AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

GCSE
BIOLOGY

H

Higher Tier Paper 1H

Tuesday 15 May 2018 Afternoon Time allowed: 1 hour 45 minutes

Materials

For this paper you must have:
- a ruler
- a scientific calculator.

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

Information
- There are 100 marks available on this paper.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	

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ANSWER IN THE SPACES PROVIDED

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0 1 Eating food containing *Salmonella* bacteria can cause illness.

0 1 . 1 Two symptoms of infection by *Salmonella* are vomiting and diarrhoea.

What causes these symptoms?

[1 mark]

0 1 . 2 Give **two** ways a person with a mild infection of *Salmonella* can help prevent the spread of the bacteria to other people.

[2 marks]

1

2

0 1 . 3 In very serious infections of *Salmonella*, a doctor can prescribe drugs to kill the bacteria.

What type of drug can the doctor prescribe to kill the bacteria?

[1 mark]

0 1 . 4 A person with AIDS may take longer than a healthy person to recover from a *Salmonella* infection.

Explain why.

[2 marks]

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0 1 . 5 *Salmonella* bacteria can be transmitted from chickens to humans. Chickens can be vaccinated to prevent the transmission of *Salmonella* bacteria to humans.

Suggest **one** other way farmers could prevent the transmission of *Salmonella* from chickens to humans.

[1 mark]

A restaurant owner employed a scientist to test the effectiveness of two kitchen cleaning liquids.

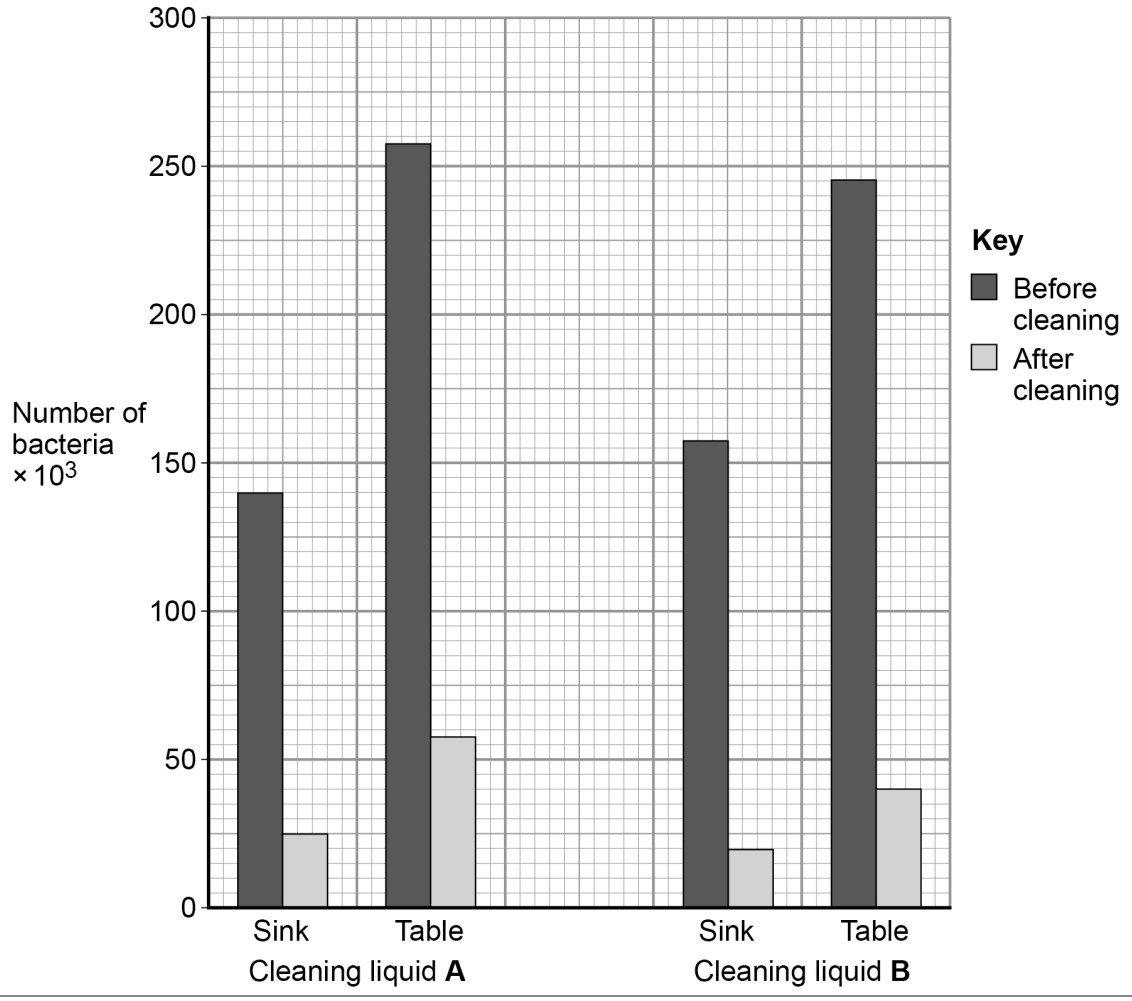
The scientist took samples from two work surfaces:

- before the surfaces had been cleaned with the cleaning liquids
- after the surfaces had been cleaned with the cleaning liquids.

The samples were then analysed for the number of bacteria they contained.

The results are shown in **Figure 1**.

Figure 1



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0 1 . 6 Which cleaning liquid is the more effective?

Give a reason for your answer.

[1 mark]

Cleaning Liquid _____

Reason _____

_____

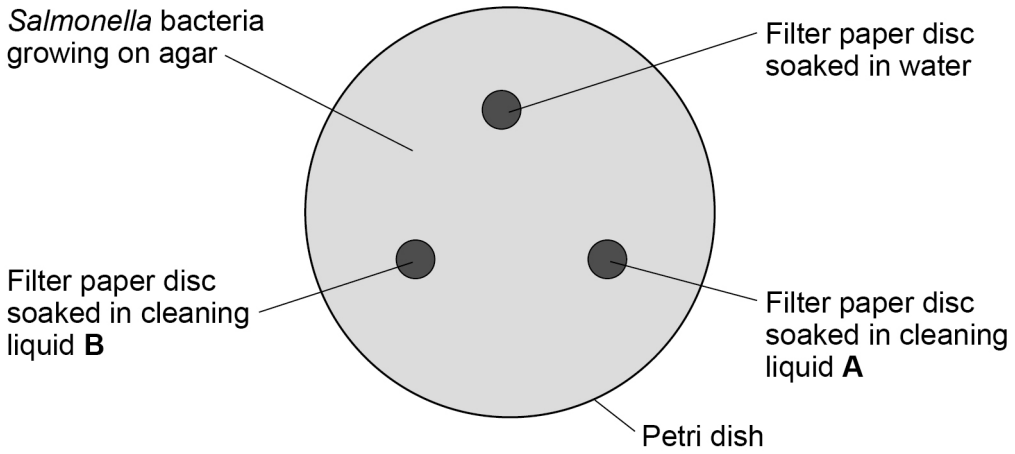
_____

Question 1 continues on the next page

The scientist investigated the effect of cleaning liquid **A** and cleaning liquid **B** on *Salmonella* bacteria grown in a laboratory.

Figure 2 shows the way the investigation was set up.

Figure 2



The Petri dish was placed in an incubator at 25 °C for 48 hours.

After 48 hours, the scientist calculated the area around each paper disc where no bacteria were growing.

The results are shown in **Table 1**.

Table 1

Filter paper disc	**Area around disc with no bacteria growing in cm^2**
Water	0
Cleaning liquid **A**	11
Cleaning liquid **B**	13

0 1 . 7 What measurement would the scientist need to take to calculate the area where no bacteria were growing?

[1 mark]

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0 1 . 8 Give **one** change to the investigation that would allow the scientist to check if the results are repeatable.

[1 mark]

0 1 . 9 The scientist showed the results to the restaurant owner.

Both cleaning liquids cost the same per dm^3.

Suggest **one** other factor the restaurant owner should consider when choosing which cleaning liquid to use.

[1 mark]

11

Turn over for the next question

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0 2 Metabolism is the sum of all the chemical reactions in the cells of the body.

One metabolic reaction is the formation of lipids.

0 2 . 1 Give **one** other metabolic reaction in cells.

