

Section 12: Nervous System

Answer Key

| | | |
|-------|---|---|
| 12.1 | What is the role of the human nervous system? | The nervous system detects stimuli from the internal or external environment and uses electrical impulses to bring about the fast, but short-lived, responses. |
| 12.2 | Describe 2 ways of measuring reaction time. | Dropping a ruler and catching it, computerised tests involving pressing a button in response to seeing something on the screen – time recorded by the computer |
| 12.3 | Summarise the order in which the nervous system works? | Stimuli, receptor, sensory neurone, CNS, motor neurone, effector, response |
| 12.4 | Name 3 types of neuron . | Sensory, Motor and Relay |
| 12.5 | What is a synapse and how does it work? | The methods by which the nervous impulse crosses the gap between neurones. <ol style="list-style-type: none"> 1. Impulse arrives at the end of neurone A 2. Neurotransmitter is released into the synaptic gap 3. Neurotransmitter diffuses across the synaptic gap 4. Neurotransmitter binds to the receptors on neurone B 5. A new electrical impulse is generated in neurone B |
| 12.6 | What neurone is involved in a reflex? | Relay |
| 12.7 | Why are reflexes important? | Reaction remove your body from danger. |
| 12.8 | Why are reflexes faster? | The do not involve the conscious part of the brain , therefore no conscious thought |
| 12.9 | What is a receptor ? State 3 examples. | Cells that detect stimuli (changes in the internal or external environment). Eyes, ears, skin, thermoreceptors, pressure receptors, tongue, nose |
| 12.10 | What is a stimulus? | A change in the environment (internal/external) |
| 12.11 | What carries out a response? Give 3 examples. | Effectors – Muscle, gland or Organ |
| 12.12 | How is a nerve cell adapted? | <ul style="list-style-type: none"> The cell body contains cytoplasm and nucleus (the control centre of the cell) The axon is a long extension of the cytoplasm (can be up to 1m). this means nerve impulses can be transmitted to the extremities by 1 cell. The myelin sheath is a fatty layer that surrounds to axon. The sheath act as an insulator and spreads up nerve impulses. The branched ends of the axon and the smaller branches coming from the cell body allow the neurone to make connections with other neurones. |

Section 13 – Endocrine System

Answer Key

| | | |
|-------|---|--|
| 13.1 | What is the endocrine system made of? | Glands which secrete hormones |
| 13.2 | How are chemical messages transported around the body? | Glands release hormones into the bloodstream which then travel to the target organ to produce an effect. |
| 13.3 | What is produced if blood glucose is a) Too high b) Too Low | a) Insulin b) Glucagon |
| 13.4 | Name 2 places in the body where glycogen is stored. | Muscles and Liver cells |
| 13.5 | What is the process called that restores the body back to normal levels? | Negative feedback |
| 13.6 | Name the hormones involved in reproduction (male and female) | Testosterone Oestrogen Follicle stimulating hormone Luteinising hormone |
| 13.7 | State the names and function of the hormones in the menstrual cycle. | FSH – matures the egg Oestrogen – Causes the uterus lining to thicken and stop FSH production LH – releases the mature egg |
| 13.8 | What are the 2 main categories of contraception ? | Physical barriers and chemical methods |
| 13.9 | Summarise the stages of IVF. | 1. Mother given FSH and LH to mature several eggs 2. Eggs are collected from the mother and by sperm from the father in a lab. 3. Fertilised eggs develop into embryos 4. Some Embryos are inserted into the mothers uterus |
| 13.10 | State 2 advantages and disadvantages of fertility treatment. | Disadvantages – emotionally and physically stressful, low success rate, multiple births Advantages – allows pregnancy when not possible, embryo screened for genetic disorders |

