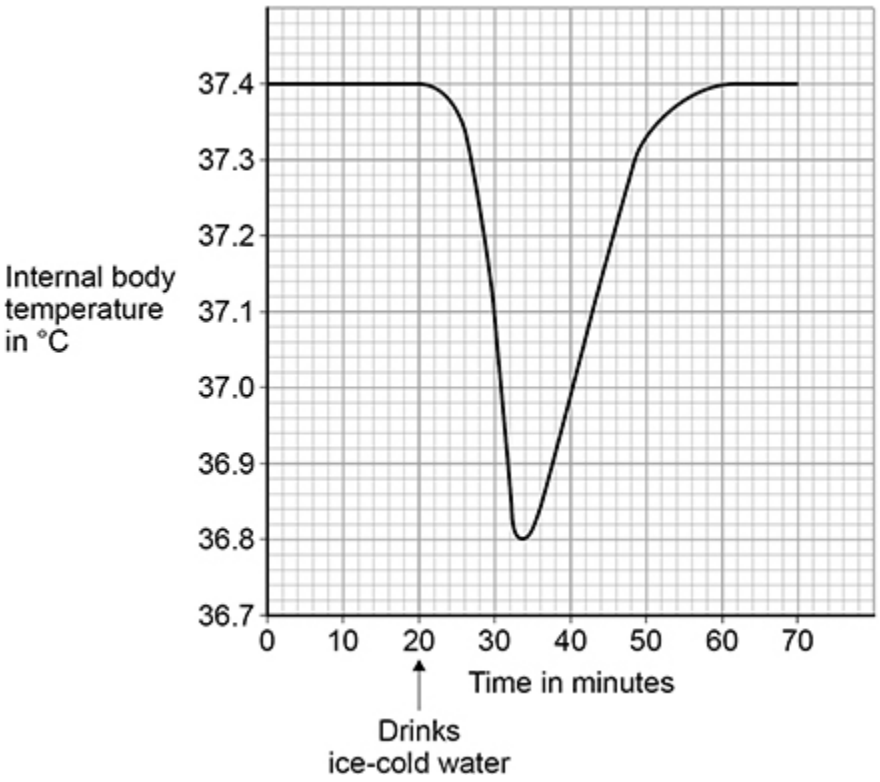
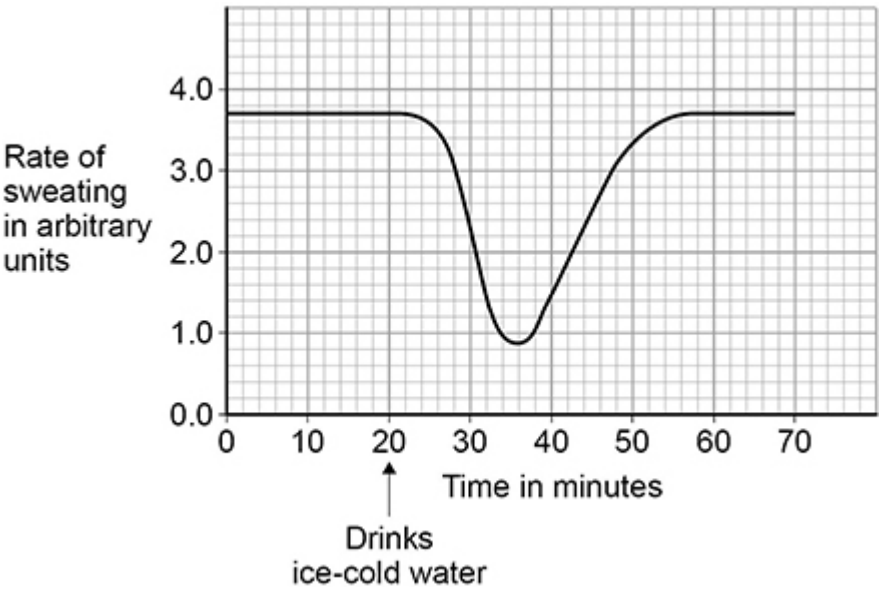


Figure 2



(b) What is this person's normal internal body temperature?

Tick (✓) **one** box.

36.8 °C ☐ 37.0 °C ☐ 37.4 °C ☐

(1)

The results show that when the ice-cold water was drunk, the temperature near the brain decreased.

(c) Explain why the temperature near the brain decreased.

_____

_____

_____

_____

(2)

(d) The thermoregulatory centre in the brain responds to the decrease in temperature.

How does the thermoregulatory centre send information to sweat glands in the skin?

_____

_____

(1)

(e) The rate of sweating changes between 24 minutes and 36 minutes.

Explain how this change helps to maintain the person's normal body temperature.

_____

_____

_____

_____

(2)

(f) During exercise, the skin appears red.

What causes the skin to appear red?

Tick (✓) **one** box.

