

Name: _____

Homeostasis and Response part 3 AQA Triple Biology

Class: _____

Date: _____

Time: **71 minutes**

Marks: **70 marks**

Comments:

1.

Homeostasis controls the internal conditions of the body.

(a) Explain how blood glucose levels are controlled in the body of someone who does **not** have diabetes.

(4)

(b) Compare how each type of diabetes is caused.
Suggest how each type of diabetes can be treated.

(4)

(c) Look at the table below.

Population of UK in 2015	6.5×10^7
Number of people diagnosed with diabetes	3.45×10^6
Estimated number of people with undiagnosed diabetes	5.49×10^5

Calculate the percentage (%) of the UK population estimated to have diabetes.

You should include both diagnosed and undiagnosed people in your calculation.

Give your answer to 2 significant figures.

Estimated percentage of population with diabetes = ____ %

(3)

(d) A urine test can be used to check for the presence of glucose in the urine.

Diabetes can also be diagnosed with a blood test to measure the concentration of blood glucose.

Suggest why a blood test is more reliable than a urine test.

(1)

(e) A blood test called the glucose tolerance test checks how well the body processes glucose.

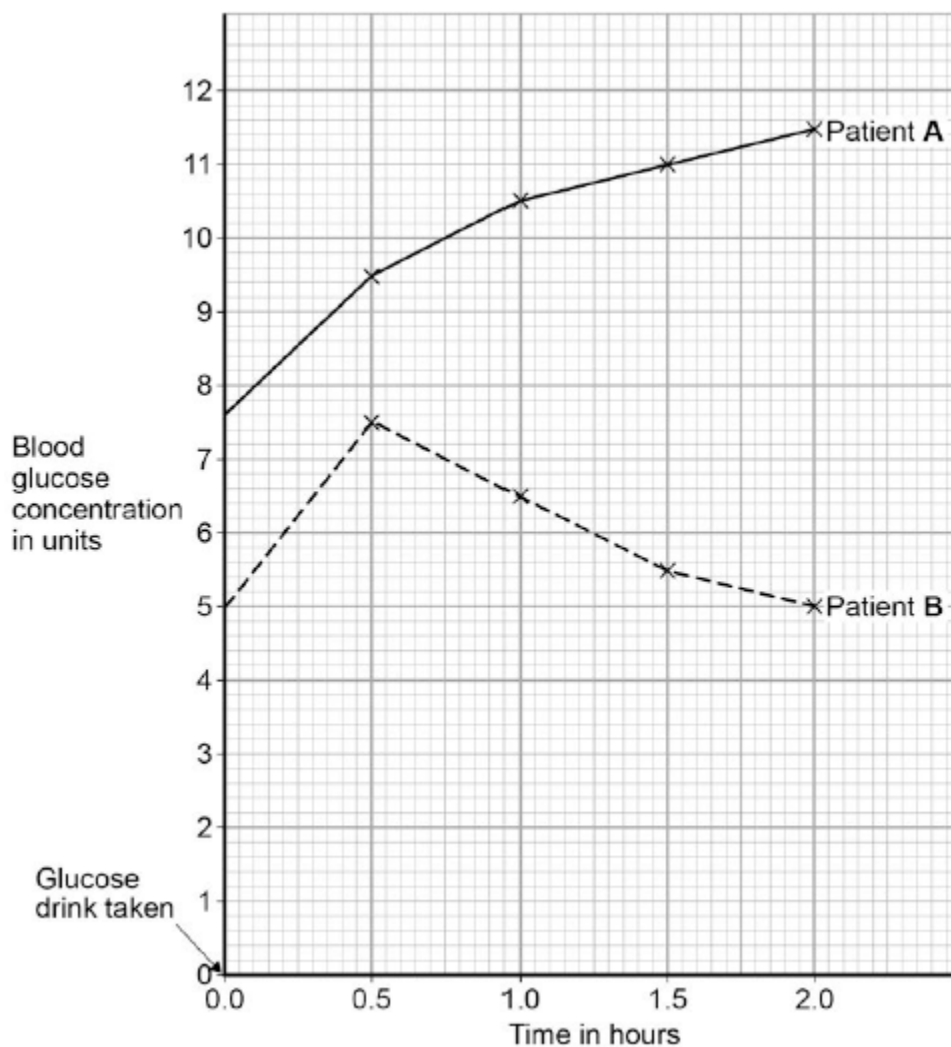
Concentrations of glucose in the blood are measured before and after drinking a glucose drink.

