1(a). An athlete is running a 10 km race. They need to produce ATP in their cells during the race.

After the race, the athlete eats some food.

Explain why eating food affects the athlete's insulin levels.

---

[2]

(b). Draw a line to connect the boxes that describe the urine produced by the athlete after the race.

Draw only **one** line.

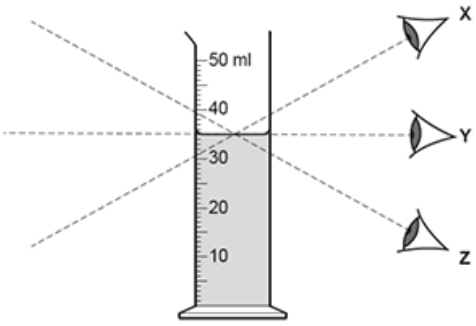
High volume	Very concentrated urine
Low volume	Dilute urine

[1]

(c). A student records some data on the volume of urine produced by different athletes after the race.

Each athlete's urine is collected in a different measuring cylinder.

The diagram shows three eye positions where the student could view the level of the urine to measure the volume produced by a particular athlete.



Complete these sentences.

Put a ring around each correct option.

The student should always view the level of liquid from position **X** / **Y** / **Z**.

Viewing the liquid from different positions for the different athletes would introduce sampling / random / systematic error into the measurement.

[2]

(d). During the race, the athlete's body temperature increases.

Which of these responses will cool them down?

Tick (✓) **two** boxes.

Response	
Hairs stand up	
Increases sweat production	
Shivering	
Vasoconstriction of blood vessels	
Vasodilation of blood vessels	

[2]

2(a). To try to lose weight some people go on a type of diet called a ketogenic diet.

In a ketogenic diet, a person eats food that is high in fat and protein but low in carbohydrates.

Complete each sentence about this diet.

Use the words from the list.

amino acids	**enzymes**	**fatty acids**	**glycerol**
glycogen	**homeostasis**	**respiration**	**sugar**

Proteins in the food are broken down to smaller molecules called

..... .

These smaller molecules are used to make more proteins in the body, such as

..... .

Fats in the food are broken down into ..... and ..... .

These are then used by the body to make lipids.

As the diet is low in carbohydrates such as starch, the person will have less

..... dissolved in their blood.

This means that the body will need to use some of its fat reserves to produce ATP by

..... .

The diet is only recommended to be used for a short period of time to lose excess fat.

[5]

(b).

Three people each make a comment about this diet.

Person **A**:	People who are very overweight could lose weight if they went on this diet and this may make them feel better about themselves.
Person **B**:	This diet could be harmful to people with underlying health conditions, such as diabetes.
Person **C**:	There are dangers to following this diet but being very overweight also causes many health issues.

Which person is discussing both the risks **and** benefits of following this diet?
Explain your answer.

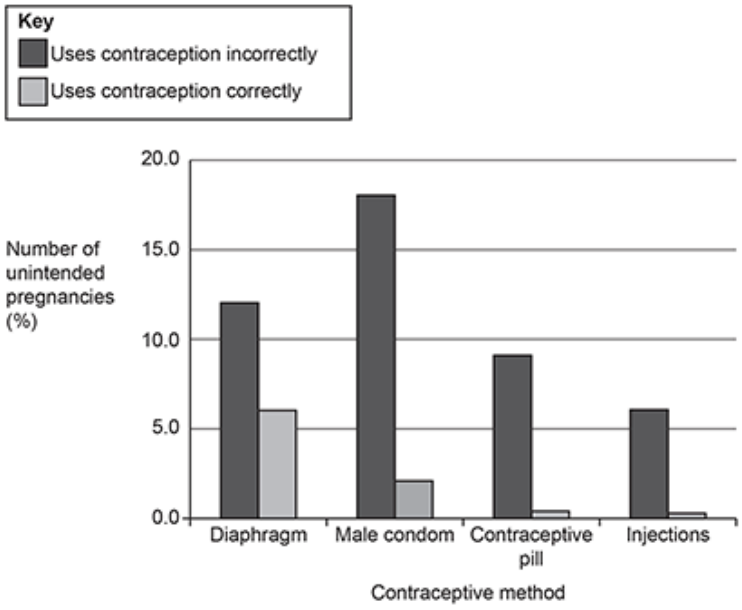
Person .....