Blood vessels moving closer to the skin surface ☐

Constriction of blood vessels in the skin ☐

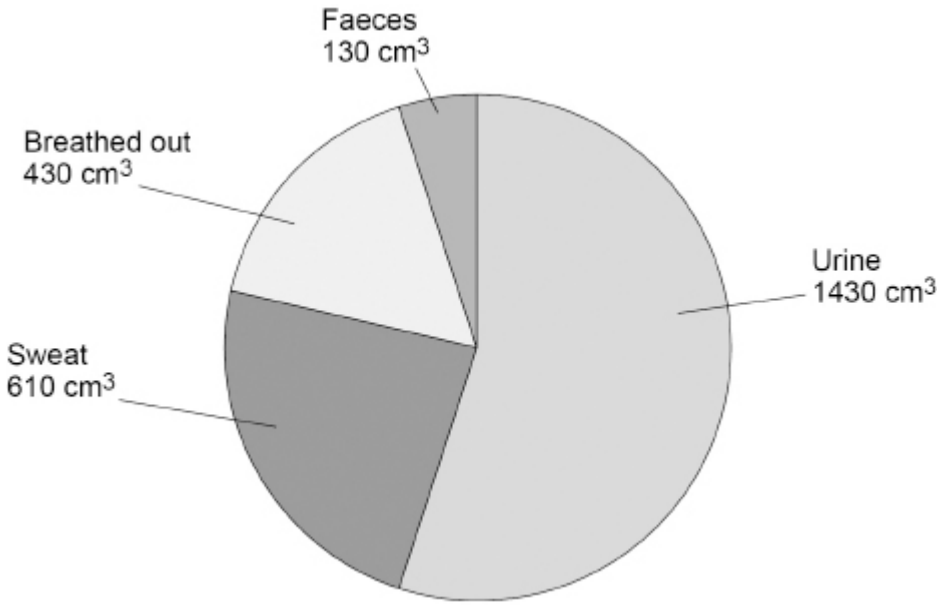
Decrease in heart rate ☐

Dilation of blood vessels in the skin ☐

(1)

(Total 8 marks)

3. The pie chart below shows the water loss from a person on one day.



(a) The total water loss was 2600 cm^3.

Calculate the percentage of the total water loss that was lost as urine.

_____

_____

_____

Percentage lost as urine = _____ %

(2)

A marathon race is 42 km long.

(b) What happens to the volume of water lost as sweat when a person runs a marathon?

_____

_____

(1)

(c) What must marathon runners do to prevent themselves becoming dehydrated?

_____

_____

(1)

(d) Complete the sentences.

Choose answers from the box.

digestion	**excretion**	**fertilisation**	**filtration**	**reabsorption**

Blood entering the kidneys goes through the process of _____.

Glucose is **not** found in urine because of _____.

Urine is removed from the body in the process of _____.

(3)

(e) People with kidney failure can have dialysis or a kidney transplant.

Dialysis is often needed 3 times each week and can take over 4 hours each time.

Dialysis usually happens in a hospital.

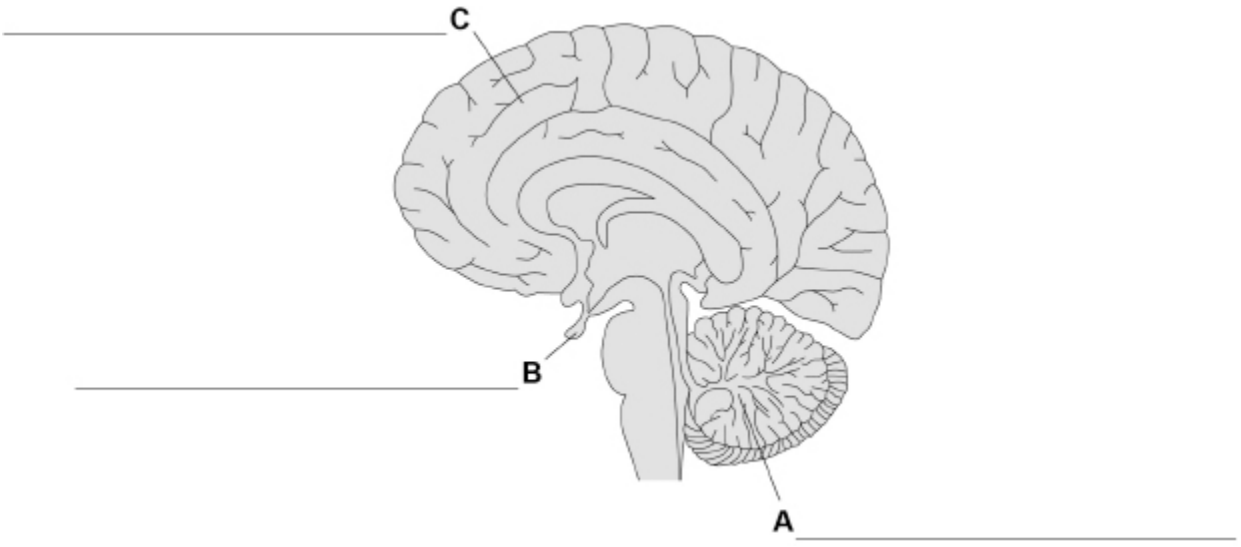
Kidney transplants require a donor and major surgery.

