Homeostasis and Response -Revision materials

Content will be tested on Biology Paper 2

Checklist

Key Point	☺	☹
Homeostasis & Response		
Define homeostasis and explain why it is important		
Give examples of conditions that are maintained in the body		
Name the different types of receptor humans have and describe how they react to a stimulus		
Know what the words receptor, sensory neurone, relay neurone, motor neurone, effector and synapse refer to and use them to describe a response		
Describe how nerve impulses travel and how they cross the synapse		
Explain what a reflex is and be able to label a diagram of a reflex arc		
Describe how the parts of the nervous system are adapted for their function		
Explain the importance of reflexes		
Describe a method to test reaction time, identifying variables and processing data obtained		
Describe the structure and function of the endocrine system, identifying major endocrine glands in the human body		
Describe what a hormone is and explain the main differences between hormonal and nervous responses		
Describe how blood sugar varies and is normally controlled by insulin		
Describe the role of glucagon in maintaining blood sugar levels, including negative feedback (H)		
Describe and compare Type 1 and Type 2 diabetes in terms of problems in the control of sugar and treatments		
Name and describe the effects of the hormones involved in controlling the female menstrual cycle		
Describe the interaction of FSH, LH, oestrogen and progesterone in the menstrual cycle and interpret graphs of hormone levels		
Describe and evaluate forms of contraception (pill, injection, condom, IUD, spermidical agents, sterilisation, diaphragm etc)		
Describe the use of fertility treatments & IVF and evaluate them in terms of cost, ethics, medical/health, success rates, stress on the parents, (H)		
Define negative feedback (H)		
Describe the roles of adrenaline and thryroxine in the body and explain how thyroxine levels are controlled by negative feedback (H)		

4.5.1 Homeostasis

Homeostasis is the maintenance of a constant internal environment. Mechanisms are in place to keep optimum conditions despite internal and external changes. This is needed for enzyme action and all cell functions.

In the human body, homeostasis controls:
- Blood glucose concentration
- Body temperature
- Water levels

Nervous and hormonal communication is involved in the automatic control systems, which detect changes and respond to them. All control systems have:

- Receptors - cells that detect stimuli (changes in the environment)
- Coordination centres - process the information received from the receptors, e.g. brain, spinal cord and pancreas
- Effectors - bring about responses to bring the conditions in the body back to optimum levels, e.g. muscles or glands

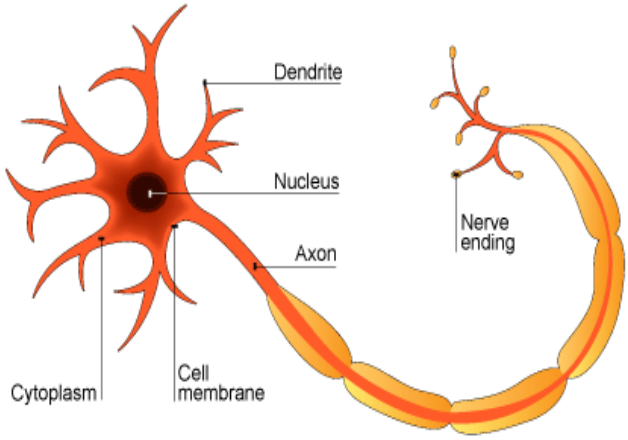
4.5.2 The human nervous system

The nervous system allows us to react to our surroundings, and coordinate actions in response to stimuli.

- Central nervous system - brain plus spinal cord.
- Stimuli - changes in the environment.
- Receptors - cells that detect stimuli / a change in the environment
- Nerve impulse - electrical message that passes along a neurone.
- Neurones - nerve cells.

Neurones are highly specialised cells:

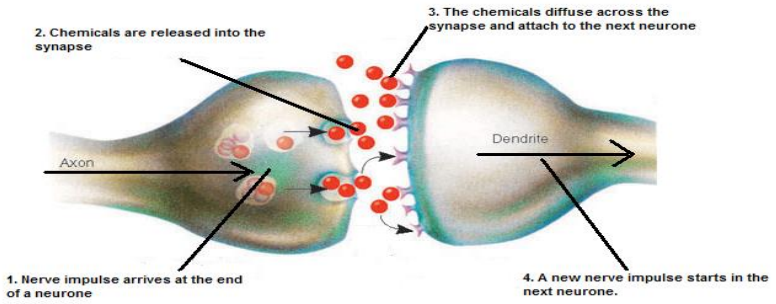
- Very long so nerve impulses can travel quickly to different parts of the body
- Branched ends to form connections with many other neurones.
- Insulating sheath to maintain the nerve impulse.



- Sensory neurone: nerve cell that transmits nerve impulses from a receptor to the central nervous system
- Relay neurone: neurone in the central nervous system
- Motor neurone: nerve cell that transmits nerve impulse from the central nervous system to an effector
- Effector: a structure that the nervous system causes to respond (a muscle or gland

Synapses: junctions between nerve cells.

1) When a nerve impulse arrives at the end of a neurone, chemicals are released.
2) These diffuse across the synapse, and cause a new nerve impulse in the next neurone



Reflex actions: Reflex actions are automatic and rapid. They are simple responses to stimuli that often protect the body from harm.

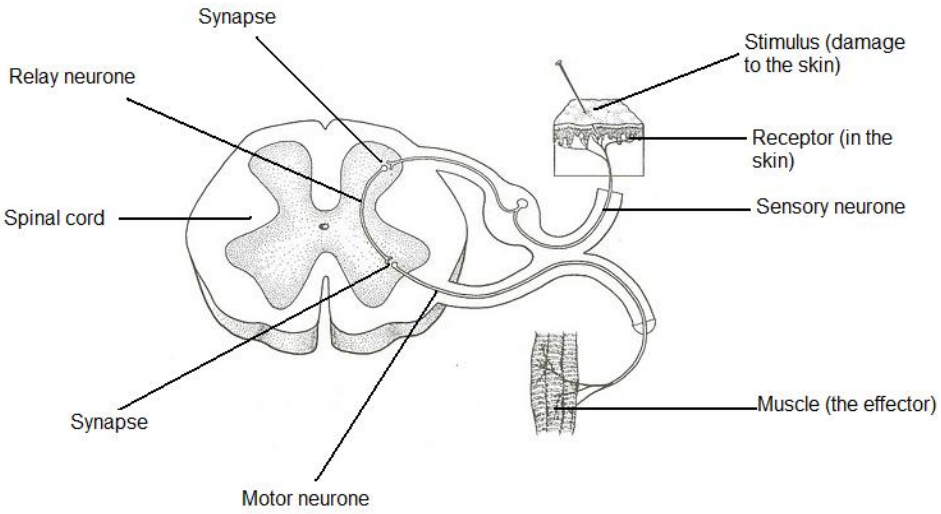
This because the information travels down a pathway called a reflex arc, allowing vital responses to take place quickly. This pathway is different from the usual response to stimuli because the impulse does not pass through the conscious areas of your brain

- In a simple reflex action:

1) Impulses from a receptor pass long a sensory neurone to the central nervous system
2) There is a synapse between a sensory neurone and a relay neurone in the central nervous system
3) A chemical is released at the synapse between the sensory neurone and a relay neurone
4) This causes an impulse to be sent along the relay neurone
5) A chemical is then released at the synapse between a relay neurone and motor neurone in the central nervous system
6) This causes impulses to be sent along a motor neurone to the effector
7) This is either a muscle or a gland
8) A muscle responds by contracting while a gland responds by releasing (secreting) chemical substances e.g. salivary gland releases saliva.

Examples of reflex arcs are: pupils getting smaller to avoid damage from bright lights, moving your hand from a hot surface to prevent damage.

Your reaction time is how long it takes you to respond to a stimulus. It can be measured with the ruler drop test.

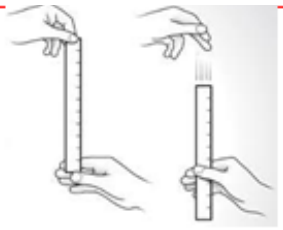


Required Practical 7: investigating the effect of a factor on human reaction time

What's the point of the practical?
To find out how a certain variable affects reaction time.

Results
- People react quicker with practice and if they are concentrating.
- They react slower if distracted in any way.