[1 mark]

Table 2 shows the mean metabolic rate of humans of different ages.

Table 2

Age in years	Mean metabolic rate in kJ/m^2/hour	
	Males	Females
5	53	53
15	45	42
25	39	35
35	37	35
45	36	35

0 2 . 2 What **two** conclusions can be made from the data in **Table 2**?

[2 marks]

Tick **two** boxes.

As age increases, mean metabolic rate of males and females increases. ☐

Males have a higher metabolic rate than females after five years of age. ☐

The mean metabolic rate of females decreases faster than males up to 25 years of age. ☐

The mean metabolic rate of males and females decreases more quickly after the age of 35. ☐

There is no relationship between age and mean metabolic rate. ☐

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0 2 . 3 Calculate the percentage decrease in the mean metabolic rate of males between 5 years and 45 years of age.

Use the equation:

$$\text{percentage decrease} = \frac{\text{decrease in metabolic rate}}{\text{original metabolic rate}} \times 100$$

Give your answer to 3 significant figures.

[3 marks]

Percentage decrease = _____

Question 2 continues on the next page

Regular exercise can increase metabolic rate.

Two people did five minutes of gentle exercise from rest.

Table 3 shows the effect of the exercise on their heart rates.

Table 3

Time in minutes	Heart rate in beats per minute	
	Person R	Person S
0 (at rest)	60	78
1	76	100
2	85	110
3	91	119
4	99	129
5	99	132

0 2 . 4 Describe **two** differences in the response of person **R** and person **S** to the exercise.

Use information from **Table 3**.

[2 marks]

1 _____

_____

2 _____

_____

0 2 . 5 Complete the line graph in **Figure 3** for person **S**.

You should:

- add the scale to the x axis
- label the x axis.

[4 marks]

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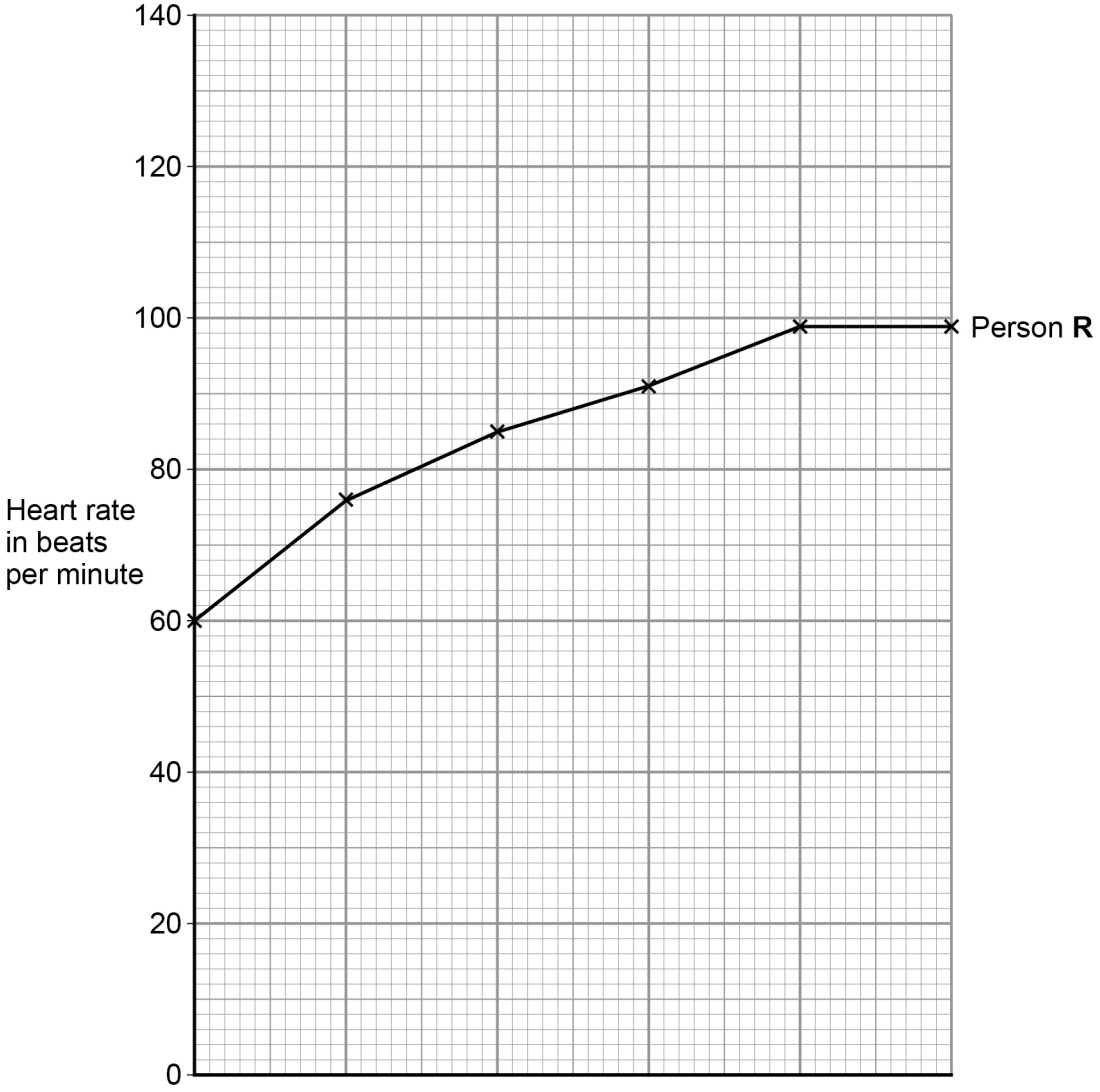
Figure 3