Patients are not allowed to eat food for 8 hours before the glucose tolerance test.

Suggest why patients are **not** allowed to eat for 8 hours before the test.

(1)

(f) The diagram below shows the results of a glucose tolerance test for two patients, **A** and **B**.



Which patient has diabetes?

Justify your answer.

Patient _____

Justification _____

(2)
(Total 15 marks)

2.

Endocrine glands produce hormones.

(a) Hyperthyroidism is caused by an overactive thyroid gland.

Suggest what would happen in the body of a person with hyperthyroidism.

(3)

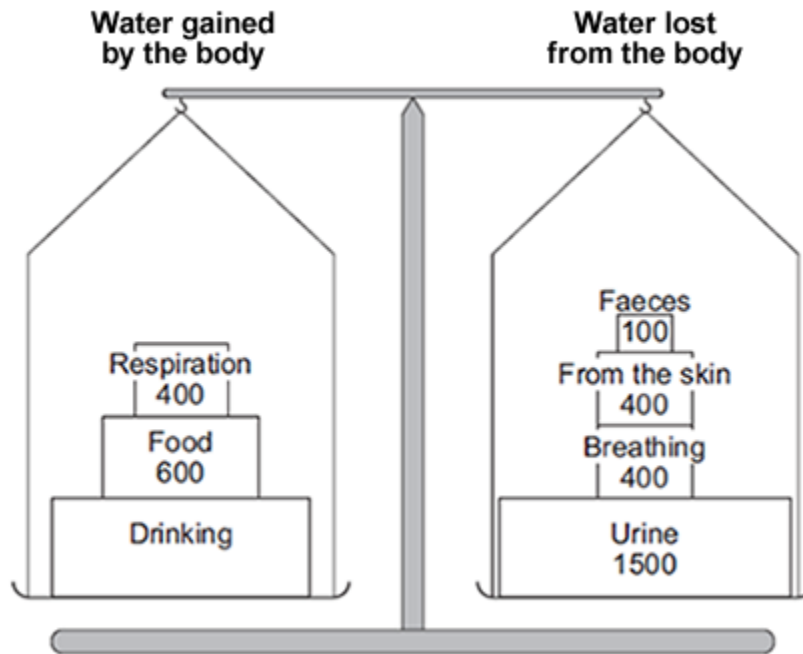
(b) Describe the roles of FSH and LH in the menstrual cycle.

(2)

3.

The diagram below shows the water balance for a person on a cold day.

The numbers show the volume of water, in cm^3 , the person's body gained and lost.



(a) (i) How much water was lost from the body on the cold day?

Draw a ring around the correct answer.

1800 cm^3

2400 cm^3

3300 cm^3

(1)

(ii) The volume of water gained by the body should balance the volume of water lost from the body.

How much water should the person have drunk to keep the balance?

Volume of water = _____ cm^3

(2)

(b) (i) Name the process by which water is lost from the skin.

(1)

(ii) Why does the body need to lose water from the skin?

(1)

(c) The next day was a hot day. The person gained the same volume of water and did the same activities.

(i) What effect did the increase in temperature have on the volume of water the person lost?

Tick (✓) **one** box.

Less water was lost through the skin.

More water was lost through the skin.

More water was lost in faeces.

(1)

(ii) What effect would the increase in temperature have on the volume of urine the person lost?

Draw a ring around the correct answer.

decrease

increase

no change

(1)

(Total 7 marks)

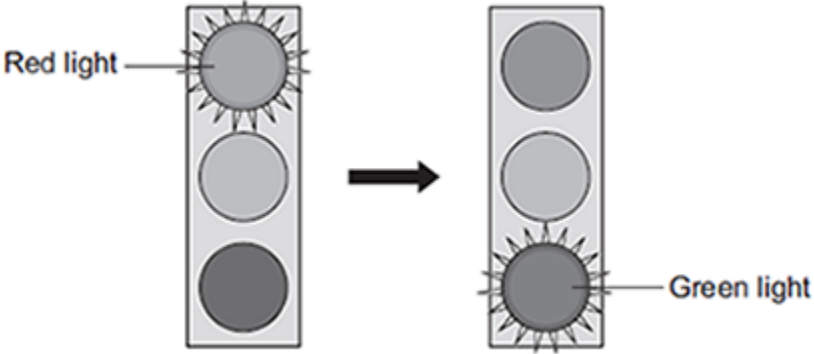
4.

