**Q1.**          Our bodies control the concentration of glucose in the blood.

Draw a ring around the correct answer to complete each sentence.

(a)     The concentration of glucose in the blood is controlled by a

|  |  |
| --- | --- |
|   | carbohydrase. |
| hormone called | insulin. |
|   | protease. |

**(1)**

|  |  |  |
| --- | --- | --- |
|   |   | intestine. |
| (b) | This hormone is produced by the | stomach. |
|   |   | pancreas. |

**(1)**

(c)     If the body does not produce enough of this hormone,

|  |  |
| --- | --- |
|   | diabetes. |
| the person develops | cystic fibrosis. |
|   | Huntington’s disease. |

**(1)**

**(Total 3 marks)**

**Q2.**Some people with diabetes do not produce enough insulin to keep their blood glucose at the correct levels.

(a)     (i)      Which organ monitors blood glucose levels?

|  |  |  |
| --- | --- | --- |
|   | Tick (✔) **one** box. |   |
|   | liver |   |
|   | pancreas |   |
|   | skin |   |

**(1)**

(ii)      What effect does insulin have on glucose in the blood?

|  |  |  |
| --- | --- | --- |
|   | Tick (✔) **one** box. |   |
|   | Insulin causes glucose to move into the cells. |   |
|   | Insulin increases the amount of glucose in the blood. |   |
|   | Insulin converts glucose to starch. |   |

**(1)**

(b)     Some people with diabetes inject insulin several times a day.

There are different types of insulin.

The graph shows some information about three different types of insulin, **A**, **B** and **C**.

(i)      Which type of insulin, **A**, **B** or **C**, should a person with diabetes inject just before eating a meal high in carbohydrates?

.......................................................

Give a reason for your answer.

...................................................................................................................

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**(2)**

(ii)      A woman with diabetes has a blood glucose level of 12 mmol per dm3 of blood.

The woman’s normal blood glucose level is 6 mmol per dm3.

The woman will need to inject insulin to lower her blood glucose level.

For each unit of insulin injected the blood glucose level will fall by 3 mmol per dm3.

How many units of insulin does the woman need to inject to bring her blood glucose level down to the normal level?

...................................................................................................................

Number of units = .......................................

**(1)**

(c)     Some people have pancreas transplants to treat diabetes.

Give **one** possible disadvantage of a pancreas transplant.

|  |  |  |
| --- | --- | --- |
|   | Tick (✔) **one** box. |   |
|   | The pancreas could be rejected. |   |
|   | The patient will need to inject insulin every day. |   |
|   | The patient’s blood glucose levels may rise and fall too much. |   |

**(1)**

**(Total 6 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 cm3 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.

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**(1)**

**(Total 6 marks)**

**Q4.**          Diabetes is a disease in which a person’s blood glucose concentration may rise.

Doctors give people drugs to treat diabetes.

The table shows some of the side effects on the body of four drugs, **A,** **B,** **C** and **insulin,** used to treat diabetes.

|  |  |
| --- | --- |
| **Drug** | **Side effects on the body** |
| **A** | Weight lossLiver, kidney and heart damageFeeling of sickness |
| **B** | Weight gainDamage to some cells in pancreas |
| **C** | More water is kept in the bodyWeight gainIncreased chance of bone breakage in women |
| **Insulin** | A little more water is kept in the bodyWeight gainIncreased risk of lung damage |

(a)     Which drug, **A,** **B,** **C** or **insulin,** is most likely to result in an increase in blood sugar concentration in some people?

Explain your answer.

Drug ..............................................................................................................

Explanation

........................................................................................................................

........................................................................................................................

**(2)**

(b)     (i)      Drugs **A, B and C** can be taken as tablets.

The chemicals in the tablets are absorbed into the blood from the digestive system.

Insulin is a protein.

Insulin **cannot** be taken as a tablet.

Why?

...............................................................................................................

**(1)**

(ii)      Other than using drugs, give **two** methods of treating diabetes.

1 ............................................................................................................

2 ............................................................................................................

**(2)**

**(Total 5 marks)**

**Q5.**The number of cases of Type 2 diabetes in the UK is increasing rapidly.

(a)     Describe how insulin and glucagon help control the blood sugar concentration in a healthy person.