Describe the advantages **and** disadvantages of having a kidney transplant instead of having dialysis.

(4)

(Total 11 marks)

4. The diagram below shows the brain.



(a) Label **A**, **B** and **C** on the diagram above.

Choose answers from the box.

cerebellum	**cerebral cortex**	**medulla**	**pituitary gland**

(3)

(b) Which part of the brain controls balance when riding a bicycle?

Tick (✓) **one** box.

Cerebellum ☐

Medulla ☐

Pituitary gland ☐

(1)

(c) The ears send information about sound to the brain.

Which word describes the brain?

Tick (✓) **one** box.

Coordinator ☐

Effector ☐

Receptor ☐

Stimulus ☐

(1)

(d) What type of cell carries impulses from the ears to the brain?

_____

(1)

(e) Human eyes detect light.

Which part of the eye has cells that detect light?

Tick (✓) **one** box.

Iris ☐

Lens ☐

Retina ☐

(1)

(f) The eyes of some birds have specialised cells to detect ultraviolet (UV) light.

Some fruits reflect UV light.

Explain why it is an advantage for birds to be able to detect UV light.

_____

_____

_____

_____

(2)

The image below shows a student reading a book.

There are trees on the far side of the field.

The student looks at the trees instead of looking at the book.

(g) What process occurs in the eye when the student looks at the trees instead of looking at the book?

Tick (✓) **one** box.

Accommodation ☐

Magnification ☐

Reflection ☐

(1)

(h) What change happens in the student's eyes when they look up at the trees?

Tick (✓) **one** box.

Light rays are refracted less ☐

More light is reflected ☐

The optic nerves move ☐

(1)

(i) The student **cannot** see the trees in focus.

Name the common defect of the eye which causes distant objects to appear out of focus.

_____

(1)

(Total 12 marks)

5. This question is about plant hormones.

(a) Farmers can spray seeds with gibberellins to start germination.

What are **two** other uses of gibberellins?

Tick (✓) **two** boxes.

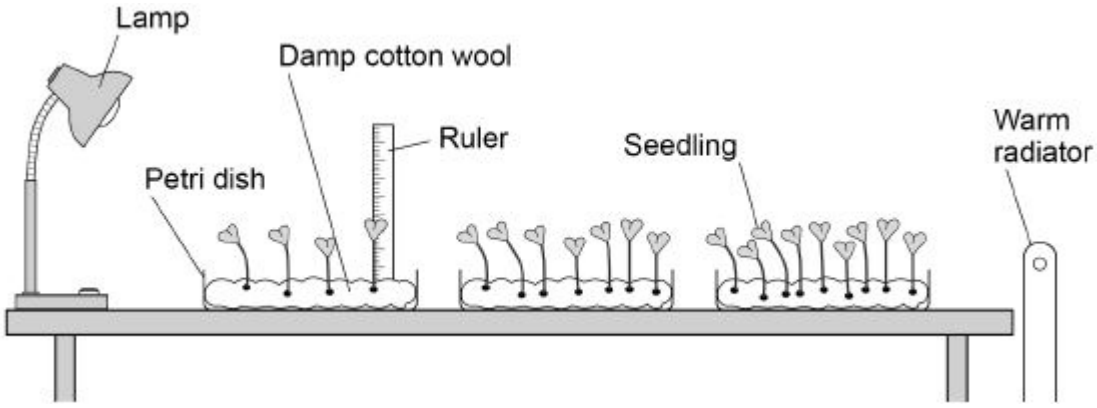
To help in tissue culture	☐
To help roots form	☐
To increase fruit size	☐
To kill weeds	☐
To promote flower production	☐

(2)

Students investigated the effect of light intensity on the height of seedlings.

Figure 1 shows the equipment.

Figure 1



(b) Describe **two** improvements the students should make to their investigation.

1 _____

_____

2 _____

_____

(2)

Figure 2 shows a seedling growing towards a lamp.

Figure 2

(c) Suggest how the students measured the length of the curved seedling in **Figure 2**.

_____

_____

(1)

(d) Explain what happened to the growth of the seedling on side **Q** compared with the growth on side **P**.

_____

_____

_____

_____

_____

_____

(3)

(e) Bananas are often stored separately from other fruits because bananas release a plant hormone.

Why does storing bananas with other fruits cause the other fruits to ripen faster?

