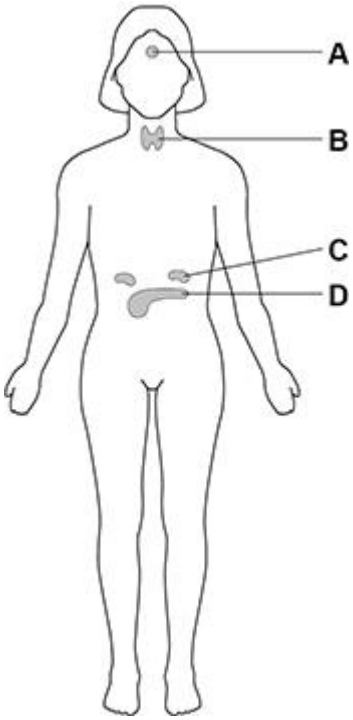
Q1.

Many internal processes of the human body are controlled by hormones.

Hormones are produced by glands.

Figure 1 shows glands in a woman's body.

Figure 1



(a) Which gland is the pituitary gland?

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

(1)

(b) Which gland is the pancreas?

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

(1)

The hormone insulin helps to decrease the blood glucose concentration.

Insulin causes its target organs to take in glucose from the blood.

(c) Which of the following is a target organ for insulin?

Tick (✓) **one** box.

Bladder ☐

Heart ☐

Liver ☐

(1)

(d) The glucose is stored as an insoluble substance.

What is the insoluble storage substance that is formed from glucose?

Tick (✓) **one** box.

Glycogen ☐

Protein ☐

Urea ☐

(1)

Scientists investigated the effect of a glucose drink on the concentration of glucose in a person's blood.

This is the method used.

1. Take a small sample of blood from the person.
2. Measure the concentration of glucose in the person's blood.
3. Give the person a drink containing 50 grams of glucose.
4. Measure the concentration of glucose in the person's blood at intervals.
5. Calculate the **change** in blood glucose concentration from the starting value.

Figure 2 shows the results.

Figure 2

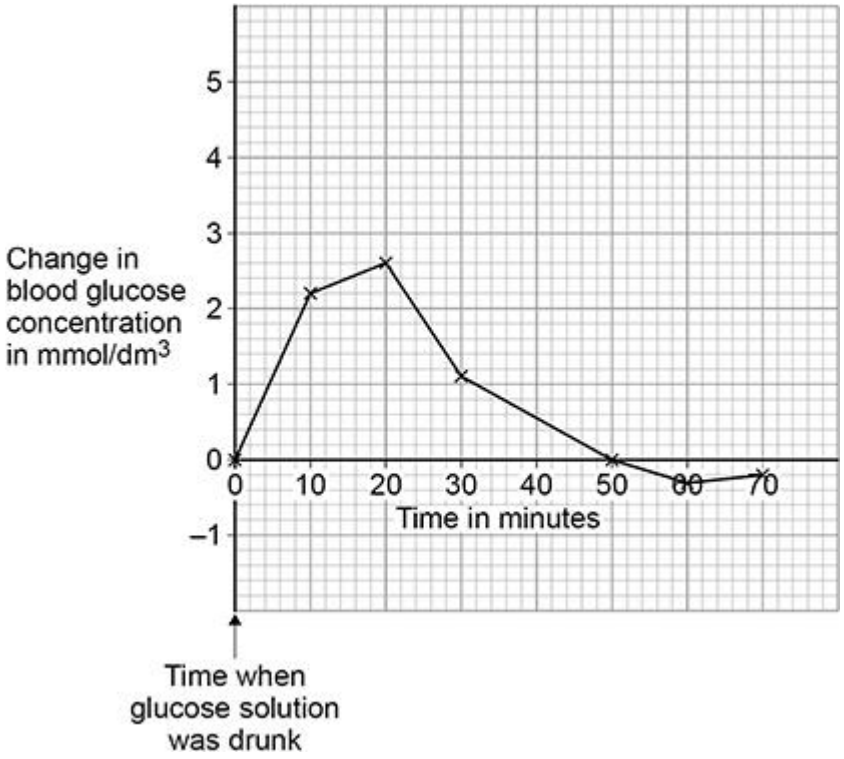


Figure 2 shows the **change** in blood glucose concentration.

(e) At the start of the investigation, the blood glucose concentration was 5 mmol/dm^3.

Calculate the highest blood glucose concentration during the investigation.

Use information from **Figure 2** in your answer.

_____

_____

_____

Highest blood glucose concentration = _____ mmol/dm^3

(2)

(f) What is the time taken for the blood glucose concentration to decrease from its highest value back to the starting value?

Use data from **Figure 2** in your answer.

_____

Time taken = _____ minutes

(1)

(g) Why can you **not** be certain that your answer to part (f) is accurate?