Car drivers need quick reactions to avoid accidents.

A student uses a computer program to measure reaction time.

The computer screen shows a traffic light on red. The traffic light then changes to green.

The diagram below shows the change the person sees on the computer screen.



When the traffic light changes to green the person has to click the computer mouse as quickly as possible.

The computer program works out the time taken to react to the light changing colour.

(a) Special cells detect the change in colour.

(i) What word is used to describe special cells that detect a change in the environment?

Draw a ring around the correct answer.

receptor cells

reflex cells

stimulus cells

(1)

(ii) Where in the body are the special cells that detect the change in colour of the traffic lights?

(1)

(b) The student used the computer program on one computer to measure the reaction times of people of different ages.

(i) Give **one** variable the student should control so that a fair comparison can be made between the people of different ages.

(1)

- (ii) The student did each measurement three times to calculate a mean value.

The table shows the results.

Age in years	Mean reaction time in milliseconds
15	242
30	
45	221
60	258
75	364
90	526

The reaction times for the 30-year-old person were **192**, **174** and **180** milliseconds.

Calculate the mean reaction time of the 30-year-old person.

Mean reaction time = _____ milliseconds

(1)

- (iii) Which **one** of the following is an advantage of repeating each test three times and **not** doing the test just once?

Tick (✓) **one** box.

Any anomalies can be identified.

The results will be more precise.

There will be no errors.

(1)

(iv) Some people think that old people should **not** be allowed to drive a car.

Why is it more dangerous for old people to drive cars?

Use information from the table above to support your answer.

(2)

(Total 7 marks)

5.

Hormones are involved in controlling the menstrual cycle and fertility.

(a) (i) Use the correct answer from the box to complete the sentence.

auxin	follicle stimulating hormone (FSH)	thalidomide
--------------	-------------------------------------------	--------------------

A hormone produced by the pituitary gland is _____

(1)

(ii) Use the correct answer from the box to complete the sentence.

luteinising hormone (LH)	oestrogen	statin
---------------------------------	------------------	---------------

A hormone produced by the ovaries is _____

(1)

(b) (i) Why are fertility drugs given to some women?

(1)

(ii) A doctor injects fertility drugs into a woman. After the injection, the hormones travel to the woman's ovaries.

How do the hormones travel to the ovaries?

Draw a ring around the correct answer.

through the bloodstream **through the neurones** **through the skin**

(1)

(c) Which **two** hormones are used in contraceptive pills?

Tick (✓) **two** boxes.

FSH	<input type="checkbox"/>	oestrogen	<input type="checkbox"/>
LH	<input type="checkbox"/>	progesterone	<input type="checkbox"/>

(2)
(Total 6 marks)

6. This question is about the nervous system.

(a) Describe the difference between the function of a receptor and the function of an effector.

In your answer you should give **one** example of a receptor and **one** example of an effector.

(4)

(b) Synapses are important in the nervous system.

(i) What is a synapse?

(2)

(ii) Describe how information passes across a synapse.

(2)

(c) Reflexes may be co-ordinated by the brain or by the spinal cord.

(i) The reflexes from sense organs in the head are co-ordinated by the brain.

Name a sense organ involved in a reflex co-ordinated by the spinal cord.

(1)

(ii) The table shows information about reflexes co-ordinated by the brain and reflexes co-ordinated by the spinal cord.

Organ co-ordinating the reflex	Mean length of neurones involved in cm	Mean time taken for reflex in milliseconds	Mean speed of impulse in cm per millisecond
Brain	12	4	3
Spinal cord	80	50	

Calculate the mean speed of the impulse for the reflex co-ordinated by the spinal cord.

Mean speed = _____ cm per millisecond

(1)

(iii) In reflexes co-ordinated by the brain there are **no** relay neurones.