Example Apparatus
- Dropping a metre stick
- Or using an online reaction test to measure reaction time (reaction distance with metre stick).
- Many IV's could be tested

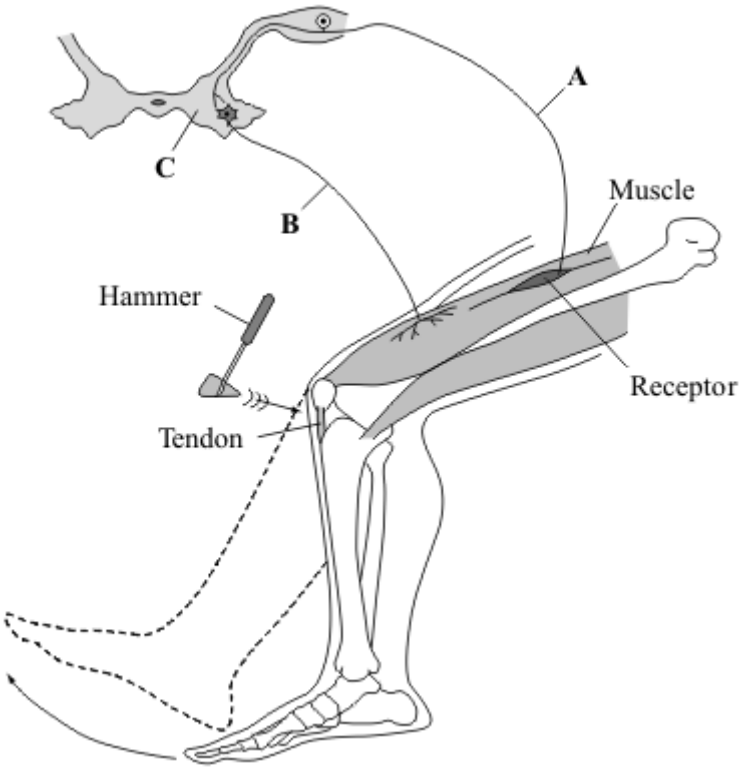


e.g. the effect of listening to music, drinking alcohol, drinking caffeine, taking drugs or medicines, gender, age, amount of practice

What may they ask us about?
- Control variables – what had to be kept the same and how did you do it?
- Why is it important to repeat? Calculate means etc
- Range of results, resolution of measurements, uncertainty of results
- Ethical considerations
- Use of control groups to compare to

Exam practice 1

Q1. The diagram shows the structures involved in the knee-jerk reflex. When the tendon is struck with the hammer, the receptor is stimulated and the lower leg moves forward.



(a) Name the structures labelled **A**, **B** and **C**.

A _____

B _____

C _____

(3)

(b) How is information passed from structure **A** to structure **B**?

_____

_____

(1)

(c) What is the effector in this response?

_____

(1)

(Total 5 marks)

Q2. This question is about the nervous system.

(a) Describe the function of receptors in the skin.

_____

_____

_____

_____

(2)

(b) A response is caused when information in the nervous system reaches an effector.

(i) There are two different types of effector.

Complete the table to show:

- the two different types of effector
- the response each type of effector makes.

Type of effector	Response the effector makes
1	....
2	....

(4)

(ii) Some effectors help to control body temperature.

Give **one** reason why it is important to control body temperature.

_____

_____

(1)

(Total 7 marks)

Q3. This question is about the nervous system.

(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)

Q4. Three students measured their reaction times.

The students used a computer program.

The image below shows the image displayed on the computer screen.

This is the method used:

1. Sit facing the computer screen.
2. Click the mouse button as quickly as possible when the computer screen turns green.
3. Record the time taken as shown on the computer screen.
4. Repeat steps 2 and 3 a further 9 times.

The table shows the students' results.

Attempt number	**Time in milliseconds**		
	Student A	**Student B**	**Student C**
1	275	260	272
2	259	268	268
3	251	251	275
4	261	256	266
5	260	244	270
6	263	280	283
7	259	468	274
8	256	258	278
9	255	255	286
10	248	277	275
Mean	259	282	275

(1 second = 1000 milliseconds)

(a) Suggest why measuring reaction time with a computer is more accurate than measuring reaction time with a stopwatch.

_____

_____

(1)

(b) The students measured 10 reaction times for each person rather than 3 reaction times.

Explain why.

_____

_____

_____

_____

(2)

(c) Explain why the mean for student **B** has been calculated incorrectly.

Use information from the table.

_____

_____

_____

_____

(2)

(d) Calculate the ratio of student **C**'s mean reaction time to student **A**'s mean reaction time.

Give your answer to 3 significant figures.

_____

_____

_____

_____

Ratio student **C** : student **A** = _____ : 1

(2)

(e) Student **A** wanted to present his mean result in seconds, in standard form.

What is the correct way of doing this?

Tick **one** box.

259×10^{-3} seconds ☐

0.259×10^{-3} seconds ☐

2.59×10^{-1} seconds ☐

0.259×10^{-4} seconds ☐

(1)

(f) Student **C** said the results from this investigation showed that he had the fastest reactions.

Give **two** reasons why student **C**'s statement is **not** correct.

1. _____

_____

2. _____

_____

(2)

(g) The reaction the students investigated is **not** a reflex action.

Give the reason why.

_____

_____

(1)

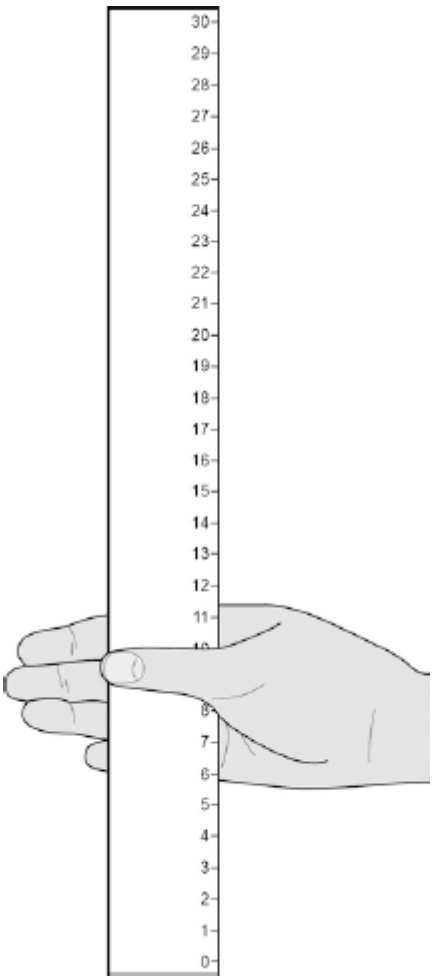
(Total 11 marks)

Q5.

Two students investigated reflex action times.

This is the method used.

1. Student **A** sits with her elbow resting on the edge of a table.
2. Student **B** holds a ruler with the bottom of the ruler level with the thumb of Student **A**.
3. Student **B** drops the ruler.
4. Student **A** catches the ruler and records the distance, as shown in the diagram below.
5. Steps **1** to **4** were then repeated.



(a) Suggest **two** ways the students could improve the method to make sure the test would give valid results.

1.

_____

_____

2.

_____

_____

(2)

(b) The table below shows Student **A**'s results.

Test Number	Distance ruler dropped in mm
1	117
2	120
3	115
4	106
5	123
6	125
7	106

What is the **median** result?

Tick **one** box.

106 ☐

115 ☐

116 ☐

117 ☐

123 ☐

(1)

(c) The mean distance the ruler was dropped is 116 mm.

Calculate the mean reaction time.

Use the equation:

reaction time in s = $\sqrt{\frac{\text{mean drop distance in cm}}{490}}$

Give your answer to 3 significant figures

_____

_____

_____

Mean reaction time = _____ s

(3)

(d) The students then measured Student **A**'s reaction time using a computer program.

This is the method used.

1. The computer shows a red box at the start.

2. As soon as the box turns green the student has to press a key on the keyboard as fast as possible.

3. The test is repeated five times and a mean reaction time is displayed.

Student **A**'s mean reaction time was 110 ms.

Using a computer program to measure reaction times is likely to be more valid than the method using a dropped ruler.

Give **two** reasons why.

1. _____

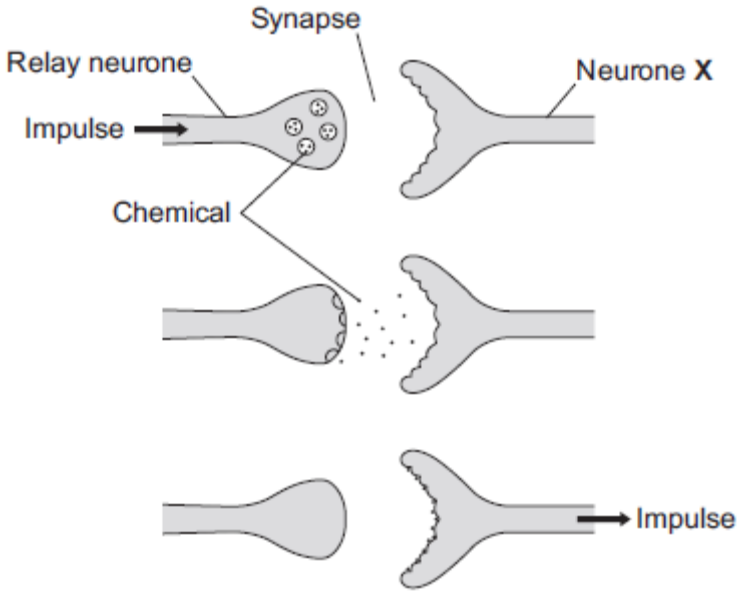
_____

2. _____

_____

(2)

Q6. The diagram below shows how a nerve impulse passing along a relay neurone causes an impulse to be sent along another type of neurone, neurone **X**.



(a) What type of neurone is neurone **X**?

_____

(1)

(b) Describe how information passes from the relay neurone to neurone **X**.
Use the diagram to help you.

_____

_____

_____

_____

_____

_____

(3)

(c) Scientists investigated the effect of two toxins on the way in which information passes across synapses. The table below shows the results.

Toxin	**Effect at the synapse**
Curare	Decreases the effect of the chemical on neurone **X**
Strychnine	Increases the amount of the chemical made in the relay neurone

Describe the effect of each of the toxins on the response by muscles.