_____

_____

(1)

(h) **Figure 2** above shows the results for a person who does **not have** Type 2 diabetes.

Sketch a line on **Figure 2** to show the results you would expect for a person who **has** Type 2 diabetes.

(2)

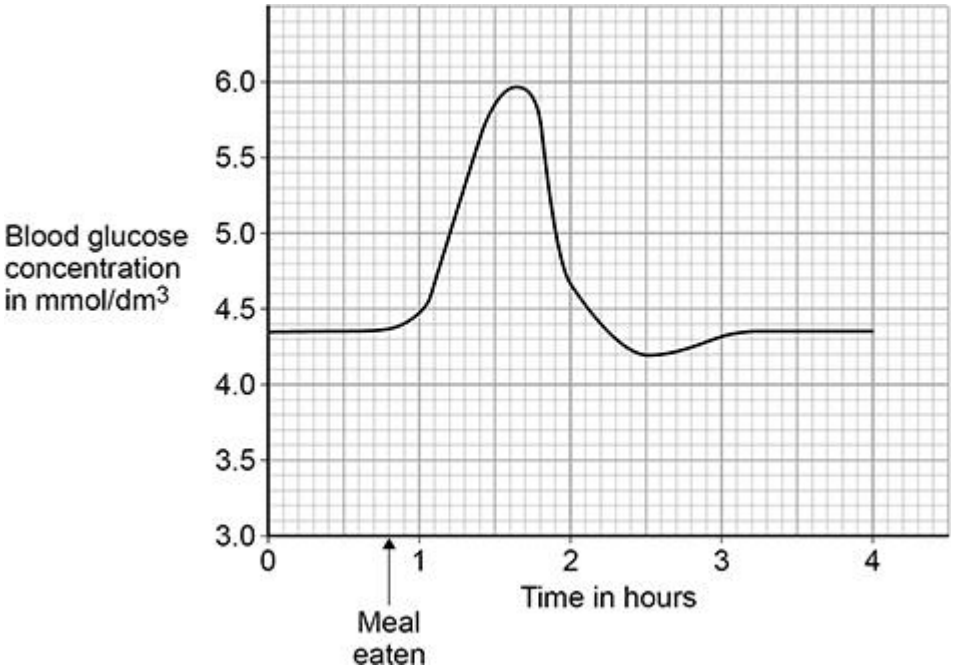
(Total 10 marks)

Q2.

It is important to control the concentration of glucose in the blood.

Figure 1 shows how the concentration of glucose in the blood of a person changed over 4 hours.

Figure 1



(a) Give **one** time when the concentration of **insulin** in the person's blood would be high.

Use **Figure 1**.

Time = _____hours

(1)

(b) Explain the effect a high concentration of insulin has on blood glucose concentration.

Effect _____

Explanation _____

_____

_____

_____

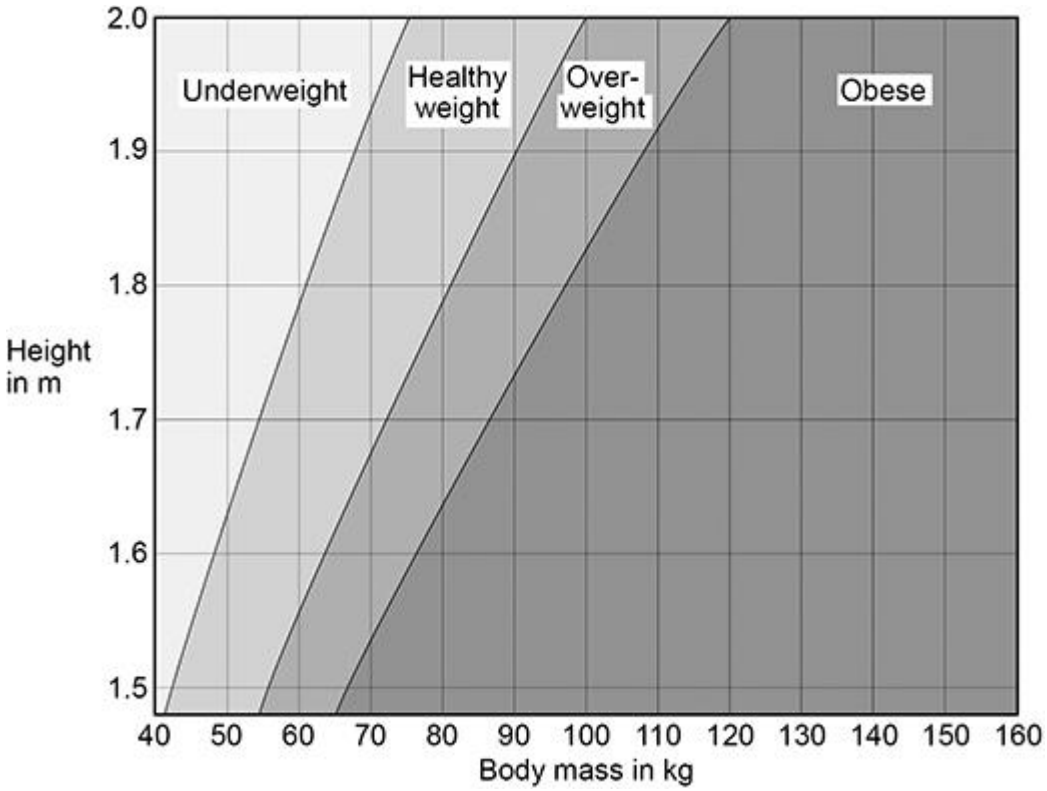
(3)