Suggest why there is a difference in the mean speed of the impulse for the two reflexes.

(2)

(Total 12 marks)

7.

(a) Which organ of the human body produces egg cells?

Draw a ring around the correct answer.

liver

ovary

testis

(1)

(b) An egg joins with a sperm and develops into an embryo.

How many chromosomes are there in each cell of a human embryo?

Draw a ring around the correct answer.

23

46

48

(1)

- (c) Some women find it difficult to have a baby. A doctor may suggest that these women should use In Vitro Fertilisation (IVF) to help them have a baby.

Table 1 shows how successful IVF was for women of different ages at one clinic.

Table 1

Age of women in years	Percentage of women who had a baby
<35	35
35–37	31
38–39	25
40–42	32
43–44	7
>44	0

- (i) A student thought that the result for women aged 40–42 was anomalous.

Suggest why the student thought this result was anomalous.

(1)

- (ii) Describe the general trend in the results in **Table 1**.

You should ignore the anomalous result.

(1)

- (d) Some babies are born with a faulty chromosome.

Scientists investigated whether the chance of having a baby with a faulty chromosome is also related to the age of the woman.

Table 2 shows the scientists' results.

Table 2

Age of women in years	Number of women per 1000 who had a baby with a faulty chromosome
25	2.0
30	2.6
35	6.1
40	19.6
45	66.0

- (i) A 45-year-old woman is more likely than a 25-year-old woman to have a baby with a faulty chromosome.

How many times more likely?

Answer = _____ times

(2)

- (ii) Suggest **two** reasons why many fertility clinics will **not** accept women over 40 years of age for IVF treatment.

Use information from **Table 1** and **Table 2** in your answer.