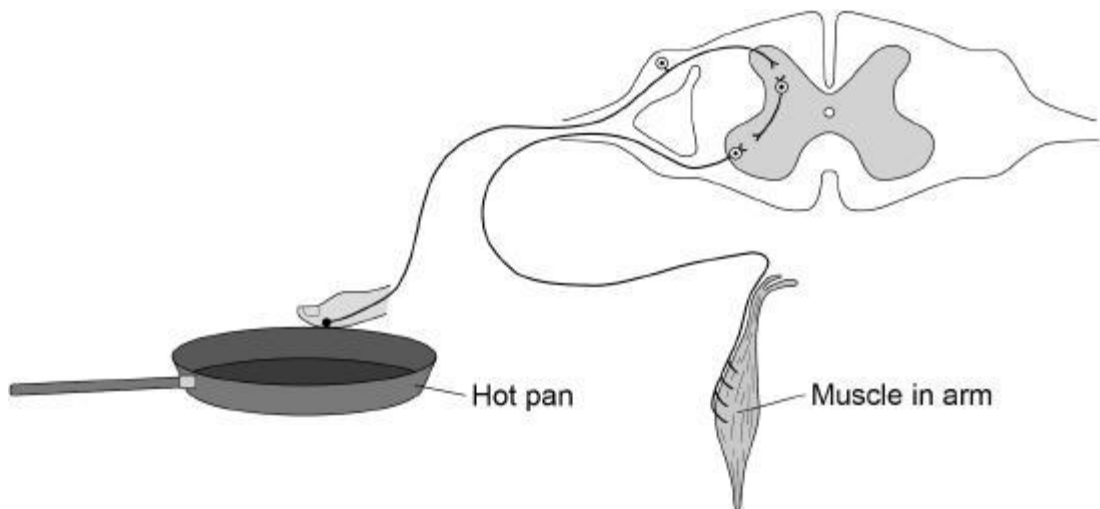
Foundation Tier

Q1.

Human reactions are a response to an external change.

- (a) Reflex actions help to protect the body against damage.

The diagram below shows the nervous pathway for a reflex action.



A stimulus from the hot pan will cause the muscle in the arm to contract and move the finger away.

Describe how the stimulus from the hot pan reaches the muscle in the arm.

(4)

- (b) A student investigated whether using the right hand or the left hand had an effect on reaction time.

The student only tested right-handed people.

Describe a method for the student's investigation.

Include details of the test you would use for reaction time.

(4)

A different student carried out an investigation to see if playing tennis improved reaction time.

The student used two groups of six people.

The table below shows the results.

| Person | Reaction time in seconds | |
|--------|--------------------------|-------------------------------|
| | People who play tennis | People who do not play tennis |
| 1 | 0.2 | 0.3 |
| 2 | 0.4 | 0.4 |
| 3 | 0.3 | 0.6 |
| 4 | 0.4 | 0.5 |
| 5 | 0.2 | 0.3 |
| 6 | 0.3 | 0.2 |
| Mean | X | 0.4 |

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

X = _____ seconds

(2)

- (d) What is the dependent variable in the student's investigation?

(1)

The student concluded:

‘Playing tennis improves reaction time.’

- (e) Give **one** piece of evidence which supports the conclusion.

(1)

- (f) Give **one** piece of evidence which does **not** support the conclusion.

(1)

(Total 13 marks)

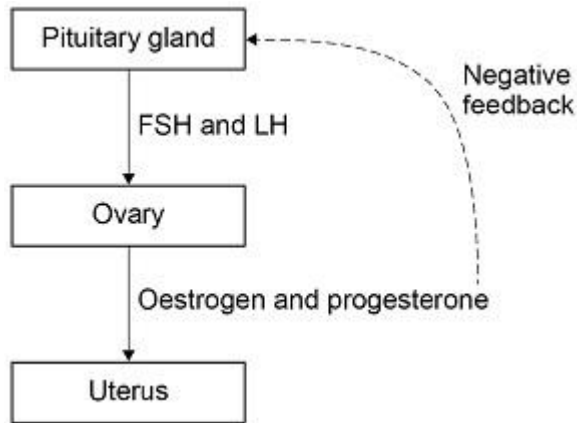
Q2.

Hormones can have effects on the body far from the gland that releases the hormone.

- (a) Name the system in the body that releases hormones.

(1)

The diagram shows part of the hormonal control of the menstrual cycle.



- (b) Describe how FSH and LH travel from the pituitary gland to the ovaries.

(1)

- (c) Explain how the body regulates the production of oestrogen and progesterone for most of the menstrual cycle.

Use the information shown in the diagram above.

(3)

- (d) A woman is most fertile at about day 15 of the menstrual cycle.

From day 12 to day 14 of the menstrual cycle, the negative feedback shown in the figure above stops.