People with diabetes have difficulty controlling the concentration of glucose in their blood.

Type 2 diabetes is linked to obesity.

Figure 2 shows how to find if an adult's body mass is healthy for their height.

Figure 2



(c) Person **A**:

- is 1.75 m in height
- has a body mass of 52 kg.

What is person **A**'s weight category?

Tick (✓) **one** box.

Underweight ☐

Healthy weight ☐

Overweight ☐

Obese ☐

(1)

(d) Person **B** is 1.9 m in height.

Give the range of body masses that would put person **B** in the healthy weight category.

Range from _____ kg to _____ kg

(1)

(e) Person **C** is obese.

A doctor thinks that person **C** has Type 2 diabetes.

The doctor tests a sample of blood from person **C**.

The table below shows:

- the results of the blood test
- the mean results for people who do **not** have diabetes.

	Concentration in blood	
	Person C	**Mean for people who do not have diabetes**
Cholesterol in mmol/dm^3	6.21	5.20
Glucose in mmol/dm^3	9.56	4.51
Insulin in arbitrary units	24.32	14.83

Type 2 diabetes occurs when body cells have a reduced response to insulin.

Give **two** ways the results of the blood test show that person **C** might have Type 2 diabetes.

1 _____

_____

2 _____

(2)

(f) Give **two** ways that a person can reduce the chance of developing Type 2 diabetes.

1 _____

_____

2 _____

(2)

(Total 10 marks)

Q3.

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)

Q4.

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)

(c) The combined pill is a contraceptive that contains progesterone **and** oestrogen.

The 'mini-pill':

- is a contraceptive that **only contains** the progesterone hormone
- has to be taken at the same time each day to prevent pregnancy.

The success rate of the mini-pill in preventing pregnancy is lower than that of the combined pill.

Explain why missing a dose of the mini-pill would reduce the success rate of the mini-pill.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(Total 9 marks)

Q5.

The pancreas and the liver are both involved in the control of the concentration of glucose in the blood.

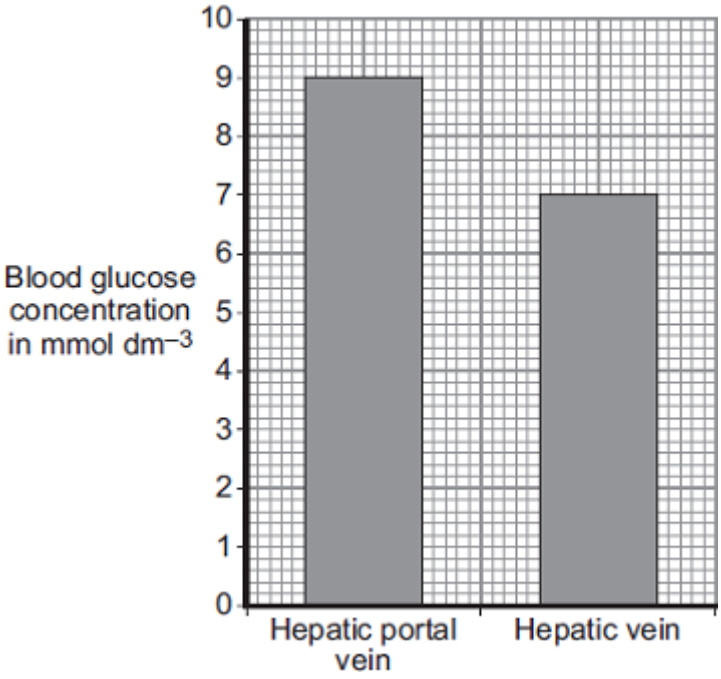
The liver has two veins:

- the hepatic portal vein taking blood from the small intestine to the liver
- the hepatic vein taking blood from the liver back towards the heart.

Scientists measured the concentration of glucose in samples of blood taken from the hepatic portal vein and the hepatic vein. The samples were taken 1 hour and 6 hours after a meal.

Graph 1 shows the concentration of glucose in the two blood vessels 1 hour after the meal.

Graph 1



(a) The concentration of glucose in the blood of the two vessels is different. Explain why.