Explanation _____

_____

_____ **[3]**

3(a). The graph shows the percentage of unintended pregnancies while using different types of contraception.



Compare the effectiveness of the different types of contraception in preventing pregnancies.
Include data from the graph.

_____

_____

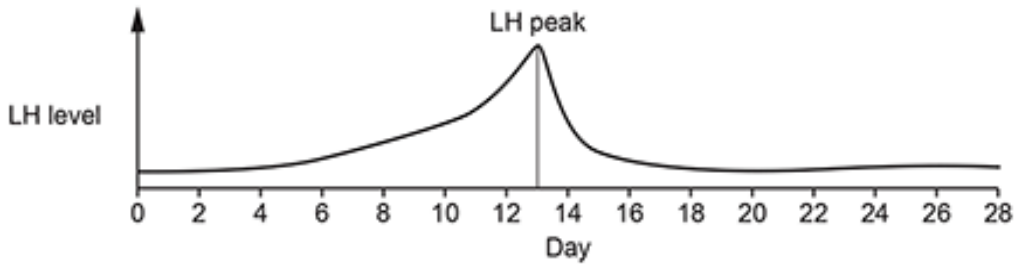
_____

---**[4]**

(b). A female is trying to get pregnant.

High levels of a hormone called LH stimulate ovulation.

The graph shows the levels of LH throughout the female's menstrual cycle.



When is the female most likely to get pregnant?
Explain your answer.

---**[2]**

(c). Some females produce low levels of progesterone after an egg has been fertilised.

Suggest how this may affect the uterus lining.

---**[1]**

4. The table lists some structures in the human body.

Identify whether each structure is:

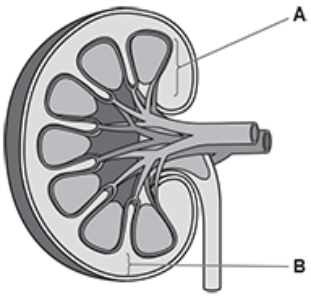
- part of the nervous system
- part of the endocrine (hormonal) system
- **not** part of either system.

Tick (✓) **one** box in each row.

Structure	**Part of the nervous system**	**Part of the endocrine system**	**Not part of either system**
Insulin producing cells in the pancreas			
Kidney tubules			
Pituitary gland			
Spinal cord			
Temperature receptors in the skin			

[5]

5(a). The diagram shows a section through a kidney.



i. Name the region labelled **A**.

..... **[1]**

ii. Name the region labelled **B**.

..... **[1]**

iii. Which type of blood vessel brings blood to the kidney?
Put a ring around the correct word.

artery **capillary** **vein**

[1]

(b). The table shows the volume of water gained and lost by one person in one day.

Water gained (litres per day)		Water lost (litres per day)	
Food and drink	2.2	From skin and lungs	0.9
Metabolic processes	0.3	Faeces	0.1
		Urine	

i. Calculate the volume of urine that will be produced by this person on this day.

Volume of urine = ... litres **[2]**

ii. The same person runs a marathon race the next day.

Explain how the kidney will maintain the water balance within this person's body during the race.

[3]

6. Which statement about type 1 diabetes is correct?

A It can be treated with insulin.
B It is caused by overproduction of insulin.
C It is usually detected later in life.
D It should be controlled by exercise and diet alone.

Your answer ☐ **[1]**

7. A lizard **cannot** regulate its body temperature in the same ways as a human.

Which method can a lizard use to **increase** its temperature?

A Its blood vessels can constrict.
B It can lie in the sun.
C It can shiver.
D It can sweat less.

Your answer ☐ **[1]**

8. Amyloidosis is a group of inherited conditions that affect people's health.

The most common type of amyloidosis is caused by a dominant allele (**A**) of a gene.

The allele **A** codes for a harmful protein called amyloid.

Amyloid protein is made by blood cells called plasma cells.
Amyloid can stop the pancreas releasing insulin.
It can also prevent sensory neurones from working.

Explain why person **2** starts to develop symptoms of amyloidosis **and** suggest what these symptoms might be.