Curare _____

_____

_____

Strychnine _____

_____

_____

(2)

(Total 6 marks)

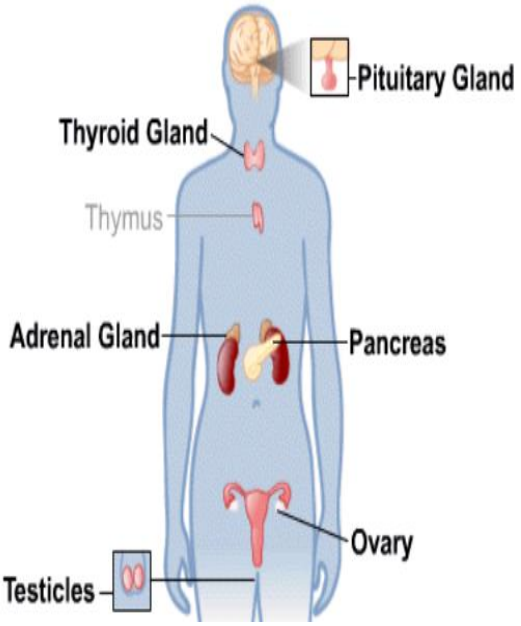
4.5.3 Hormonal Coordination in Humans

Human endocrine system (4.5.3.1)

The human body has two communication system- the nervous system and the endocrine system. The endocrine system sends hormones (chemical messengers) around the body. When they reach a target tissue they produce a response.

- The endocrine system is made up of glands which secrete hormones directly into the bloodstream.
- The blood transports the hormone to a target organ or tissue where it has an effect.
- Compared to the nervous system, the hormonal system is much slower but it acts for longer.
-

Pituitary gland	• The master gland • Secretes hormones into the blood to either have an effect on the body or act on other glands to stimulate them to produce different hormones
Pancreas	• Secretes insulin • Controls blood glucose levels
Thyroid	• Secretes thyroxine • Controls metabolic rate, heart rate and temperature
Adrenal gland	• Secretes adrenaline • Involved in the 'fight or flight' response (the body's response to stressful situations)
Ovary	• Secretes oestrogen • Is involved in the menstrual cycle and the development of female secondary sexual characteristics (different features that develop during puberty that distinguish a female from a male)
Testes	• Secretes testosterone • Is involved in the production of sperm and the development of male secondary sexual characteristics



4.5.3.2. Control of Blood Glucose Concentration

The concentration of glucose in your blood needs to be kept within a certain limit because glucose is needed by cells for respiration. It is controlled by the **pancreas**.

Eating foods that contain carbohydrates increases the glucose levels in the blood.

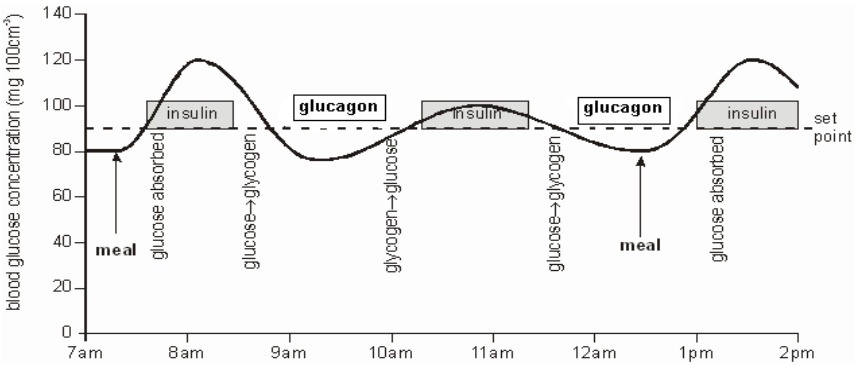
- If the glucose levels are too high, the pancreas produces the hormone **insulin**
- Insulin binds to cell in target organs (muscles and liver) causing:
    - 1) Glucose to move from the blood into muscle cells for respiration
    - 2) Excess glucose to be converted into **glycogen** which is stored in the liver
- The blood glucose concentration is reduced

Rigorous activity, e.g. exercise, uses glucose for respiration and therefore there is less in the blood.

- If glucose levels decrease, the pancreas produces the hormone **glucagon**
- Glucagon binds to to the liver cells causing glycogen to be broken down into glucose
- Glucose is released into the blood, increasing the blood glucose concentration

Your blood glucose concentration is kept constant through using these two hormones. They work in a negative feedback loop.

- When blood glucose levels increase/decrease, a hormone is secreted to oppose the change.
- The action of this hormone cannot occur continually because when the blood arrives at a certain glucose concentration the other hormone is produced, resulting in the opposite effect.



Diabetes

When you have diabetes you cannot control your blood glucose level. There are two forms, Type 1 and Type 2.

Type 1 diabetes: the pancreas **cannot produce** enough insulin	**Type 2 diabetes**: the body cells **no longer respond** to insulin
○ Blood glucose level can rise to a fatal amount ○ Glucose is excreted with urine and lots of urine is produced leaving the individual very thirsty ○ It is treated with insulin injections at meal times, which results in glucose being taken up from the bloodstream ○ It is also advised to limit the intake of simple carbohydrates which contain lots of glucose ○ Doctors are attempting to cure diabetes with pancreas and pancreatic cell transplants, and genetically engineering pancreatic cells from mice to make insulin	○ Blood glucose levels can rise to a fatal amount ○ **Obesity is a risk factor** for this disease ○ Treatments include reducing the number of simple carbohydrates in diet, losing weight and increasing exercise ○ There are also drugs to make insulin more effective on body cells, help the pancreas make more insulin or reduce the amount of glucose absorbed from the gut

Treating diabetes

- Insulin from pigs and cows was used to treat diabetic people for many years.
- Insulin is now produced using micro organisms that have been genetically engineered to contain the human insulin gene.
    - This modern insulin is chemically identical to human insulin.
- Pancreas transplants can also be used to treat diabetes in some people.
    - However, there are not enough dead donors to supply all the people who need them.
    - Also, organ transplants are not always successful.
- In the future, stem cells may be used to cure diabetes.
    - However, this requires the use of human embryos, which many people disagree with.

Q1. (b) The control of blood sugar level is an example of an action controlled by hormones.

Give **two** ways in which a reflex action is different from an action controlled by hormones.

1. _____

_____

_____

2. _____

_____

_____

(2)

(Total 5 marks)

Q2. A person with Type 1 diabetes cannot make enough insulin.

(a) Which organ makes insulin?

Tick **one** box.

Adrenal gland	☐
Pancreas	☐
Pituitary gland	☐
Thyroid	☐

(1)

(b) A person with Type 1 diabetes can control the concentration of glucose in the blood by injecting insulin.

Complete the sentences.

Choose answers from the box.

DNA	**glycogen**	**kidney**
liver	**protein**	**skin**

Insulin acts on an organ called the _____ .

This organ then takes in excess glucose from the blood and changes

the glucose into _____ .

(2)

(c) Insulin cannot be taken as a tablet. This is because insulin is a type of protein.

What would happen to the insulin in the tablet if it reached the stomach?

_____

_____

(1)

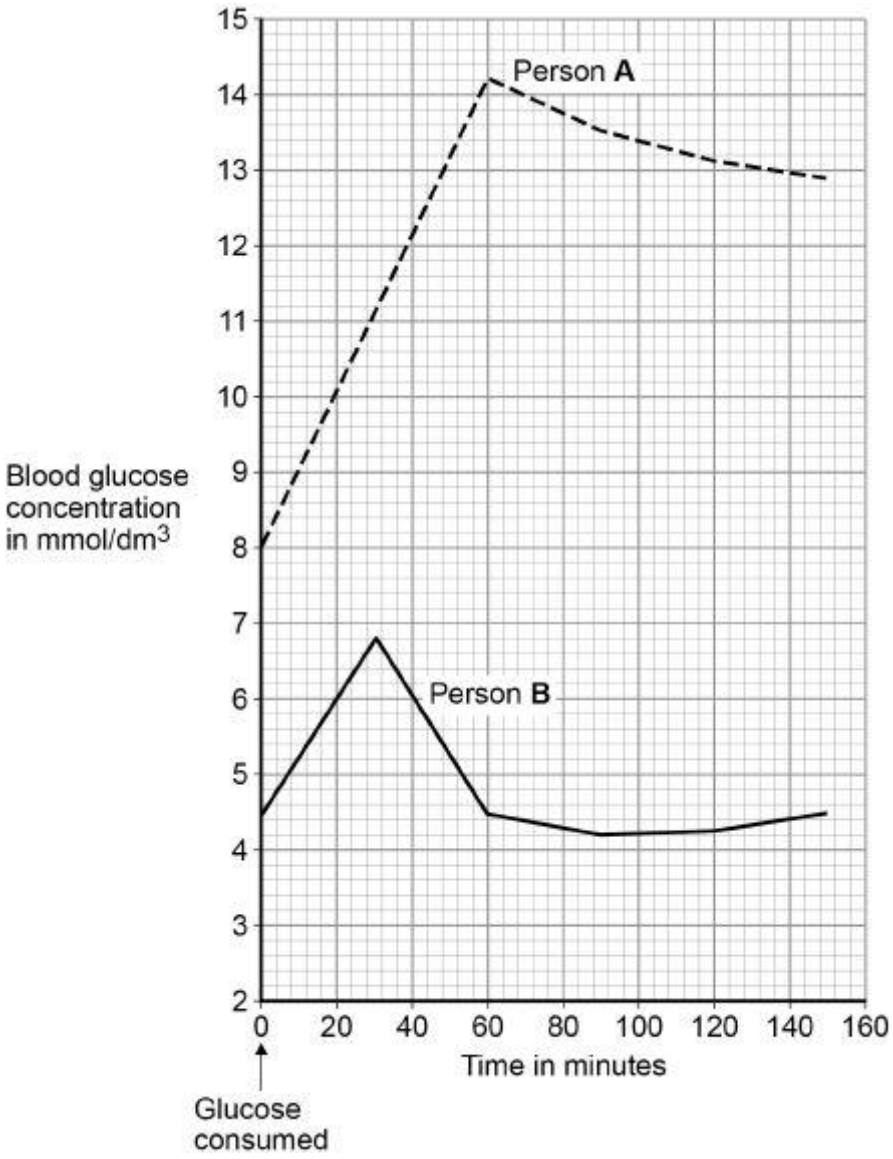
Two people each drank the same volume of a glucose drink.