_____

_____

_____

_____

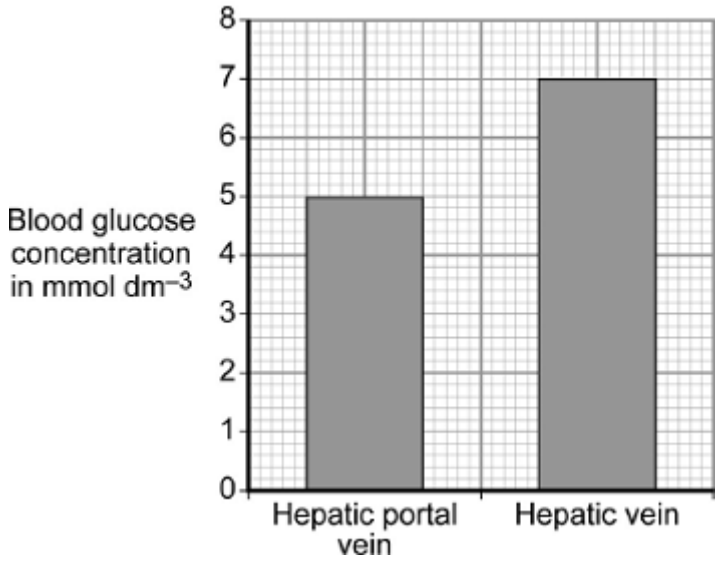
_____

_____

(3)

(b) **Graph 2** shows the concentration of glucose in the two blood vessels 6 hours after the meal.

Graph 2



Blood vessel

(i) The concentration of glucose in the blood in the hepatic portal vein 1 hour after the meal is different from the concentration after 6 hours.

Why?

_____

_____

(1)

(ii) The person does **not** eat any more food during the next 6 hours after the meal.

However, 6 hours after the meal, the concentration of glucose in the blood in the hepatic vein is higher than the concentration of glucose in the blood in the hepatic portal vein.

Explain why.

_____

_____

_____

_____

_____

_____

(3)

(Total 7 marks)

Q1.

(a) A

1

(b) D

1

(c) liver

1

(d) glycogen

1

(e) 2.6

allow answers in the range 2.5 to 2.7

1

7.6 (mmol/dm^3)

allow a correctly calculated value using student's value from graph + 5

1

(f) 30 (minutes)

*allow ½-hour **or** 0.5 hour*

1

(g) points too far apart
or
no reading between 30 and 50 mins

allow no reading at 40 mins

or
points joined by straight lines
or
values could have fallen to zero change before 50 mins

allow not a curve of best fit

1

(h) higher values of y than given line

1

returning to(wards) zero change later than given line

1

[10]

Q2.

(a) an answer in the range 1.1 to 2(.0) (hours)

1

(b) *effect:* lowered

1

explanation:
glucose taken in

or
glucose converted to glycogen
or
glucose used in respiration

1

by cells / liver / muscles

1

(c) underweight

1

(d) (from) 67.5 (kg to) 90 (kg)

allow in the range 67 to 68 (kg) for 67.5 (kg)
allow in the range 90 to 90.5(kg) for 90 (kg)
allow from 90 (kg to) 67.5 (kg)

1

(e) (person **C** has) higher glucose (than mean)

allow comparison of higher glucose using numbers
*allow (person **C**'s) glucose is too high*

1

(person **C** has) higher insulin (than mean)

allow comparison of higher insulin using numbers
*allow (person **C**'s) insulin is too high*
*do **not** accept (person **C** has) higher cholesterol*
ignore unprocessed data

1

answers must be comparative

(f) more exercise

allow example of (more) exercise

1

eat less carbohydrate / sugar **or** eat a low carbohydrate diet

allow eat less fat
allow eat a carbohydrate
controlled diet
*if no other marks awarded allow **1** mark for*
lose weight
***or** maintain healthy weight*
***or** eat less*
***or** eat fewer calories*
ignore references to healthy / balanced diet or diet unqualified

1

[10]

Q3.

(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]

Q4.

(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

allow (and consequently) an egg is available to be fertilised

1

[9]

Q5.

(a) (concentration high) in the hepatic portal vein is blood with glucose absorbed from the intestine

1

concentration is lower in the hepatic vein because insulin

1

(has caused) glucose to be converted into glycogen

1

or

allows glucose into liver cells

(b) (i) (after 6 hours) most of the glucose has been <u>absorbed</u> from the intestine **or** from food into the blood

1

(ii) because glucagon (made in the pancreas) causes

if biological terms incorrectly spelt they must be phonetically accurate

*do **not** accept glucagon <u>made</u> / <u>produced</u> by the liver*

1

glycogen to be converted into glucose

1

glucose released into blood

allow the liver maintains the correct / constant level of glucose in the blood

1

[7]