_____

_____

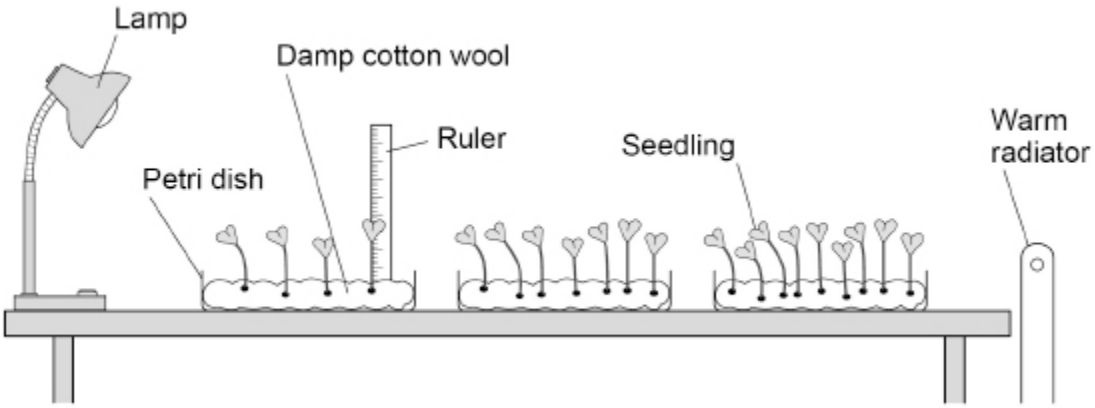
(1)

(Total 9 marks)

6. A student investigated the effect of light intensity on the growth of seedlings.

Figure 1 shows the equipment.

Figure 1



(a) Which **two** improvements should the student make to the investigation?

Tick (✓) **two** boxes.

- Give more water to the seedlings nearest the lamp ☐
- Leave some of the seedlings for a few more days ☐
- Open a window to let more air in ☐
- Put all the dishes the same distance from the radiator ☐
- Use equal numbers of seedlings in each dish ☐

(2)

(b) What is the dependent variable in the investigation?

Tick (✓) **one** box.

The height of the seedlings ☐

The mass of cotton wool ☐

The temperature of the room ☐

(1)

(c) In each dish the seedlings compete with each other.

Give **two** factors the seedlings compete for.

1 _____

_____

2 _____

_____

(2)

Figure 2 shows a seedling growing towards a lamp.

Figure 2

(d) What happened to the growth of the seedling on side **P** compared with the growth on side **Q**?

Tick (✓) **one** box.

Side **P** has grown less than side **Q** ☐

Side **P** has grown more than side **Q** ☐

Side **P** has grown the same as side **Q** ☐

(1)

(e) Plant responses are called tropisms.

Which tropism causes the seedling to grow towards light?

Tick (✓) **one** box.

Geotropism ☐

Gravitropism ☐

Phototropism ☐

(1)

(f) Which hormone causes the seedling to grow towards the light?

Tick (✓) **one** box.

Auxin ☐

Insulin ☐

Testosterone ☐

(1)

(Total 8 marks)

7. The nervous system allows a person to detect stimuli.

(a) Draw **one** line from each stimulus to the sense organ that detects the stimulus.

Stimulus	Sense organ
Chemicals	Ear
Light	Eye
	Tongue

(2)

Moving a hand away from a hot object is an example of a reflex action.

(b) What is a reflex action?

_____

_____

_____

_____

(2)

(c) A muscle in the arm moves the hand away from the hot object.

How does the arm muscle do this?

Tick (✓) **one** box.

The muscle contracts. ☐

The muscle expands. ☐

The muscle relaxes. ☐

The muscle shrinks. ☐

(1)

Two students investigated the effect of drinking coffee on reaction time.

This is the method used.

1. Student **A** holds a metre rule just above student **B**'s hand, as shown in **Figure 1**.

2. Student **A** lets go of the metre rule.

3. Student **B** catches the metre rule as quickly as possible.

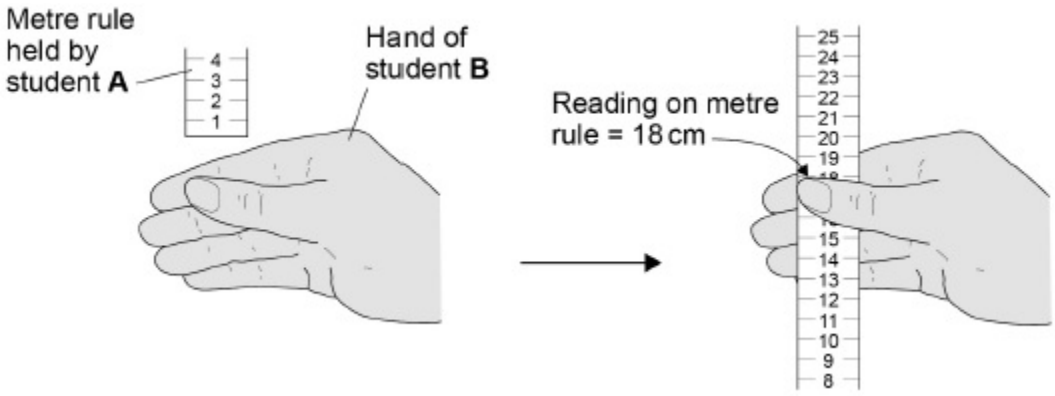
4. Student **A** writes down the reading from the scale on the metre rule.