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**(6)**

(b)     What is Type 2 diabetes?

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........................................................................................................................

**(1)**

(c)     Body mass index (BMI) is a person’s body weight divided by the square of his or her height.

(i)      **Graph 1** shows the relationship between BMI and the percentage probability of developing Type 2 diabetes.

**Graph 1**

                  Percentage probability of developing Type 2 diabetes



Suggest an explanation for the relationship between BMI and the risk of developing Type 2 diabetes.

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**(2)**

(ii)     **Graph 2** shows changes in the number of new cases of Type 2 diabetes in the UK.

**Graph 2**

                  Year



Suggest explanations for the trend shown by the data in **Graph 2**.

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**(3)**

**(Total 12 marks)**

**M1.**          (a)     insulin

*extra ring drawn cancels the mark*

**1**

(b)     pancreas

*extra ring drawn cancels the mark*

**1**

(c)     diabetes

*extra ring drawn cancels the mark*

**1**

**[3]**

**M2.**(a)     (i)      pancreas

**1**

(ii)     Insulin causes glucose to move into cells.

**1**

(b)     (i)      **A**

**1**

rapid rise **or** fastest

**1**

(ii)     2

**1**

(c)     The pancreas could be rejected.

**1**

**[6]**

**M3.**         (a)      (i)     insulin

*accept glucagon (correct spelling only)*

**1**

(ii)     pancreas

*accept phonetic spelling*

*allow pancrease*

**1**

(b)     (i)      11(.0)

*accept in range 10.5-11 (.0)*

**1**

(ii)     any **two** from:

*ignore numbers unless comparative*

•        high(er) concentration (of blood glucose) (anywhere / any time)

*accept 115 not 88*

*139 not 99*

•        large(r) increase (in concentration after the drink)

*accept increase by 24 not 11 / their b(i)*

•        fast(er) / steep(er) rise

*accept it takes 3 hours not 1 ¼ hours to get back to original level*

*accept it takes a long time to get back to normal*

•        slow(er) fall

**2**

(iii)    any **one** from:

•        insulin present / produced

*accept glucagon not produced*

•        (used in) respiration

*allow exercise*

•        taken into cells

*allow converted to glycogen*

*allow taken into liver (cells) / muscle (cells)*

*allow produce / make energy*

**1**

**[6]**

**M4.**          (a)    B

**1**

less / no insulin (produced) **or** insulin produced in pancreas

*allow pancreas can’t monitor (blood) sugar (level)*

*ignore pancreas can’t control (blood) sugar (level)*

*allow increased glucagon production*

*allow A as liver stores less glucose / sugar for* ***2*** *marks only*

**1**

(b)     (i)      (it / protein / insulin) digested / broken down

*if ref to specific enzyme must be correct (protease / pepsin)*

*ignore denatured*

*do* ***not*** *accept digested in mouth / other incorrect organs*

**1**

(ii)     any **two** from:

*ignore injections*

•        (attention to) diet

*accept examples, eg eat less sugar(y food)* ***or*** *eat small regular meals*

*allow eat less carbohydrate / control diet*

*ignore cholesterol or balanced / healthy diet*

•        exercise

*ignore keep fit / healthy*

•        (pancreas) transplant / stem cells / genetic engineering

**2**

**[5]**

**M5.**(a)     any **six** from:

•        hormone(s) / named produced by pancreas

•        if blood glucose levels are too high, insulin is produced / released

•        allowing glucose to move from the blood into the cells / named eg liver

•        glucose is converted to glycogen

•        if blood glucose levels fall, glucagon is produced / released

•        glycogen is converted to glucose

•        causing glucose to be released into the blood

**6**

(b)     diabetes that occurs when the body (cells) do not respond / are less responsive to insulin

**1**

(c)     (i)      higher BMIs due to increase in mass / weight (relative to height) / obesity

**1**

obesity / being overweight / being fat is a (significant) risk factor for Type 2 diabetes

*allow causes Type 2 diabetes*

**1**

(ii)     any **three** from:

•        related to described change in diet eg fast foods

•        and less exercise

•        which increases the chance of obesity / increases BMI

•        increased awareness has helped to slow the increase

**3**

**[12]**