0 2 . 6 After five minutes of exercise, the heart rate of person **S** was 132 beats per minute. When person **S** rested, his heart rate decreased steadily at a rate of 12 beats every minute.

Calculate how much time it would take the heart rate of person **S** to return to its resting rate.

[2 marks]

Time = _____ minutes

Turn over ►

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0 2 . 7 A student made the following hypothesis about the heart rate of smokers and non-smokers during exercise.

"During exercise, the heart rate of smokers increases more than the heart rate of non-smokers."

Design an investigation that would allow you to test this hypothesis.

[6 marks]

20

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0 3 The circulatory system is composed of the blood, blood vessels and the heart.

0 3 . 1 Urea is transported in the blood plasma.

Name **two** other substances transported in the blood plasma.

[2 marks]

1 _____

2 _____

0 3 . 2 Some athletes train at high altitude.

Training at high altitude increases the number of red blood cells per cm^3 of blood.

Explain why having more red blood cells per cm^3 of blood is an advantage to an athlete.

[3 marks]

_____

_____

_____

_____

_____

_____

0 3 . 3 Which **two** blood vessels carry deoxygenated blood?

[2 marks]

Tick **two** boxes.

- Aorta ☐
- Coronary artery ☐
- Pulmonary artery ☐
- Pulmonary vein ☐
- Vena cava ☐

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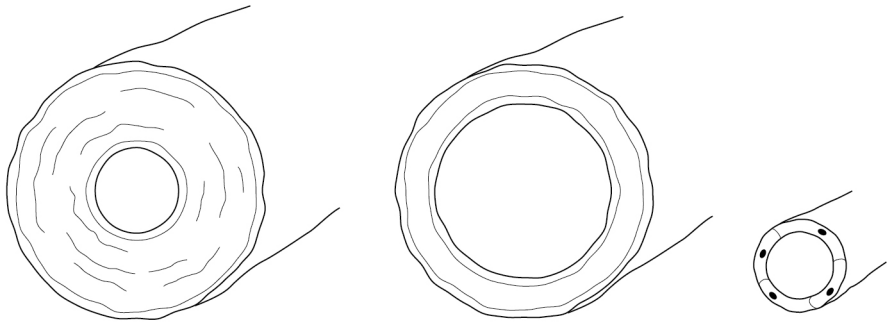
Figure 4 shows the three types of blood vessel.

Figure 4



0 3 . 4 Which type of blood vessel carries blood into the right atrium?

[1 mark]

Tick **one** box.

A		B		C	

0 3 . 5 Compare the structure of an artery with the structure of a vein.