5. Students **A** and B repeat steps 1-4 another four times.

6. Student **B** then drinks a cup of coffee.

7. After 15 minutes, students **A** and **B** repeat steps 1-5.

Figure 1

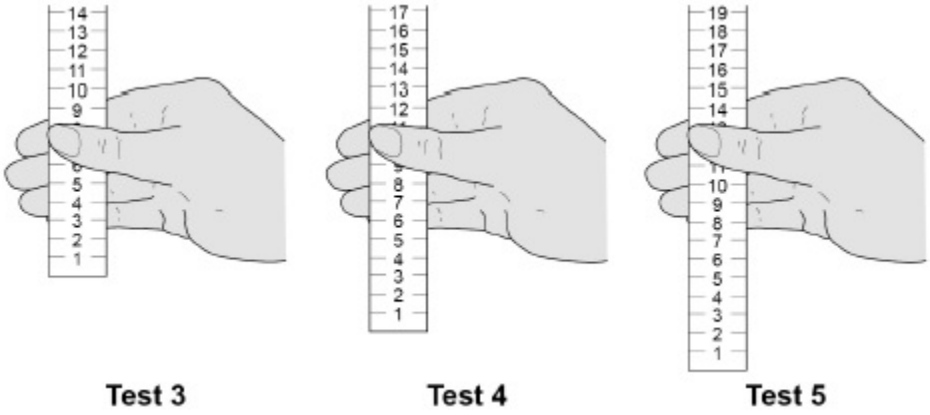


The table below shows some of the results.

Test	Reading from scale on metre rule in cm	
	Before drinking coffee	After drinking coffee
1	18	10
2	21	14
3	15	
4	12	
5	19	

Figure 2 shows the results **after** drinking the coffee for tests **3**, **4** and **5**

Figure 2



(d) Complete the table.

Use results from **Figure 2**.

(2)

The students made the following conclusion:

‘Drinking coffee speeds up reactions.’

(e) Give evidence from the table above to support the students’ conclusion.

_____

_____

(1)

(f) The students’ conclusion may **not** be valid.

Suggest **two** improvements the students could make to their method.

1 _____

_____

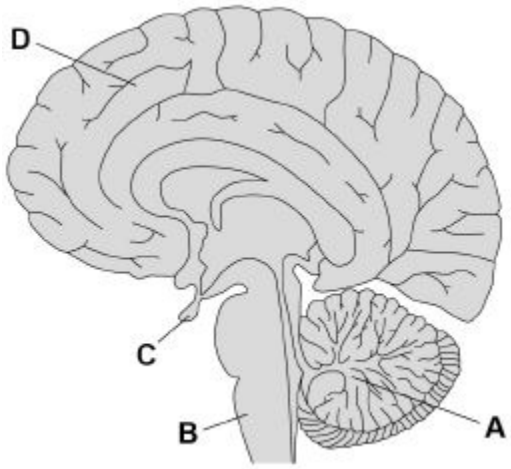
2 _____

_____

(2)

(Total 10 marks)

8. The diagram below shows the brain.



(a) Which part of the brain becomes more active if a person balances on one leg instead of standing on two legs?

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

(1)

(b) Name the part of the brain that is responsible for making a decision.

_____

(1)

(c) In most MRI scanners the person being scanned needs to stay completely still.

A functional MRI (fMRI) scanner allows a person to move while the scanner makes images of the person's brain activity.

Suggest how the fMRI scanner could help to find out more about the brain damage a person has.

_____

_____

_____

_____

_____

_____

(3)

(d) Describe how the brain receives information about light entering the eye.

You should include the names of structures in your answer.

(3)

(e) The eyes of some birds contain cells that detect ultraviolet (UV) light.

UV light is reflected by some fruits and the urine of small mammals.

Explain how birds that detect UV light have evolved from birds that could not detect UV light.

(6)

(Total 14 marks)

9. Two of the substances the body excretes are urea and carbon dioxide.

(a) Complete the sentence.

Choose the answer from the box.

carbohydrate	**lipid**	**protein**	**salt**

A person makes a lot of urea if the person's diet contains

a lot of _____

(1)

(b) Why must urea be excreted from the body?

_____

_____

(1)

(c) A person produces more carbon dioxide during exercise than when resting.

Complete the sentences.

Choose answers from the box.

breathing	**digestion**	**egestion**
osmosis	**respiration**	

The process that makes carbon dioxide is _____

During exercise, extra carbon dioxide can be removed from the body by increasing the rate of _____.

(2)

(d) Excess water must also be removed from the body.

If a person sweats a lot, less water will be excreted in the urine.

A healthy person did the same amount of exercise on each of 3 days.

The following table shows information for the 3 days.

Day	Air temperature in °C	Volume of water consumed in cm^3	Relative amount of urine produced by the kidneys
1	30	1500	
2	20	1500	
3	15	2000	

Complete the table.