Person **A** has Type 1 diabetes.

Person **B** does **not** have diabetes.

Figure 1 shows how the concentration of glucose in their blood changed.

Figure 1



(d) How much higher was the **highest** concentration of glucose in the blood of person **A** than the **highest** concentration in person **B**?

Use information from **Figure 1**.

_____
_____

_____
_____

_____
_____

_____
_____

Answer =
_____ mmol/dm^3

(2)

(e) Describe **one** other way that the results for person **A** were different from the results for person **B**.

Use information from **Figure 1**.

_____

_____

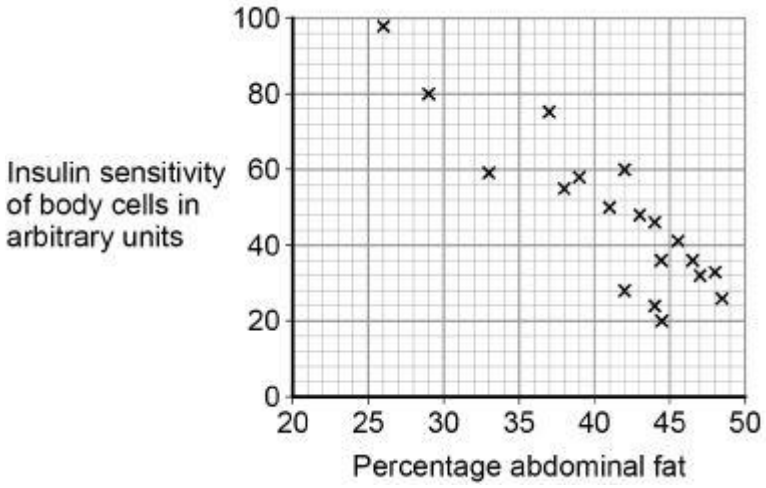
(1)

Type 2 diabetes is another form of diabetes. Type 2 diabetes is common in obese people.

People with Type 2 diabetes make enough insulin, but still cannot control their blood glucose concentration. This is because the body cells are not sensitive to the insulin.

Figure 2 shows information about abdominal fat and insulin sensitivity in body cells.

Figure 2



(f) What type of relationship is shown in **Figure 2**?

Tick **one** box.

A negative correlation ☐

No correlation ☐

A positive correlation ☐

(1)

(g) A person is at risk of developing Type 2 diabetes.

Suggest **two** ways the person could lower the chance of developing Type 2 diabetes.

1. _____

_____

2. _____

_____

(2)

(Total 10 marks)

Q3. It is important that the concentration of glucose (sugar) in the blood is controlled.

(a) (i) Which hormone controls the concentration of glucose in the blood?

_____

(1)

(ii) Which organ produces this hormone?

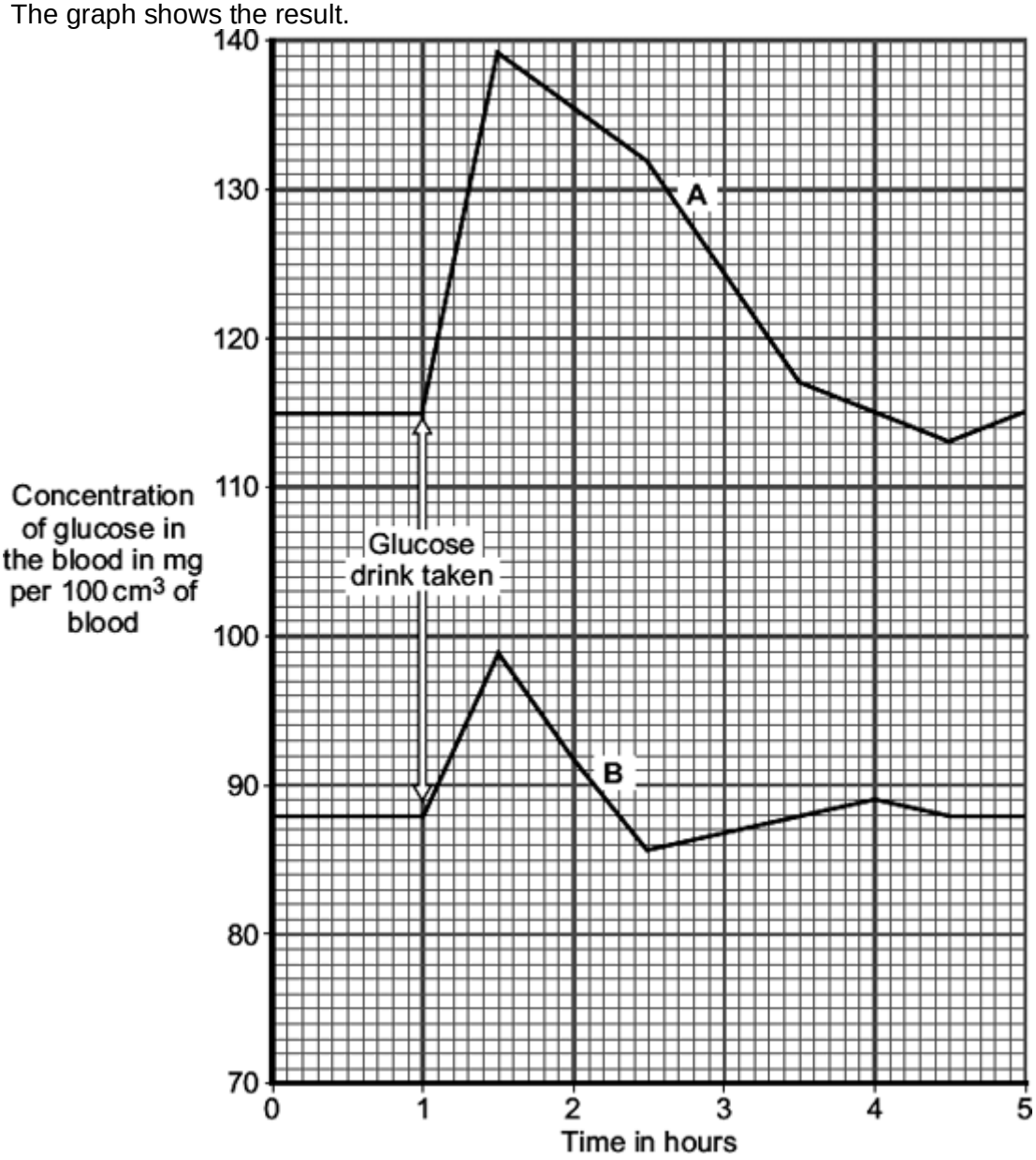
_____

(1)

(b) The concentration of glucose in the blood of two people, **A** and **B**, was measured every half an hour.

One hour after the start, both people drank a solution containing 50 g of glucose.

The graph shows the result.



(i) By how much did the blood glucose concentration in person **B** rise after drinking the glucose drink?

_____ mg per 100 cm^3 of blood

(1)

(ii) A doctor suggests that person **A** has diabetes.

Give **two** pieces of evidence from the graph to support this suggestion.

1. _____

_____

2. _____

_____

(2)

(iii) Give **one** reason for the fall in blood glucose concentration in person **B**, shown in the graph.

_____

(1)

(Total 6 marks)

Q4. The pancreas is involved in digestion and controlling the internal conditions of the body.

(b) Diabetes may be caused by a lack of insulin.

Part of the treatment for someone with diabetes is to pay careful attention to the diet.

(i) Give **one** symptom of diabetes.

_____

_____

(1)

(ii) Give **one** way in which a diabetic may be advised to change their diet.

_____

_____

(1)

(iii) How does this change in diet help the diabetic?

_____

_____

(1)

(iv) State **one** other way in which the symptoms of diabetes may be treated.

_____

(1)

(c) Many of the cells in the pancreas contain large numbers of ribosomes.

What is the function of ribosomes in a cell?

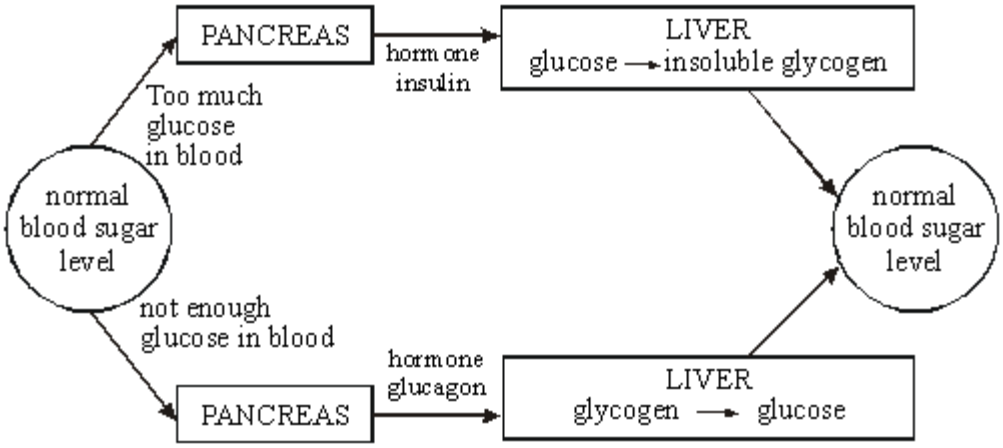
_____

_____

(1)

(Total 7 marks)

Q5.