1. _____

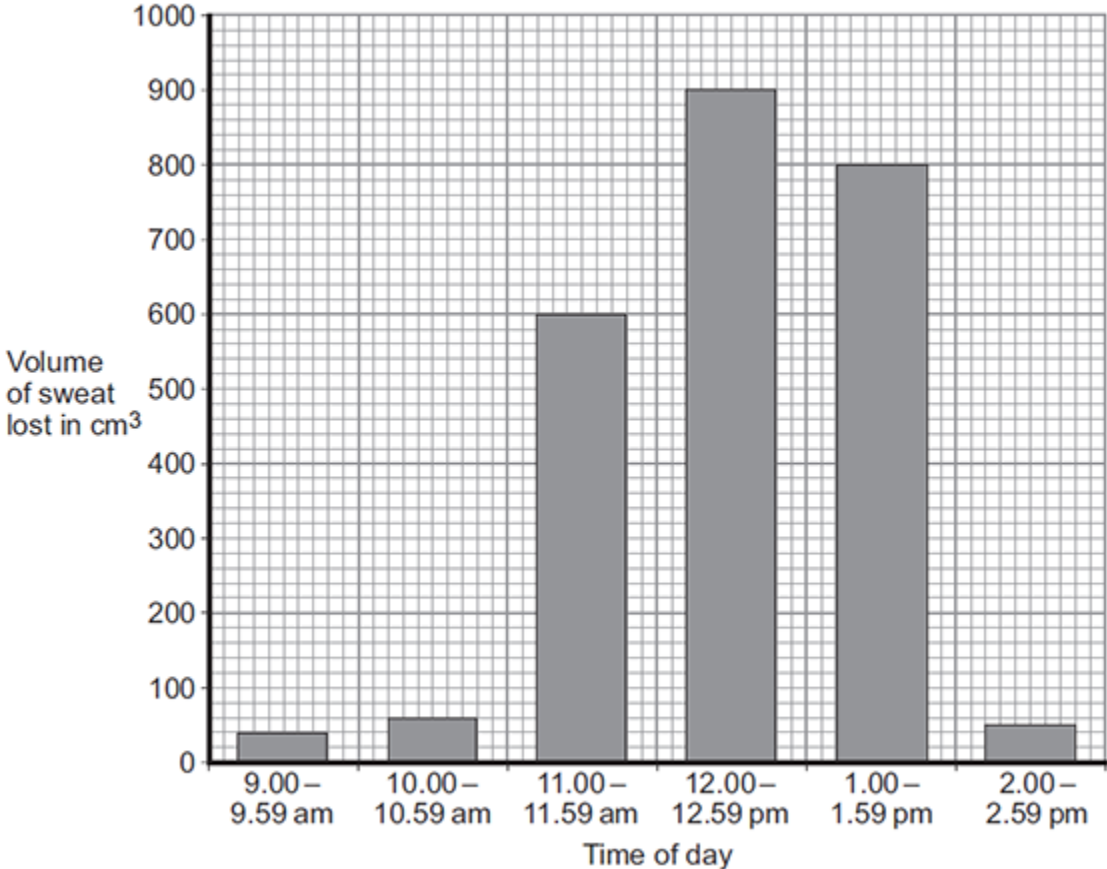
2. _____

(2)

(Total 8 marks)

8.

A scientist measured the volume of sweat lost between 9.00 am and 2.59 pm in one day by one person. The graph below shows the results.



(a) (i) Suggest what happened at 11.00 am.

Tick (✓) **one** box.

- The person moved into a cold room.
- The person removed their coat.
- The person started running a race.

(1)

(ii) Calculate the total volume of sweat lost between 11.00 am and 1.59 pm.

Total volume of sweat lost = _____ cm³

(1)

(iii) Suggest **one** way the person could replace the water that was lost as sweat.

(1)

(b) (i) Sweating helps keep our internal body temperature within a narrow range.

Which organ monitors body temperature?

Tick (✓) **one** box.

brain

kidney

pancreas

(1)

(ii) The organ that monitors internal body temperature receives information about temperature from the skin.

Which structures in the skin send impulses with this information?

Tick (✓) **one** box.

capillaries

glands

receptors

(1)

(c) How does sweating help to control body temperature?

(1)

(Total 6 marks)

Mark schemes

- 1.** (a) if too high insulin released from pancreas 1
- so glucose is moved into cells
allow glucose is stored 1
- if too low, glucagon is released (from pancreas) 1
- causes glycogen to be converted to glucose and released into the blood 1
- (b) type 1 not enough / no insulin produced 1
- whereas type 2 cells do not respond to insulin 1
- type 1 is treated with injections of insulin 1
- whereas type 2 is treated with diet and exercise
- or**
loss of weight
or
drugs 1
- (c) $(3.45 \times 10^6) + (5.49 \times 10^5) = 3.999 \times 10^6$
or
 $3\,450\,000 + 549\,000 = 3\,999\,000$
*allow 3.999×10^6 **or** $3\,999\,000$ with no working shown for 1 mark* 1

$$\frac{3.999 \times 10^6}{6.5 \times 10^7} \times 100$$

or

$$\frac{3\,999\,000}{65\,000\,000} \times 100$$

= 6.15

allow 6.15 with no working shown for 2 marks

allow for 1 mark for a calculation using either:

$$\frac{3.45 \times 10^6}{6.5 \times 10^7}$$

or

$$\frac{3\,450\,000}{65\,000\,000}$$

or

$$\frac{5.49 \times 10^6}{6.5 \times 10^7}$$

or

$$\frac{549\,000}{65\,000\,000}$$

1

6.2

allow 6.2 with no working shown for 3 marks

1

allow ecf from second step correctly rounded for 1 mark

(d) could be other reasons for glucose in urine

or

blood test gives current / immediate result, urine levels might be several hours old

or

not always glucose in urine

1

(e) results not affected by glucose from food

or

8 hours is sufficient time for insulin to have acted on any glucose from food eaten

or

so that there is a low starting point to show the effect

1

(f) (patient **A**)

*no mark for identifying **A***

glucose level much higher (than **B**)

1

and remains high / does not fall

1

[15]