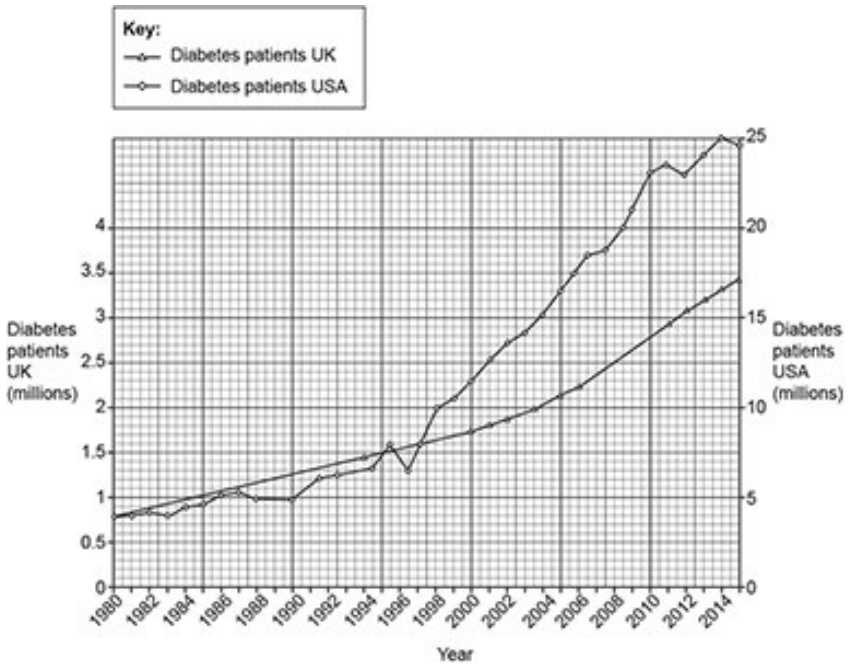
[3]

9. Which disease is classed as a communicable disease?

A Cirrhosis of the liver
B Tuberculosis
C Type 1 diabetes
D Type 2 diabetes

Your answer ☐ **[1]**

10(a). The graph shows the number of patients with diabetes in the UK and the USA from 1980 to 2015.



How many patients had diabetes in the UK in the year 2000?

Number =..... million **[1]**

(b). Calculate the difference between the number of patients with diabetes in the UK and the number with diabetes in USA for the year 2000.

Number =..... million **[2]**

(c). Describe how the number of patients with diabetes has changed in **both** countries from 1980 to 2015.

---**[2]**

(d). The numbers presented in this graph may not be accurate.

Suggest why.

---**[1]**

(e). Diabetes can be Type 1 or Type 2.

Describe **two** differences between the treatments for Type 1 and Type 2 diabetes.

1

2

---

[2]

11(a). A boat with ten people onboard capsizes and all ten people are found in the sea.

The first aiders at the scene take the body temperature of each of the ten people.

Rescued person	Body temperature after rescue (°C)
1	35.2
2	35.0
3	34.9
4	34.8
5	35.1
6	35.1
7	34.8
8	34.9
9	35.0
10	34.9

i. Calculate the mean temperature of the ten people rescued.

Give your answer to **1** decimal place.

Mean temperature = ... °C **[2]**

ii. If a person's body temperature is below 35 °C, they are classed as hypothermic.

What percentage of those rescued would be classed as hypothermic?

Percentage hypothermic =..... % **[2]**

iii. Describe how the body responds to hypothermia.

[3]

iv. The body needs to maintain a constant body temperature.

Write down **one** other feature of the internal environment of the body that should be kept constant.

[1]

(b). A study in the British Medical Journal looked at 35 488 people to see if there were differences in individuals' normal body temperatures.

They found the following:

- the mean body temperature was 36.6 °C
- 95% of the population had a body temperature between 35.7 °C and 37.3 °C.

The study did **not** include people with infections or severe illnesses.

i. The British Medical Journal is a peer-reviewed journal.
Explain why scientists publish their results in peer-reviewed journals.

[2]

ii. Explain why the study did **not** include people with infections or severe illnesses.

[2]

iii. Give **one** reason why a study such as this should have a large sample size.

_____

_____ **[1]**

12. One symptom of diabetes is glucose in the urine.
Which biochemical test is used to confirm the presence of glucose in the urine?

A Benedict's
B Biuret
C Ethanol (emulsion)
D Iodine

Your answer ☐ **[1]**

END OF QUESTION PAPER