Explain what happens when the negative feedback stops.

(3)

- (e) A contraceptive injection contains progestin.

Progestin is a synthetic form of progesterone.

Explain how the progestin injection prevents pregnancy.

(4)

(Total 12 marks)

Higher Tier

Q3.

This question is about homeostasis.

- (a) Define the term homeostasis.

(2)

- (b) Name the hormone released if the blood glucose concentration falls too low.

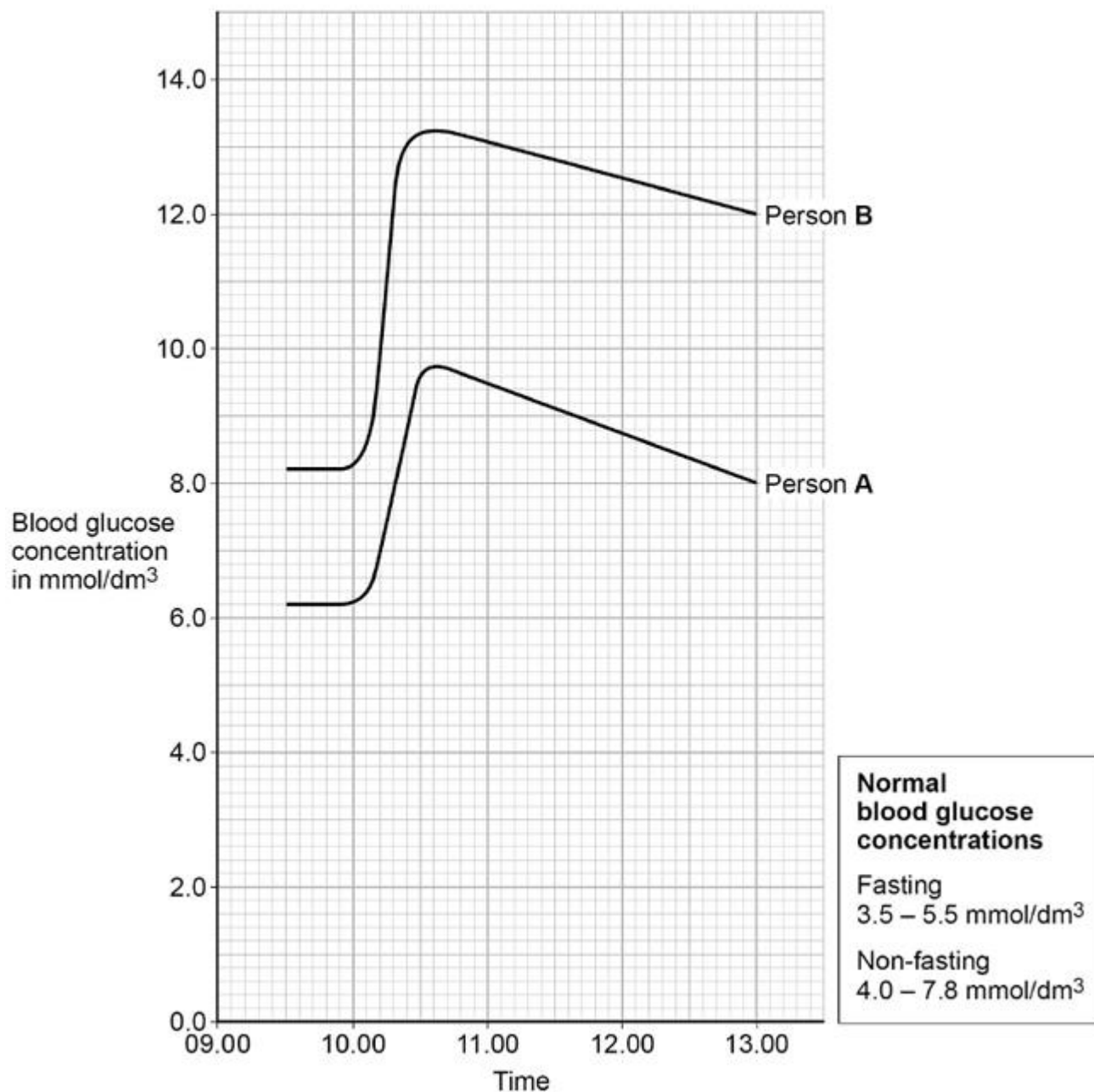
(1)

Two people were sent to a hospital to find out if they have diabetes.