The diagram shows how the blood sugar level is controlled in the body.

Explain fully what would happen if somebody ate some glucose tablets.

_____

_____

_____

_____

_____

_____

(Total 4 marks)

Q6. HIGHER ONLY

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.

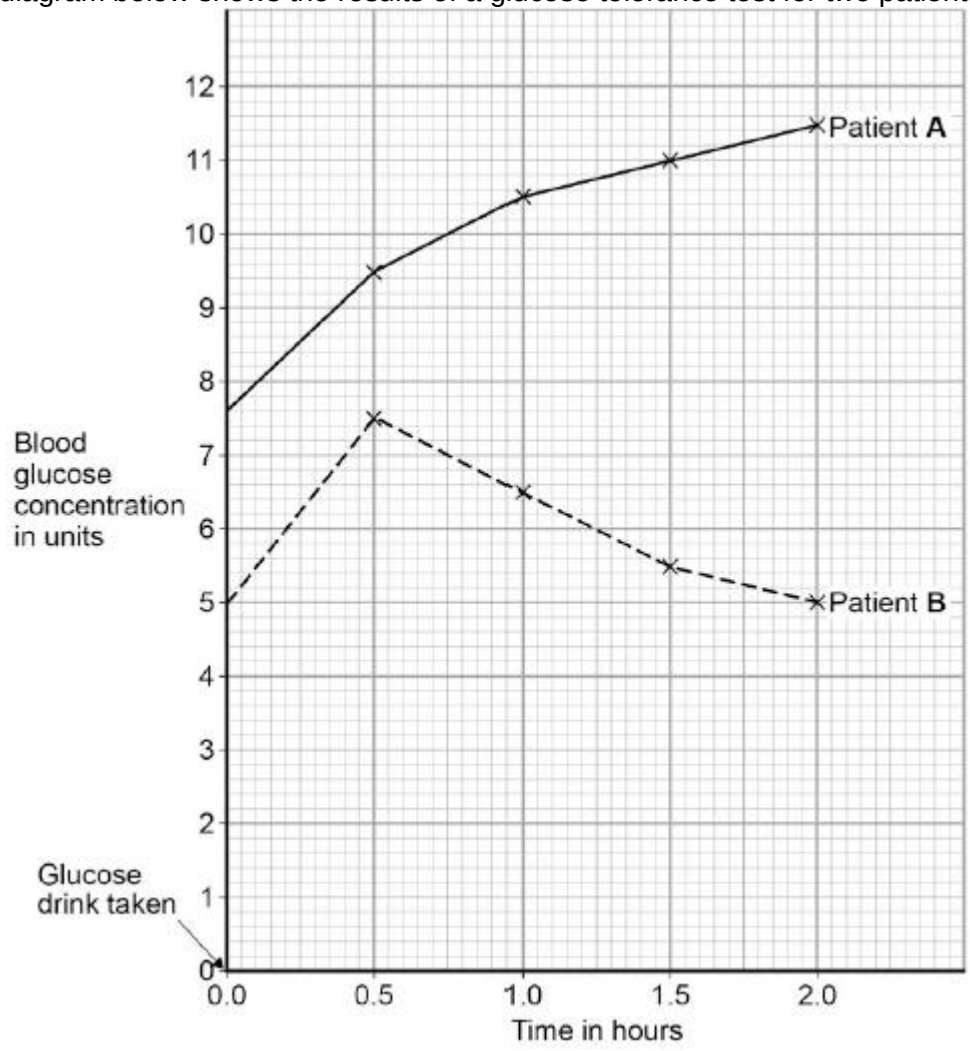
Suggest why patients are **not** allowed to eat for 8 hours before the test.

_____

_____

(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)(

4.5.3.4 Hormones in Human Reproduction

During puberty, **reproductive hormones** begin to be released. These causes **secondary sexual characteristics** to develop in men and women and eggs to mature in women.

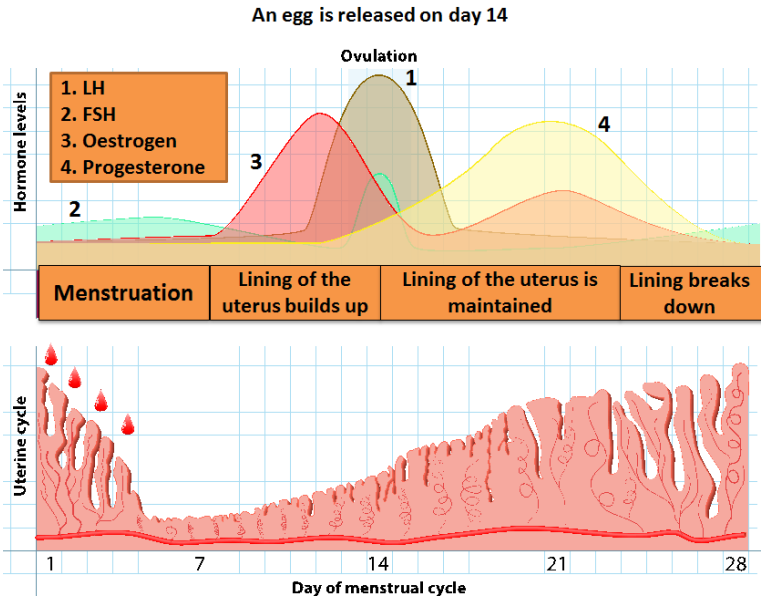
Main reproductive hormones:

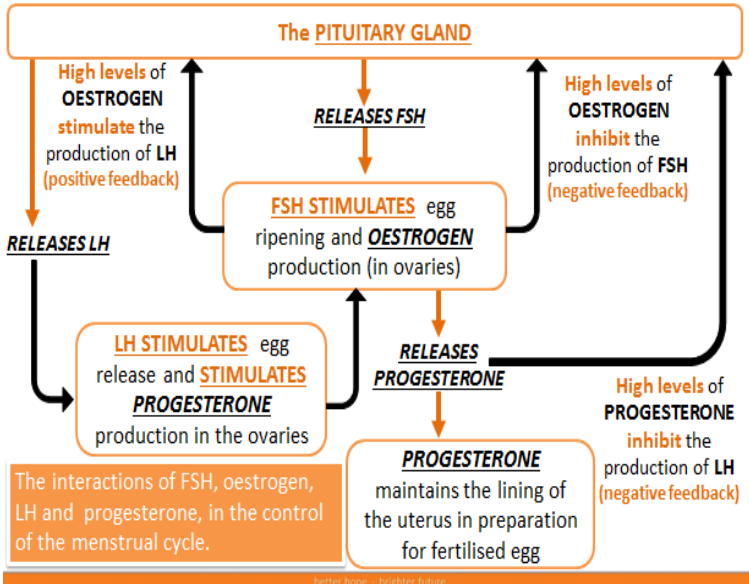
The main **male** reproductive hormone is **testosterone**.	The main **female** reproductive hormone is **oestrogen**
Produced by the **testes** Stimulates **sperm production**	Produced in the **ovary** Produces physical changes and is involved in the menstrual cycle

Menstrual cycle: The monthly release of an egg from a woman' s ovaries

- The changes in the thickness of the lining of her womb
- These are controlled by hormones secreted by the pituitary gland and by the ovaries.
- They are involved in promoting the release of an egg.

Hormone	Produced in...	Causes...
FSH **Follicle stimulating Hormone**	**Pituitary Gland**	Causes the maturation of an egg in the ovary, within a structure called a **follicle** ➢ Secreted by the pituitary gland ➢ Causes eggs to mature in the ovaries. ➢ It also **stimulates the ovaries to produce oestrogen.**
Oestrogen	**Ovaries**	Causes the lining of the uterus to grow again ➢ Secreted by the ovaries. ➢ **Secreted as a result of FSH** ➢ **Stimulates the production of LH and inhibits the secretion of more FSH.**
LH **Luteinising hormone**	**Pituitary Gland**	➢ **Produced** in the pituitary gland – **as a result of the hormone oestrogen**. ➢ Stimulates the release of eggs from the ovary (**ovulation**)
Progesterone	**Ovaries**	➢ Secreted by the corpus luteum (egg follicle) / ovaries ➢ Maintains the uterus lining during pregnancy. ➢ **Inhibits the release of both FSH and LH**





Exam practice 3

Q1. 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	☐	oestrogen	☐
LH	☐	progesterone	☐

(2)

(Total 6 marks)

Q2. The human menstrual cycle is controlled by hormones.

Name the gland which produces:

(i) FSH

_____

(1)

(ii) oestrogen.

_____

(1)

(Total 2 marks)

Q3.

The human body produces many hormones.

(a) (i) What is a *hormone*?

_____

_____

(1)

(ii) Name an organ that produces a hormone.

_____

(1)

(iii) How are hormones transported to their target organs?

_____

(1)

(b) Describe how the hormones FSH, oestrogen and LH are involved in the control of the menstrual cycle.

_____

_____

_____

_____

_____

_____

_____

_____

(3)

(Total 6 marks)

Q4.