[3 marks]

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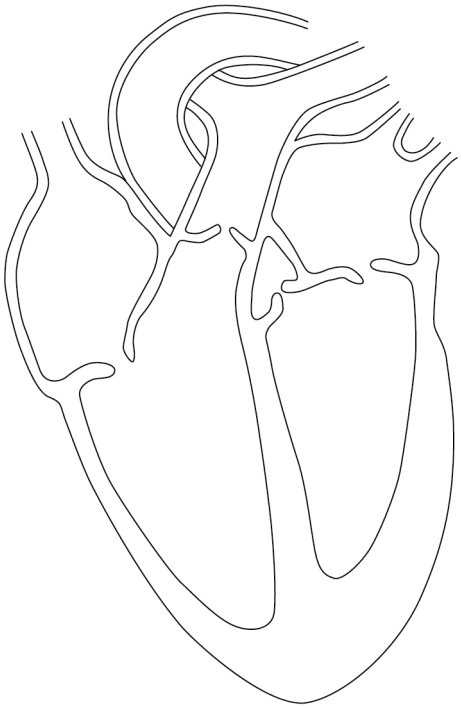
0 3 . 6 Heart rate is controlled by a group of cells. This group of cells act as a pacemaker.

Figure 5 shows a section through the heart.

Draw an **X** on **Figure 5** to show the position of the pacemaker.

[1 mark]

Figure 5



0 3 . 7 A patient may be fitted with an artificial pacemaker.

What condition may be treated using an artificial pacemaker?

[1 mark]

_____

_____

13

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0 4 A student carried out an investigation using chicken eggs.

This is the method used.

1. Place 5 eggs in acid for 24 hours to dissolve the egg shell.
2. Measure and record the mass of each egg.
3. Place each egg into a separate beaker containing 200 cm^3 of distilled water.
4. After 20 minutes, remove the eggs from the beakers and dry them gently with a paper towel.
5. Measure and record the mass of each egg.

Table 4 shows the results.

Table 4

Egg	Mass of egg without shell in grams	Mass of egg after 20 minutes in grams
1	73.5	77.0
2	70.3	73.9
3	72.4	75.7
4	71.6	73.1
5	70.5	73.8

0 4 . 1 Another student suggested that the result for egg **4** was anomalous.

Do you agree with the student?

Give a reason for your answer.

[1 mark]

Do not write outside the box

0 4 . 2 Calculate the percentage change in mass of egg **3**.

[2 marks]

Percentage change in mass = _____

0 4 . 3 Explain why the masses of the eggs increased.

[3 marks]

0 4 . 4 Explain how the student could modify the investigation to determine the concentration of the solution inside each egg.

[3 marks]

Turn over ►

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Chicken egg shells contain calcium. Calcium ions are moved from the shell into the cytoplasm of the egg.

Table 5 shows information about the concentration of calcium ions.

Table 5

Location	Concentration of calcium ions in arbitrary units
Egg shell	0.6
Egg cytoplasm	2.1

0 4 . 5 Explain how calcium ions are moved from the shell into the cytoplasm of the egg.

[3 marks]

12

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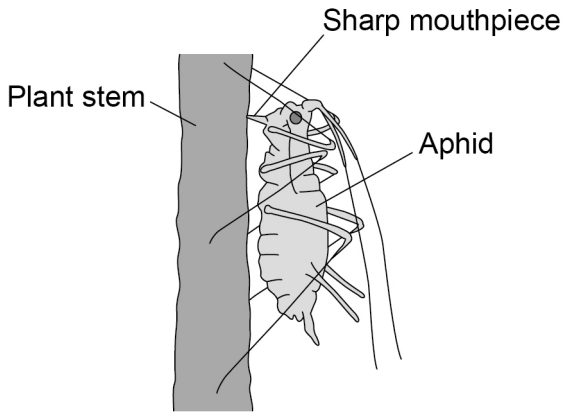
0 5 Plants can be infected by fungi, viruses and insects.

Aphids are small insects that carry pathogens.

Figure 6 shows an aphid feeding from a plant stem.

Figure 6



0 5 . 1 An aphid feeds by inserting its sharp mouthpiece into the stem of a plant.

Give the reason why the mouthpiece of an aphid contains a high concentration of dissolved sugars after feeding.

[1 mark]

Question 5 continues on the next page

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0 5 . 2 Plants infected with aphids may show symptoms of magnesium deficiency.