This is the method used at the hospital.

- Do not eat or drink after midnight. This is called fasting.
- Measure blood glucose concentration at 9.30 am
- Drink a glucose solution at 10.00 am
- Measure blood glucose concentration for the next 3 hours.

The graph shows the results.



Person **A** and person **B** have diabetes.

(c) Describe how the graph above shows that person **B** has diabetes.

Use data from the graph.

(3)

- (d) Person **A** and person **B** had a test to measure the concentration of insulin in their blood when they were fasting.

The table shows the results.

| Person | Fasting blood insulin concentration in arbitrary units |
|--------------|--|
| A | 280 |
| B | 20 |
| Normal range | 50–175 |

Suggest which type of diabetes person **A** and person **B** have.

Give a reason for each answer.

Person **A**

Type of diabetes _____

Reason _____

Person **B**

Type of diabetes _____

Reason _____

(2)

- (e) Toxic hypoglycaemia syndrome (THS) has caused the deaths of hundreds of starving children in some tropical countries.

- The starving children have had nothing to eat all day.
- The starving children then eat many lychee fruits.
- The lychee fruits contain a molecule which stops an enzyme in the liver working.
- This enzyme normally converts stored fats into glucose.

Children who have eaten during the day are **not** affected by eating many lychee fruits.

Starving children may die from eating many lychee fruits but children who have eaten during the day are not affected.

[illegible]

(Total 14 marks)

Two 18-year-old male students measured their reaction times.

Method 1

- ## Method 2

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The table below shows the results.

| Student | Reaction time in seconds | | | | | | | |
|----------|--------------------------|--------|--------|------|----------|--------|--------|------|
| | Method 1 | | | | Method 2 | | | |
| | Test 1 | Test 2 | Test 3 | Mean | Test 1 | Test 2 | Test 3 | Mean |
| A | 0.72 | 0.69 | 0.71 | 0.71 | 0.8 | 0.6 | 0.8 | 0.7 |
| B | 0.53 | 0.49 | 0.52 | 0.51 | 0.6 | 0.7 | 0.5 | 0.6 |

- (a) Student **A** and student **B** had different reaction times.

Suggest **two** reasons why student **A**'s reaction time was longer than student **B**'s reaction time.

1. _____

2. _____

(2)

- (b) Give **two** reasons why Method **1** would give more accurate results than Method **2**.

1. _____

2. _____

(2)

(c) In Method **1** the students react to a sound.

In Method **2** the students react when they see the metre rule drop.

A sound wave is a longitudinal wave.

Visible light is a transverse wave.

Describe the difference between a longitudinal wave and a transverse wave.

(2)

(d) The nervous system coordinates reflex actions.

A person accidentally touches a hot object.

The person moves their hand away quickly.

Describe how information about the hot object is detected, **and** how the information reaches the muscles in the arm.

(4)

(Total 10 marks)

Mark schemes

Q1.

- (a) any **four** from:
- (stimulus is) detected by the receptor
 - (initiates) an electrical impulse
 - (impulse) travels via the neurones
 - sensory, relay and motor
- allow in this order only*
- crosses synapses
 - (crosses synapses) as a chemical
- 4
- (b) **Level 2:** The method would lead to the production of a valid outcome. All key steps are identified and 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**
- select at least 3 people
 - do reaction time test at least 3 times using right hand
 - details on how to do test in valid manner
 - find a mean
 - remove anomalous readings
 - repeat for each person for left hand
 - select people of same age
 - select people of same gender
 - same time of day
 - other control such as amount of coffee, sleep.
- To access level 2 the right hand and left hand of each person must be compared*
- (c)
- $$\frac{(0.2 + 0.4 + 0.3 + 0.4 + 0.2 + 0.3)}{6}$$
- or
- $$\frac{1.8}{6}$$
- 1
- 0.3
- 1
- (d) reaction time
- allow time*
- 1

- (e) students who play tennis (regularly) had shorter / faster (mean) reaction time(s)

1

- (f) any **one** from:

- overlap in times between two groups
allow correctly described as comparative data
- small difference in (mean) times
- small sample used
allow students who did not play tennis may have played other (ball) games

1

[13]

Q2.