This question is about the hormones that control the monthly cycle in women.

Complete the sentences.

Hormones control the monthly release of an egg from a woman's _____ .

They also control the thickness of the lining of her _____ .

Hormones that are given to women to stimulate the release of eggs are called

_____ drugs.

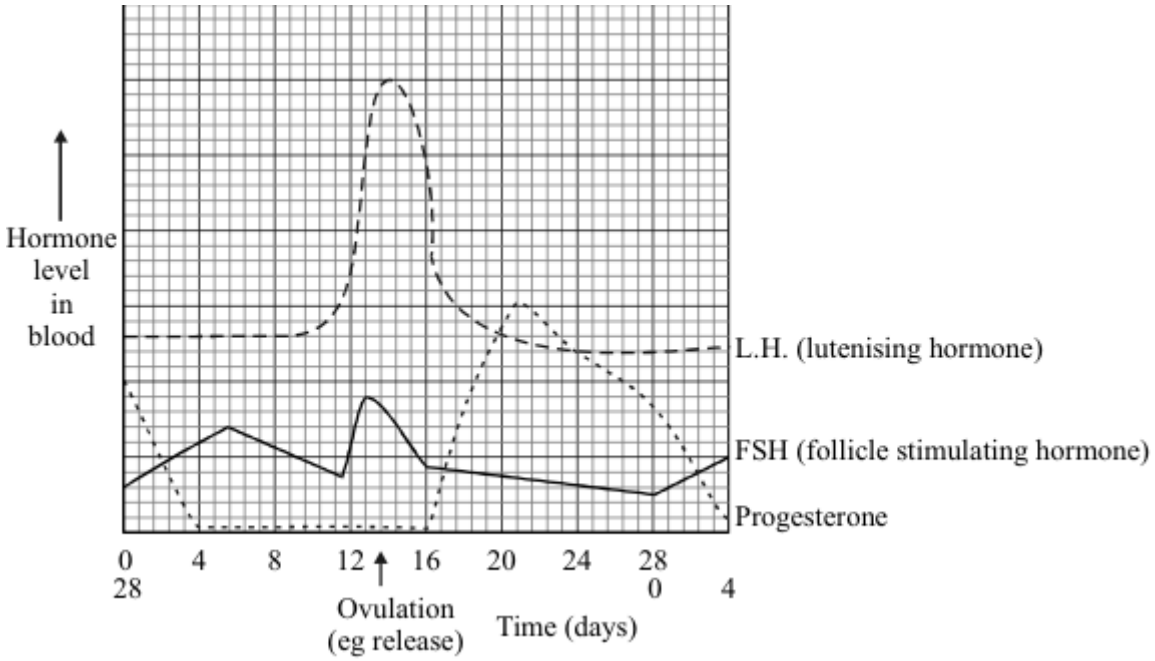
Hormones that are given to women to prevent the release of eggs are called

oral _____ .

(Total 4 marks)

Q5.

The graph shows changes in the levels of three hormones in a menstrual cycle.



(a) What does the graph suggest the stimuli might be which cause the egg to be released?

_____

_____

_____

_____

(3)

Q6.

This question is about hormones.

(a) (i) Hormones carry messages.

What type of messenger is a hormone?

Draw a ring around the correct answer.

chemical **electrical** **environmental**

(1)

(ii) Which part of the brain secretes hormones?

Draw a ring around the correct answer.

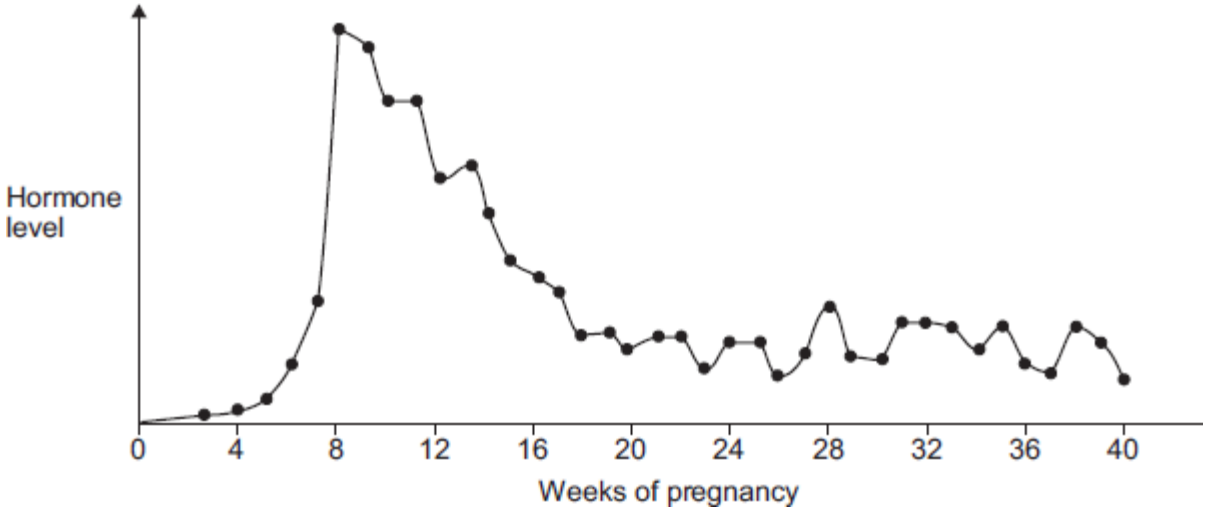
cerebellum **medulla** **pituitary gland**

(1)

(b) **Figure 1** shows the level of a pregnancy hormone over a 40-week pregnancy.

This hormone can be detected in a pregnancy test.

Figure 1



A woman takes a pregnancy test.

In which week of pregnancy is the test most likely to give a positive result?

Use information from **Figure 1**.

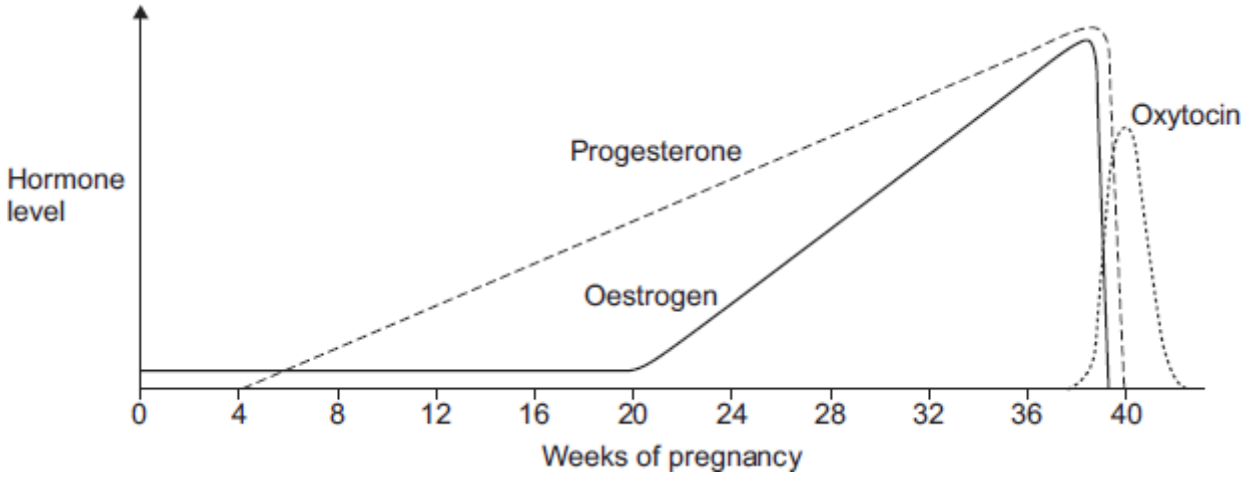
Write the correct answer in the box.

(1)

(c) **Figure 2** shows the levels of three other hormones during pregnancy.

The baby is usually born at about 40 weeks.

Figure 2



Adaptation by kind permission of Biozone International

(i) Describe the patterns in the levels of oestrogen and progesterone from 0 to 36 weeks.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(ii) Which hormone is likely to stimulate contractions of the uterus (womb) when the baby is born?

Use information from **Figure 2** to give a reason for your answer.

_____

_____

_____

_____

(2)

(Total 9 marks)

4.5.3.5 Contraception

Methods for preventing pregnancy i.e. fertilisation may use a hormonal OR a non-hormonal method.

Hormonal methods of contraception.	These prevent the release of an egg.

The **contraceptive pill** must be taken regularly or the bodies own hormones will be released, leading to an egg maturing	• The mixed pill contains oestrogen and progesterone
	  ○ This means the oestrogen levels are constantly high, inhibiting FSH so no eggs mature.
	  ○ The lining also stops developing and the mucus in the cervix becomes thick so sperm cannot move through
	  ○ Some possible side effects include changes in mood, mood swings, depression, breast pain or tenderness, breast enlargement, increased blood pressure.
	• The progesterone only pill
	  ○ This has less side effects in comparison to the mixed pill.