Choose answers from the box.

least	medium	most

(2)

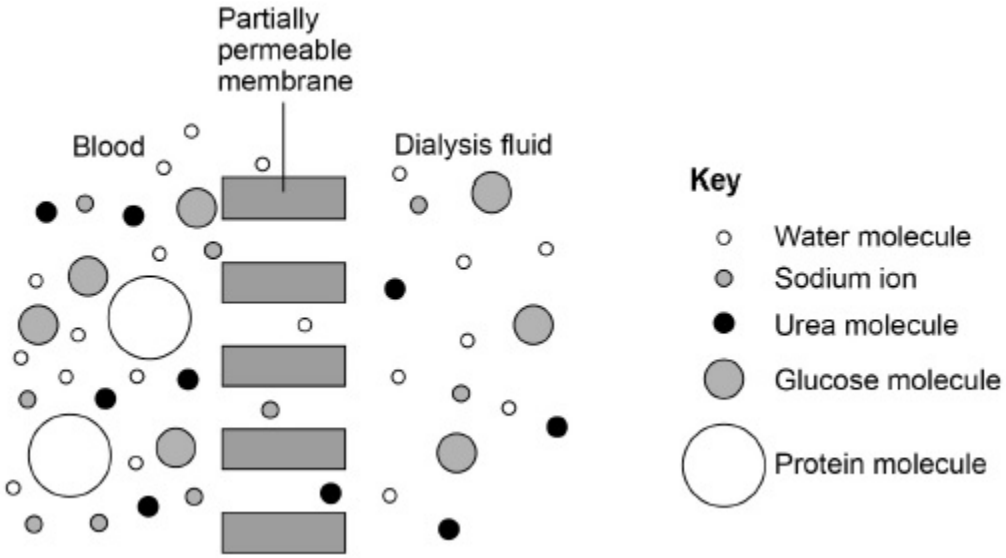
Some people have kidney disease.

Kidney disease may be treated by dialysis or by having a kidney transplant operation.

- During dialysis, a person is connected to a machine that filters the blood.
- Each dialysis session lasts about 6 hours.
- The person has several dialysis sessions each week.

Figure 1 shows how dialysis works.

Figure 1



(e) How does urea move out of the blood during dialysis?

Tick (✓) **one** box.

Diffusion ☐

Digestion ☐

Osmosis ☐

Respiration ☐

(1)

(f) Which substance in **Figure 1** does **not** pass from the blood into the dialysis fluid?

Give the reason for your answer.

Substance _____

Reason _____

_____

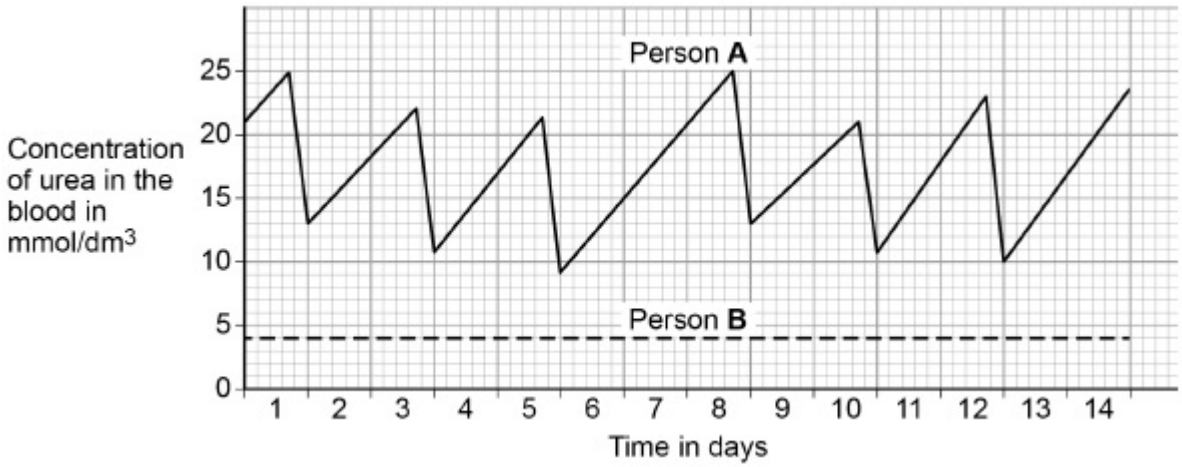
(2)

Two people have kidney disease.

- Person **A** is treated by dialysis.
- Person **B** has had a kidney transplant.

Figure 2 shows changes in the urea concentration in the blood of each person over 2 weeks.

Figure 2



(g) How many dialysis sessions did person **A** have **each week**?

_____

(1)

(h) What happens to the concentration of urea in the blood between dialysis sessions?

_____

(1)

(i) Give **two** reasons why a kidney transplant is a better method for treating kidney disease than dialysis.

1 _____

_____

2 _____

_____

(2)

(Total 13 marks)

1.