- (a) endocrine (system)

1

- (b) in the blood(stream)

allow in plasma

1

- (c)

allow correct sequence of steps starting with low oestrogen / progesterone

(when oestrogen / progesterone are released from the ovaries negative feedback to the pituitary)

inhibits / prevents / stops / reduces the production / release of FSH / LH

allow causes less FSH / LH to be produced / released

1

(so) less stimulation of ovaries

1

(so) less oestrogen / progesterone released

1

- (d) (when negative feedback stops) oestrogen / progesterone do not inhibit release of LH

*allow (when negative feedback stops) oestrogen / progesterone stimulates release of LH
ignore references to FSH*

1

(so) there is an increase in LH

ignore references to FSH

1

LH causes the release of an egg

or

LH causes ovulation

*do **not** accept FSH causes release of an egg*

1

(e) body reacts as though progesterone levels are increased

1

(which has) negative feedback effect on the pituitary gland

allow decreased production (of hormones) from pituitary gland

1

(so) decreased production / release of FSH

allow (so) decreased production / release of LH

1

(decreased FSH) prevents maturation of egg

allow (decreased LH) so no egg released

mp3 and mp4 must correspond

if no other mark awarded allow

progesterone / progestin thickens mucus in cervix for 1 mark

and

thicker mucus makes it difficult for sperm to enter uterus for 1 mark

1

[12]

Q3.

(a) regulation / control / maintenance of internal conditions (of a cell / body)

allow keeping the internal conditions (of a cell / body) the same

1

for optimum (cell / enzyme activity)

allow description of optimum functioning (of cell / body)

1

(b) glucagon

correct spelling only

1

(c) any **two** from:

- fasting blood glucose is higher than normal range
- reached a very high concentration after glucose drink
- did not return to normal after 3 hours
- **or**
- fell slowly after reaching peak.

use of correct data in comparison to normal ranges given for any of the above points

allow \pm half a small square for values quoted from the graph

1

ignore references to person A

2

- (d) (person A has Type) 2 (pancreas) producing (lots of) insulin but body cells cannot respond to it.

*allow cells becoming resistant to insulin for respond to insulin. do **not** accept the person has become resistant to insulin*

1

(person B has Type) 1 (pancreas) not producing enough insulin (to control concentration of glucose in the blood)

1

type of diabetes must be correct

- (e) starving children have used up their glycogen stores

allow starving children have no / low glycogen stores

1

(so) would need (liver enzyme) to release glucose from fats

1

as enzyme is stopped from working they get low / no glucose

allow no working enzyme leads to hypoglycaemia

1

(cell) respiration is insufficient (so they die)

allow starving children use proteins to release energy (which leads to death)

1

children that are not starving have glycogen stores in liver / muscle

1

(so) glucagon will continue to release glucose (into the blood for them)

1

[14]

Q4.

- (a) any **two** from:
- was more tired

- less practice
 - less caffeine
allow correct reference to named drug
 - had drunk alcohol
allow converse if clearly describing student B
ignore experimental method ignore fitter
- 2
- (b) the computer (timer) had a higher resolution
- 1
- the metre rule could slip through the hand causing inaccurate readings
allow it is harder to catch a ruler than
press a button
ignore reference to human error ignore
reference to
accuracy / precision
allow converse
- 1
- (c) in a longitudinal wave, the oscillations / vibrations are parallel to the direction of energy transfer
allow direction of travel for energy
transfer
- 1
- in a transverse wave, the oscillations / vibrations are perpendicular to the direction of energy transfer
allow direction of travel for energy
transfer
if no other mark scored allow 1 mark for
transverse waves have peaks and
troughs and longitudinal waves have
compressions and rarefactions
- 1
- (d) (temperature) receptors (in the skin / hand detect the information)
- 1
- an (electrical) impulse travels along the sensory neurone
ignore message / signal / information
- 1
- (then) travels along the relay neurone and then the motor neurone
- 1
- chemical moves / diffuses across the synapse
ignore gap
allow chemical moves / diffuses across
the synapse applied to between any two
neurons in the pathway
max 3 marks if not in correct order
- 1