Magnesium deficiency symptoms include:

- yellow leaves
- stunted growth.

Explain how a deficiency of magnesium could cause these symptoms.

[5 marks]

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0 5 . 3 A farmer thinks a potato crop is infected with potato virus Y (PVY).

The farmer obtains a monoclonal antibody test kit for PVY.

To make the monoclonal antibodies a scientist first isolates the PVY protein from the virus.

Describe how the scientist would use the protein to produce the PVY monoclonal antibody.

[4 marks]

10

Turn over for the next question

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0 6 Cystic fibrosis (CF) is a genetic disorder caused by a change in a gene.

0 6 . 1 What molecule are genes made of?

[1 mark]

0 6 . 2 CF affects the cell membranes of cells in the lungs and digestive system.

What is the function of the cell membrane?

[1 mark]

0 6 . 3 In a person with CF, cells lining the lungs and digestive system create too much mucus.

The mucus can:

- block the duct leading from the pancreas to the small intestine
- block the tubes leading to the alveoli in the lungs.

Explain why children with CF grow more slowly than children without CF.

[6 marks]

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Table 6 shows information about people in the UK in 2015.

Table 6

	Median age in years
People with CF	19
Whole population	40

0 6 . 4 Describe how the median age of a group of people can be determined.

[2 marks]

0 6 . 5 Suggest **one** reason why the median age for people with CF is lower than the median age for the whole population.

[1 mark]

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0 6 . 6 People with a lung function below 30% may need a lung transplant.

Table 7 gives information about people with CF in 2015.

Table 7

Lung Function (%)	Percentage of people with CF
>75	22
51 – 75	72
30 – 50	4
<30	2

In 2015, the total number of people with CF in the UK was 10 800.

Calculate how many people with CF in the UK in 2015 would **not** need a lung transplant.

[2 marks]

Number of people = _____

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0 6 . 7 Lung transplants from donors have risks. One risk is organ rejection.

Scientists are researching how to solve the problem of organ rejection and hope to use stem cells to create healthy lungs.

The healthy lungs can then be transplanted into CF patients without the risk of organ rejection.

Describe how scientists may use stem cells to create healthy lungs that are **not** rejected by the CF patient.

[4 marks]

0 6 . 8 Some people disagree with the use of stem cells because of the risk of cancer.

Give **one** other reason why some people disagree with the use of stem cells to create new organs for transplants.

[1 mark]

18

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0 7 **Table 8** shows information about some food components in cow's milk.

Table 8

	Value per 500 cm^3	Recommended Daily Allowance (RDA) for a typical adult
Energy in kJ	1046	8700
Fat in g	8.4	70.0
Salt in g	0.5	6.0
Calcium in mg	605	1000
Vitamin B-12 in µg	4.5	2.4

0 7 . 1 How much **more** milk would a typical adult have to drink to get their RDA for calcium compared with the amount of milk needed to get their RDA for vitamin B-12?

[3 marks]

Volume of milk = _____ cm^3

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0 7 . 2 Describe how a student could test cow's milk to show whether it contains protein and different types of carbohydrate.

[6 marks]

Question 7 continues on the next page

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A scientist investigated the effect of bile on the breakdown of fat in a sample of milk.

The scientist used an indicator that is colourless in solutions with a pH lower than 10, and pink in solutions with a pH above 10.

This is the method used.

1. Add 1 drop of bile to a test tube and one drop of water to a second test tube.

2. Add the following to each test tube:
   - 5 cm^3 of milk
   - 7 cm^3 of sodium carbonate solution (to make the solution above pH 10)
   - 5 drops of the indicator
   - 1 cm^3 of lipase.

3. Time how long it takes for the indicator in the solutions to become colourless.

The results are shown in **Table 9**.

Table 9

	Time taken for the indicator to become colourless in seconds
Solution with bile	65
Solution without bile	143

0 7 . 3 Explain why the indicator in both tubes became colourless.

[3 marks]

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0 7 . 4 Give the reason why the measurement of the time taken for the indicator to become colourless might be inaccurate.

[1 mark]

0 7 . 5 Explain the difference in the results for the two test tubes in **Table 9**.

[3 marks]

16

END OF QUESTIONS

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