The **contraceptive patch** contains oestrogen and progesterone.	• It is small and is stuck on the skin • Lasts for one week
The **contraceptive implant** releases a continuous amount of progesterone.	• This prevents the ovaries from releasing the egg, thickens the mucus in cervix so sperm cannot swim and stops fertilised eggs from embedding in the uterus • Lasts for three years
The **contraceptive injection** is made up of progesterone.	• Same effect as the implant • Lasts for 2 to 3 months
The plastic **intrauterine device (IUD**) releases progesterone.	• Same effect as the implant • T shaped, inserted into the uterus

Non-hormonal methods of contraception	These stop sperm fertilising the egg.
Chemical methods involve **spermicides**.	• these kill or disable sperm, but are only 70% to 80% effective.
Barrier methods include **condoms** and **diaphragms**:	• Condoms are either worn over the penis or are inside the vagina. They also prevent the individual from contracting sexually transmitted diseases. A problem is that it can tear and therefore let sperm through. • A diaphragm is a plastic cup which is positioned over the cervix. It is used with spermicide.
The copper intrauterine device	• works by killing sperm in the uterus and stopping any fertilised embryos from implanting in the uterus lining.
Surgical methods of male and female sterilisation	• Involve cutting and tying the fallopian tubes or sperm duct. This lasts forever.
Abstaining from intercourse	• ensures that an egg is not fertilised. Others may only abstain during ovulation.

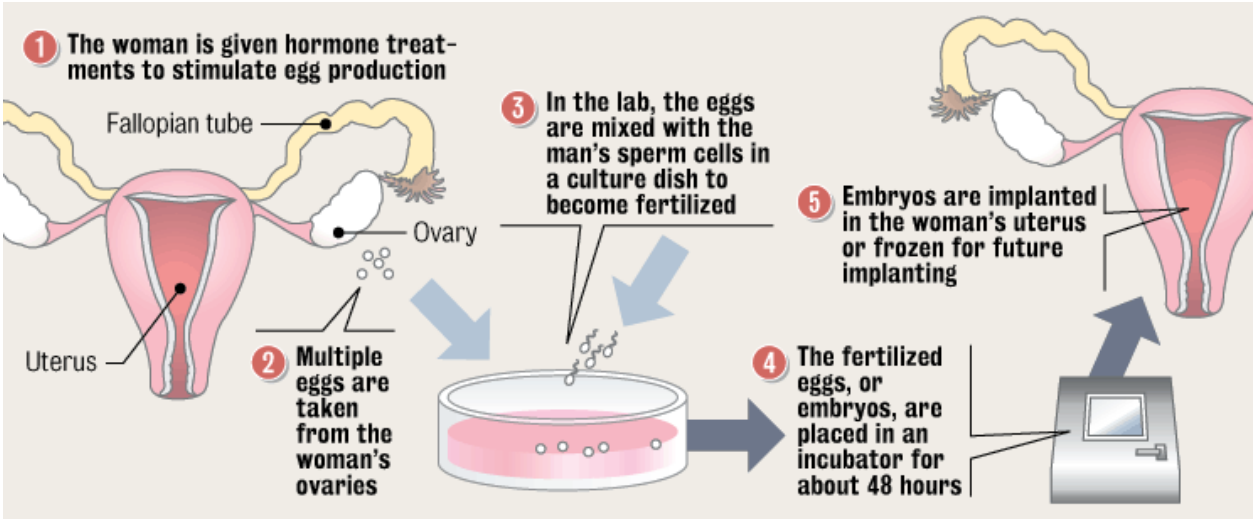
4.5.3.6 The use of hormones to treat infertility (HIGHER TIER ONLY)

Fertility drugs are used to increase the chance of pregnancy.

- The main hormones used are FSH and LH because they stimulate the maturation and release of the egg.
- The woman can then become pregnant normally.

In Vitro Fertilisation (IVF) is another treatment.

- The mother is given FSH and LH to **encourage the maturation eggs**
- These are extracted from the mother and **fertilised** in the lab using sperm
- The fertilised eggs develop into **embryos** and then one or two are **inserted in the uterus**



- Fertility drugs can result in **multiple pregnancies**, which can be **dangerous to the mother**.
- **Excess embryos** may be used for **embryo research**, and many **people disagree** with this, because embryos have the potential to become a living human

4.5.3.7 Negative feedback (HIGHER TIER ONLY)

As discussed earlier, negative feedback is when the body responds to an increase or decrease in a factor by returning it back to its original level.

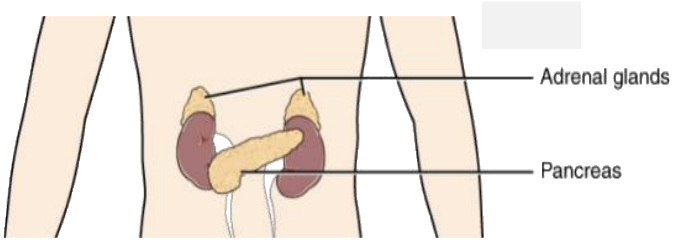
Negative feedback is more common than positive feedback.

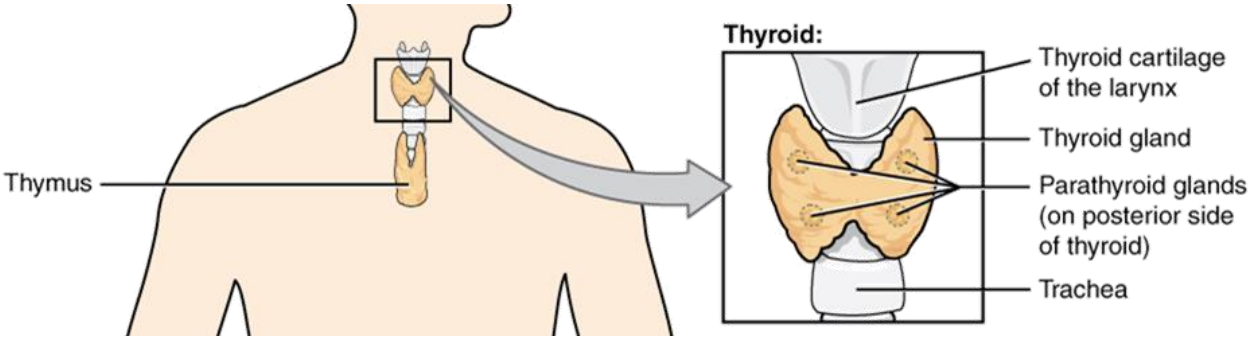
Negative feedback:
- occurs when there is a change in the body (i.e. blood glucose increases)
- the nervous system detects the change
- this stimulates an opposite hormonal response
- this reverses the effect back to homeostasis.

P**ositive Feedback: (less common)**
- a change starts
- the nervous system detects the change
- then stimulates more hormones to be released to accelerate the change.

Two key hormones:

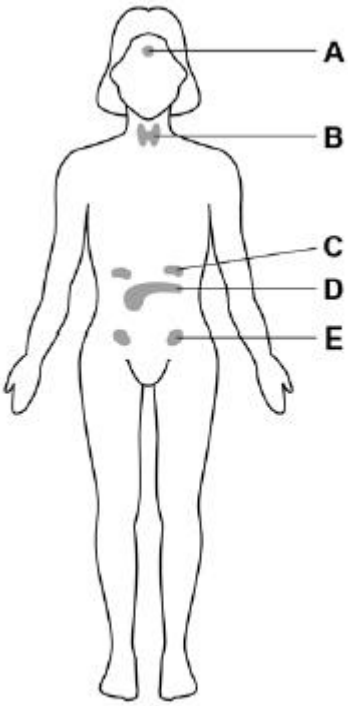
Adrenaline is produced in times of stress, and stimulates the 'fight or flight' response	**Thyroxine regulates metabolic rate (how quickly reactions occur). It is also important in growth and development.**
• Released by the adrenal glands (on top of the kidneys) • **This is stimulated by fear or stress, detected in the brain**	• Released by the thyroid gland • Its release is stimulated by the thyroid stimulating hormone
The effects of adrenaline include: • Increased heart rate and breathing rate to deliver more oxygen and glucose to the brain and muscles for respiration • Glycogen stored in liver is converted to glucose for respiration • Pupils dilate to let in more light • Blood flow to muscles is increased ○ Blood flow to digestive system is decreased	The levels of thyroxine are controlled by negative feedback. • When the levels increase, it is detected by receptors in the brain • This inhibits the release of TSH • This inhibits the release of thyroxine, so levels fall





Q1. The menstrual cycle in a woman is controlled by hormones.

The diagram shows some of the glands in a woman's body that produce hormones.



The hormones that control the menstrual cycle are produced by the pituitary gland and by the ovaries.

(a) Which gland is the pituitary gland?

Tick **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐

(1)

(b) Which gland is the ovary?

Tick **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐

(1)

(c) Complete the sentence.

In the menstrual cycle, one egg is released approximately every _____ days.

(1)

(d) Which hormone is used in the oral contraceptive pill?

Tick **one** box.

Adrenaline ☐

Insulin ☐

Progesterone ☐

Testosterone ☐

(1)

(e) Describe how the oral contraceptive pill stops a woman becoming pregnant.

_____

_____

_____

(2)

(f) Complete the sentences.

Choose the answers from the box.

adrenaline	insulin	oestrogen	progesterone	testosterone

Development of the female secondary sex characteristics is controlled

by _____ .

Sperm production is stimulated by _____ .

(2)

(Total 8 marks)

Q2. (b) The information is about two types of contraceptive pill used by women.

Combined pill

- contains two hormones
- is taken for 21 days, then no pills are taken for 7 days
- > 99 % effective at preventing pregnancy
- increases chance of headaches
- increases chance of breast cancer
- decreases chance of cancer of the ovary

Mini-pill

- contains one hormone
- must be taken at the same time every day
- < 99 % effective at preventing pregnancy
- increases chance of breast cancer

(i) Which **two** hormones does the combined pill contain?