2.	(a) Too much thyroxine is released into the blood	1
	which raises BMR	1
	causing increase in formation of glycogen / lipids / proteins	
	or	
	increase in rate of respiration	
	or	
	increase in breakdown of excess proteins	1
	(b) FSH causes eggs to mature and stimulate ovaries to produce oestrogen	1
	LH stimulates the egg to be released	1
	(c) (missing a dose causes a) dip / drop in progesterone levels	1
	(therefore) FSH is not inhibited anymore	1
	(therefore) LH is not inhibited anymore	1
	(and consequently) an egg is matured and released	
	<i>allow (and consequently) an egg is available to be fertilised</i>	1
		[9]
3.	(a) (i) 2400 cm ³	1
	(ii) 1400 (cm ³)	
	<i>allow 2 marks for ecf of correct answer to [answer given in (a)(i) – 1000]</i>	
	<i>allow 1 mark for 2400 – (600 + 400) or equivalent with no or incorrect answer</i>	
	<i>allow 1 mark for ecf of answer given in (a)(i) – 1000 or equivalent with no or incorrect answer</i>	2
	(b) (i) sweat(ing)	
	<i>allow evaporation</i>	
	<i>allow perspiration</i>	1
	(ii) any one from:	
	• for cooling	
	• to maintain body temperature	1

- (c) (i) More water was lost through the skin. 1
- (ii) decrease 1

[7]

- 4.** (a) (i) receptor cells 1
- (ii) eye(s)
accept retina 1

- (b) (i) any **one** from: 1
- gender / sex
 - quality of eyesight
eg wearing glasses
 - eg of factor that might affect reaction times
eg alcohol consumption / distractions / tiredness / health / time of day / amount of practice (at this test)
do not allow time / age

- (ii) 182 1
- allow 182.0* 1

- (iii) Any anomalies can be identified. 1

- (iv) reaction time (too) long **or** reactions (too) slow 1
- allow reaction time (too) slow*
*allow examples of data quoted **or** derived from the table, eg (mean) reaction time for 90 year olds is 162 ms longer than for 75 year olds*

- (so) more likely to have / cause an accident 1

[7]

- 5.** (a) (i) follicle stimulating hormone / FSH 1
- (ii) oestrogen 1

- (b) (i) any **one** from:
- to help them have a baby / get pregnant
ignore to make them fertile
 - to stimulate egg production / release / maturation
 - own levels of FSH / LH / hormone (too) low
allow to increase hormone / FSH / LH levels
do not allow to increase oestrogen levels

1

(ii) through the bloodstream

1

(c) oestrogen

1

progesterone

1

[6]

6.

(a) receptors detect / sense stimuli / change in surroundings **or** convert stimulus into an impulse

ignore send impulses to brain / spinal cord

1

example of a receptor

allow any appropriate organ or part of an organ, eg eye / retina or
named type of receptor eg light receptor

1

effectors allow / make response **or** convert an impulse to an action

ignore receive impulses from brain / spinal cord

1

(effector) muscle / gland

allow an example
ignore eg arm / leg

1

(b) (i) junction

allow idea of a (small) gap / space
*do **not** allow if implication is that the neurones move*

1

between neuron(e)s

allow named types of neurones

1

- (ii) chemical
allow answers in terms of specific types of neurone
allow neurotransmitter / named neurotransmitter released

1

any **one** from:

- (chemical released) from one neurone
ignore produced
- (chemical) passes (across synapse) to next neurone to stimulate / cause (electrical) impulse
allow diffuses for passes (across)

1

- (c) (i) skin
ignore hand / leg

1

- (ii) 1.6 (cm per millisecond)
allow 2 if evidence of rounding up of 1.6

1

- (iii) any **two** from:
ignore length of neurones
- synapses slow down transmission / impulse
allow idea of movement of chemical being slower than electrical impulse
 - fewer synapses (via brain)
*allow one synapse compared to two **or** only one synapse*
 - (therefore) fewer delays
allow impulse travels more slowly in relay neurones

2

[12]

7.

- (a) ovary

1

- (b) 46

1

- (c) (i) does not fit the pattern
or
it is higher than the 3rd value / it should be lower than the 3rd value / it should be between the 3rd and 5th values
*do **not** allow use of incorrect figures*

1

- (ii) As age increases % of women (having a baby) decreases

1

- (d) (i) 33

allow 1 mark for $\frac{66}{2}$
if no answer / wrong answer

2

(ii) low success rate

1

more likely to have a baby with health problems / abnormalities / a faulty chromosome

1

[8]

8.

(a) (i) The person started running a race.

1

(ii) 2300

1

(iii) drinking (water / sports drink)
or
through eating

1

(b) (i) brain

1

(ii) receptors

1

(c) cools us down

allow evaporates

1

[6]