(a) response / reaction

ignore examples

ignore action

1

automatic **or** no thinking **or** not conscious **or** involuntary

ignore reference to brain

ignore quick

1

(b) receptor (in skin of finger / hand) detects stimulus / temperature change

allow receptor detects heat ignore pain

1

(electrical) impulses pass along neurones

allow electrical signals pass along nerve cells

ignore messages

1

(impulses pass from) sensory to relay to motor neurones

1

synapse between neurones where chemical crosses gap

allow neurotransmitter / acetylcholine for chemical

allow by diffusion

1

(synapses) in spinal cord / CNS

ignore brain

1

muscle contraction (to pull hand away)
or effector is a muscle

1

(c) coordination by endocrine system is:

allow converse points if clearly indicating nervous co-ordination answers must be comparative

slower

1

longer-lasting

1

(chemical / hormone) via blood instead of electrical / impulse / neurones

1

(d) FSH (release from pituitary) stimulates maturation of egg / ovum / follicle

ignore reference to days of menstrual cycle

allow FSH stimulates development / growth of egg

1

oestrogen (release from ovary) inhibits FSH production **and** stimulates LH production

1

LH (release from pituitary) stimulates ovulation

allow LH stimulates release of egg

1

progesterone (release from ovary) inhibits FSH **and** LH production

allow (release from corpus luteum)

1

oestrogen **and** progesterone maintain the uterus lining

*allow oestrogen **and** progesterone build up the uterus lining*

1

[16]

2. (a) any **one** from:

- movement would release (extra) heat
- movement would increase body temperature
- movement would increase sweating

1

(b) 37.4 °C

1

(c) <u>blood</u> is cooled at stomach / mouth

1

(cooled) blood flows to the brain

1

(d) via nerve(s) / neurones
or
via (nerve) impulse(s)

ignore type of neurone

allow electrical signals

allow via the nervous system

1

(e) less sweating occurs

allow less sweat evaporates

*do **not** accept no sweating*

1

so less heat is lost **or** less cooling

allow less heat used for evaporation of sweat / water

1

(f) dilation of blood vessels in the skin

1

[8]

3. (a) $\frac{1430}{2600} \times 100$

1

55 (%)

1

(b) (volume) increases

allow (volume) goes up

1

(c) drink (a lot / more)

1

(d) filtration

1

reabsorption

1

excretion

this order only

1

(e) **Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.

3–4

Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.

1–2

No relevant content

0

Indicative content

Advantages of kidney transplant

- no need for regular / long hospital visits **or** is a long-term solution
- flexible lifestyle, such as can go on holidays
- may not live near a hospital **or** reference to transport costs
- no risk of infection from frequent needles / treatment
- less / no need to control diet
- maintains correct concentration of substances in blood / body
- cheaper long term for NHS / hospital

Disadvantages of kidney transplant

- may be rejected
- have to keep taking anti-rejection drugs **or** immunosuppressants
- (suitable) donor may not be available **or** need for tissue matching
- risk from surgery (e.g. anaesthesia or infection)
- recovery from surgery will take a long time
- does not last forever (therefore further surgery needed)

For Level **2**, answers must refer to both advantages **and** disadvantages

[11]

4.

(a) (A) cerebellum **1**

(B) pituitary gland **1**

(C) cerebral cortex **1**

(b) cerebellum **1**

(c) coordinator **1**

(d) neurone

allow nerve (cell)
ignore names of neurone **1**

(e) retina **1**

(f) can see fruit / food

allow can find fruit / food **1**

(so) get more food **1**

(g) accommodation **1**

(h) light rays are refracted less

1

(i) any **one** from:

- myopia
- short-sightedness

allow near-sightedness

1

[12]

5. (a) to increase fruit size

1

to promote flower production

1

(b) any **two** from:

- keep temperature the same (for all dishes)

  *allow move equal distance **or** away from radiator **or** turn off radiator **or** use heat shield between lamp and seedlings*
- use equal numbers of seedlings (in each dish)
- use seedlings of the same (initial) height

  allow use seedlings of the same (initial) size
- use more seedlings in each dish
- give all dishes the same volume of water

  allow give all dishes the same amount of water
- use seed(ling)s of the same species

  allow use seed(ling)s of the same type
- measure light intensity

  allow measure distance from lamp
  *allow put lamp above each dish and use different light intensity **or** power for each*

  *allow same concentration of mineral ions **or** named example*
  ignore nutrients / food

  *do **not** accept keep the same light intensity*

2

(c) any **one** from:

- use a piece(s) of thread / string **and** measure length of thread (with ruler)

  *allow use a piece of thread **and** (put the thread against) a ruler*
- straighten seedling / shoot **and** measure (with ruler)

  allow straighten seedling against a ruler
- measure with a flexible ruler **or** a tape measure

  *allow use a flexible ruler **or** a tape measure*

1

(d) (side nearest the lamp) receives more light (on side P)

reference to side only needed once

allow side Q receives less light
allow side Q is in the shade
ignore side P is in the light

1

(therefore) unequal distribution of auxin

allow more auxin on side Q

allow (so) more auxin present

on side away from the lamp

*do **not** accept more auxin on light side **or** side P*

1

(auxin causes) more growth on side away from the lamp

allow more growth on side Q
allow (auxin causes) cell
elongation on side away from the light

ignore mechanism of auxin action

1

(e) ethene is released from bananas

allow ethylene is released from bananas

allow the hormone is ethene / ethylene

1

[9]

6. (a) put all the dishes the same distance from the radiator

1

use equal numbers of seedlings in each dish

1

(b) the height of the seedlings

1

(c) any **two** from:

- light
- water
- mineral(s) / ions / salts

allow nitrate / magnesium / nitrogen / nutrients

allow space
ignore food
ignore carbon dioxide / oxygen
ignore heat

2

(d) side **P** has grown less than side **Q**

1

(e) phototropism

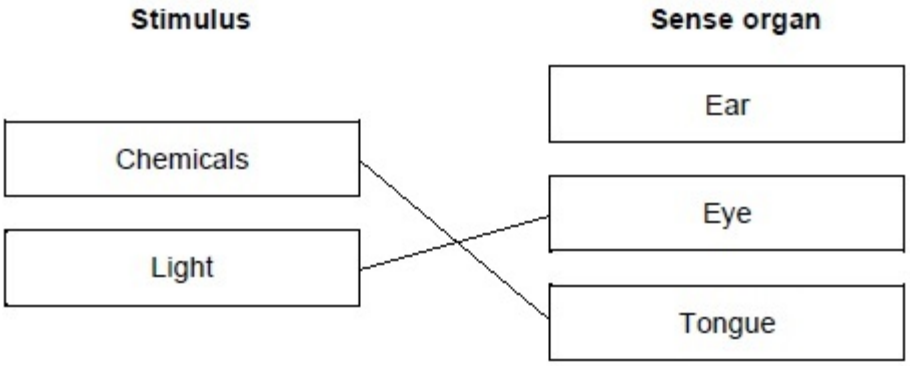
1

(f) auxin

1

[8]

7. (a)



additional lines from a stimulus negates the mark for that stimulus

2

(b) any **two** from:

1

- fast / rapid
- protect (from danger / harm)

1

- a response / a reaction

  ignore 'action'
- automatic / involuntary **or** not under conscious control

  allow not coordinated by conscious part of the brain

  or

  allow does not involve thought / thinking

  ignore not coordinated by the brain

(c) the muscle contracts

1

(d) (10)
(14)
8
11
13

in this order

all 3 correct = 2 marks
2 correct = 1 mark
0 or 1 correct = 0 mark

2

(e) (after drinking coffee) ruler falls less far (before being caught)

allow mean before = 17 ***and*** *mean after = 11(.2)*
or *mean after is only 11(.2)*

allow (ruler is) caught more quickly

1

(f) any **two** from:

- more repeats
- test more students
- use ruler with more precise scale – e.g. mm scale

  ignore accurate
- drop from same height (above the hand)
- make sure student **B**'s hand is stationary
- same distance between finger(s) and thumb

  allow alternative method – e.g. use of computer to measure reaction time

2

[10]

8. (a) A

1

(b) cerebral cortex

allow cerebrum

allow cerebral hemisphere(s)
ignore D

1

(c) any **three** from:

- can ask people to do different tasks (while taking scan)

  allow can ask person to do a (specific) task
- to see which part of brain is active / inactive

  allow to see which part of the brain is working
- to compare with a person without brain damage
- to see (exactly) where the damage is
- (traditional) MRI scanner cannot be used if people can't stay still

  *allow examples such as children **or** patients with Parkinson's disease*
  allow may be better for people who are claustrophobic

3

(d) (cells in) retina sensitive to light

allow retina detects light
allow rods / cones detect light

1

impulse passes along (sensory) neurone

*allow electrical signal **or** electrical message passes along (sensory) neurone*

1

(along) optic nerve

allow chemical transmission across synapse

1

(e) **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

- mutation (in gene / DNA)
- randomly **or** due to chance
- causes new / different protein / (visual) pigment to be made
- in the retina of bird
- (so more) variation in the wavelengths of light birds retinas could detect

- birds with the mutation **or** birds able to detect UV are more likely to see fruits (that reflect UV)
- birds with the mutation **or** birds able to detect UV are more likely to see where small mammals are or have been
- therefore get more food (small mammals or fruit)
- avoid being eaten (by small mammals)
- out competing those birds without the mutation **or** birds not able to detect UV

- so more likely to survive **and** reproduce **or** have offspring
- by natural selection
- passing on allele / gene / mutation to offspring
- repeated over many generations

For Level 3 a link to UV vision is required

[14]

9. (a) protein

1

(b) urea is a waste (product)

*allow toxic / poisonous **or** may damage cells **or** denatures proteins*

ignore harmful / dangerous

1

(c)

in this order

respiration

1

breathing

1

(d)

in this order

least

medium

most

*3 correct = **2** marks*
*1 or 2 correct = **1** mark*

2

(e) diffusion

1

(f) protein

1

(molecules too) large

this mark may only be awarded if mp1 is correct or not attempted
allow pores in membrane are too small

1

(g) 3

allow three

1

(h) increases

ignore numbers

1

(i) any **two** from:

*allow converse points for person **A** / dialysis*

- has a low(er) concentration of urea
- constant urea concentration / level

allow substance (if named must be correct)

- less time attached to machine **or** fewer hospital visits
- no / less restriction on travel
- not piercing skin repeatedly
- less chance of infection / blood clots
- cheaper in the long term

ignore cheaper unqualified

- no restrictions on diet

2

[13]