Draw a ring around **two** answers.

LH **oestrogen** **progesterone** **FSH**

(2)

(ii) Give **two** advantages of taking the combined pill and **not** the mini-pill.

_____

_____

_____

_____

(2)

(iii) Give **one** advantage of taking the mini-pill and **not** the combined pill.

_____

_____

(1)

(Total 8 marks)

Q3 (b) The table gives information about three methods of giving hormones to stop a woman becoming pregnant.

	The 'pill'	The 'patch'	The 'implant'
How the hormone is given	Swallowed each day for 21 days out of every 28 days.	Stuck onto the skin. Each patch lasts three weeks. There is a one week gap between each patch.	Needs an operation to put it under the skin. Lasts for up to 5 years.

Use the information in the table to answer these questions.

(i) Which of the three methods is likely to be the most reliable?

_____

(1)

(ii) Explain why you chose this method.

_____

_____

(1)

(iii) Give **one** disadvantage of the method you have chosen.

_____

(1)

(Total 6 marks)

Q4. A woman's fertility can be controlled by using hormones.

(a) Some contraceptive pills contain oestrogen.

Name the gland which produces oestrogen.

_____

(1)

Women are being encouraged to use longer-term methods of contraception to reduce their chances of having an unwanted pregnancy.

The table summarises four long-term methods of contraception.

Method	What it is	How it works	How long does it last?	Chances of getting pregnant	Side effects
Hormone implant	Rod containing slow-release hormone inserted under the skin	Stops ovaries releasing eggs	3 years	Less than 1 in 1000	Acne in some women
Hormone injection	Injection that slowly releases hormone	Stops ovaries releasing eggs	12 weeks	Less than 4 in 1000	Weight gain in some women

IUD	Small plastic and copper coil placed in womb	Stops fertilized eggs developing in womb	5–10 years	Less than 20 in 1000	Heavier or more painful periods in some women
IUS	Plastic device containing slow-release hormone placed in womb	Stops fertilized eggs developing in womb	5 years	Less than 10 in 1000	Irregular periods in some women

(b) Which of the methods in the table is the most reliable?

_____

(1)

(c) What is the advantage of using long-term contraception methods instead of taking a contraceptive pill every day?

_____

_____

(1)

(d) The IUD is the least reliable of the contraceptive methods shown in the table. Use information from the table to suggest a reason for this.

_____

_____

(1)

(e) Some people have ethical objections to the use of an IUD or an IUS.

Suggest **one** reason why people might object to their use.

_____

_____

(1)

(f) (i) Explain how the hormone in the implants prevents the ovary releasing eggs.

_____

_____

_____

(2)

(ii) Hormones can also be used as 'fertility drugs'.

Explain how a fertility drug helps a woman to become pregnant.

_____

_____

_____

_____ **(2)**

Higher only.

Q5.

In-vitro fertilisation (IVF) is used to help some women get pregnant.

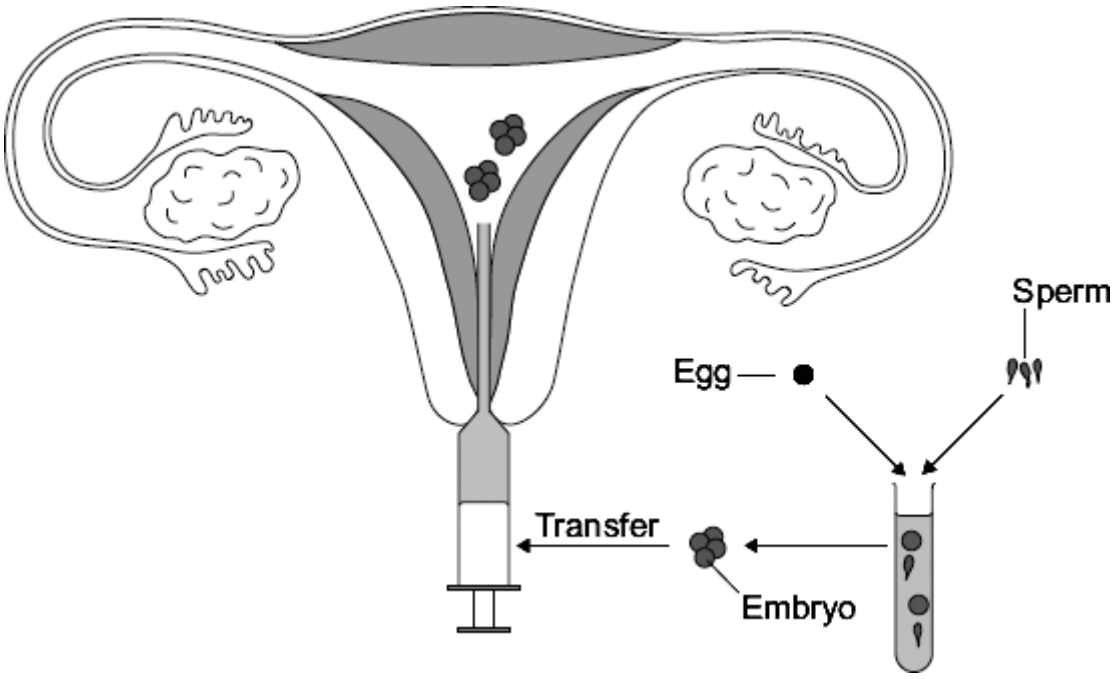
(a) Name the **two** hormones used in IVF treatment.

1. _____

2. _____

(2)

(b) The diagram shows the process of IVF.



Describe the process of IVF. Use information from the diagram to help you.

_____

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(Total 6 marks)

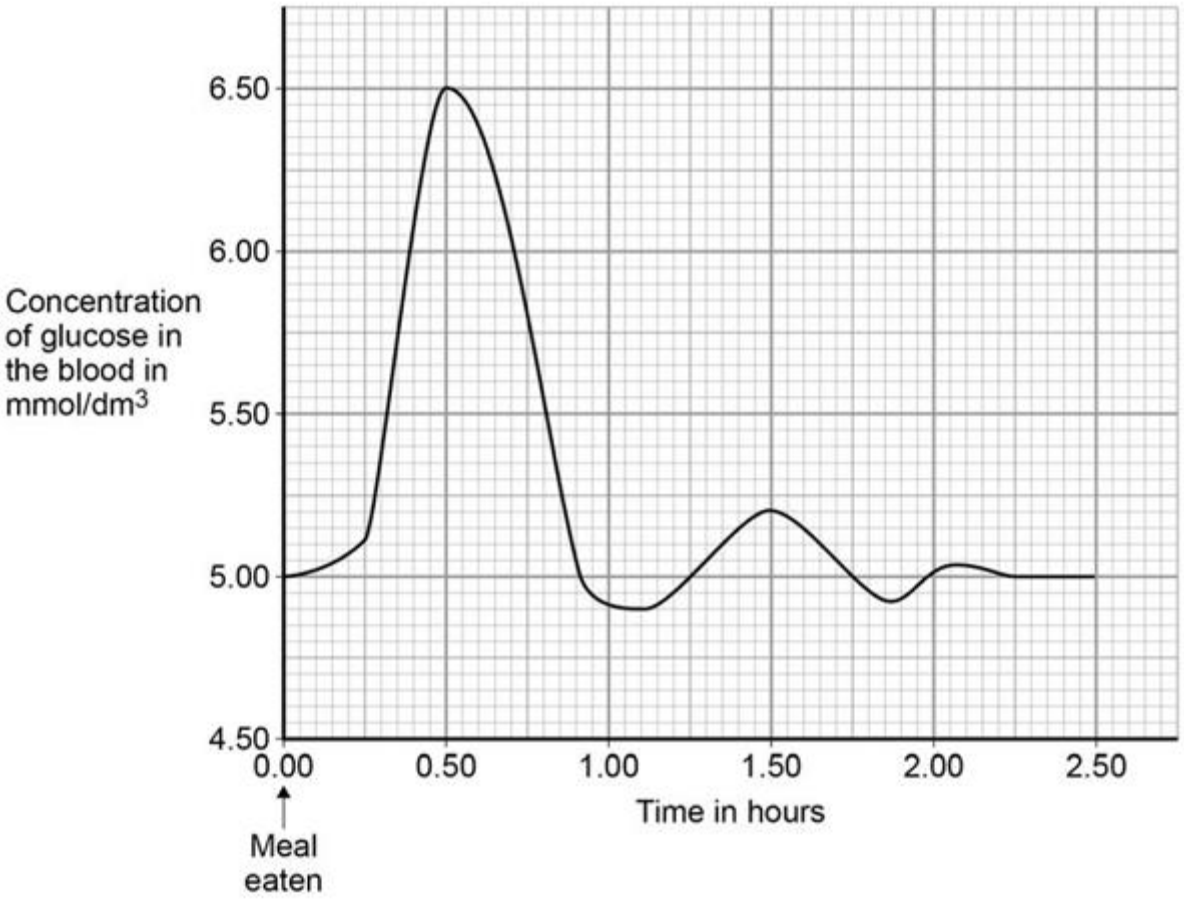
Q6. Many functions of the human body are controlled by chemicals called hormones.

(b) Name the **two** hormones that control blood glucose concentration.

_____ and _____

(1)

The graph shows changes in the concentration of glucose in the blood of a healthy person following a meal.



(c) Explain how negative feedback controls the blood glucose concentration during the first one and a half hours after the meal.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(Total 8 marks)

Q7. 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)