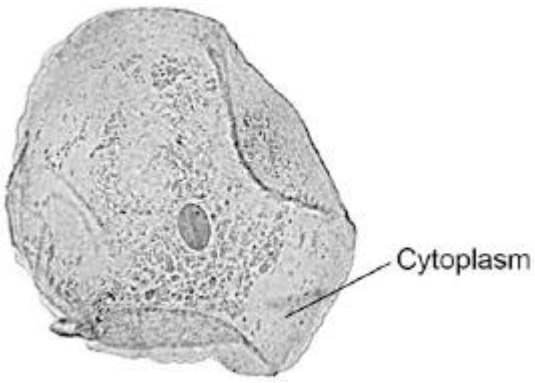
Q1.Figure 1 shows a human cheek cell viewed under a light microscope.

Figure 1



(a) Label the nucleus **and** cell membrane on **Figure 1**.

(2)

(b) Cheek cells are a type of body cell.

Body cells grow through cell division.

What is the name of this type of cell division?

Tick **one** box.

Differentiation ☐

Mitosis ☐

Specialisation ☐

(1)

(c) Ribosomes and mitochondria are **not** shown in **Figure 1**.

What type of microscope is needed to see ribosomes and mitochondria?

.....

(1)

(d) What is the advantage of using the type of microscope you named in part **(c)**?

Tick **one** box.

Cheaper ☐

Higher magnification ☐

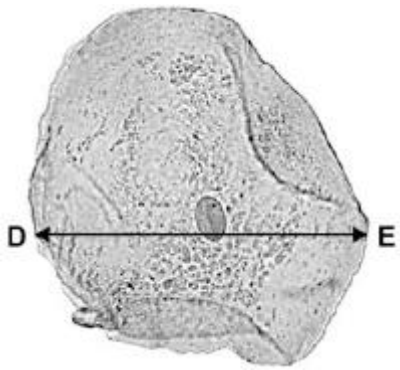
Lower resolution ☐

(1)

(e) The cheek cell in **Figure 2** is magnified 250 times.

The width of the cell is shown by the line **D** to **E**.

Figure 2



Calculate the width of the cell in micrometres (μm).

Complete the following steps.

Measure the width of the cell using a ruler ..... mm

Use the equation to work out the real width of the cell in mm:

$$\textbf{real size} = \frac{\textbf{image size}}{\textbf{magnification}}$$ ..... mm

Convert mm to μm ..... μm

(3)

(f) A red blood cell is 8 μin diameter.

A bacterial cell is 40 times smaller.

Calculate the diameter of the bacterial cell.

Tick **one** box.

0.02 μm ☐

0.2 μm ☐

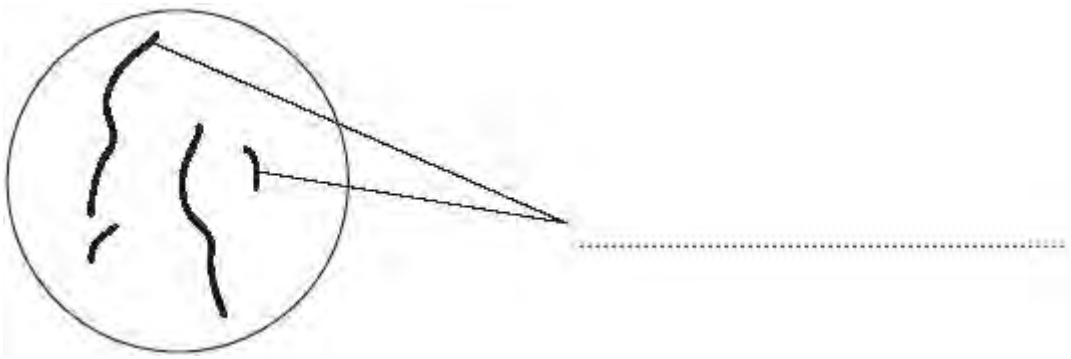
2.0 μm ☐

20.0 μm ☐

(1)
(Total 9 marks)

Q2. **Diagram 1** shows the nucleus of a body cell as it begins to divide by mitosis.

Diagram 1



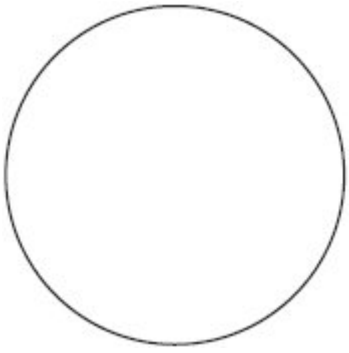
(a) Use a word from the box to label **Diagram 1**.

alleles	**chromosomes**	**gametes**

(1)

(b) Complete **Diagram 2** to show what the nucleus of one of the cells produced by this mitosis would look like.

Diagram 2



(1)

(c) Stem cells from a recently dead embryo can be grown in special solutions.

Some facts about stem cells are given below.

- Stem cells from an embryo can grow into any type of tissue.
- Stem cells may grow out of control, to form cancers.

- Large numbers of stem cells can be grown in the laboratory.
- Stem cells may be used in medical research or to treat some human diseases.
- Patients treated with stem cells need to take drugs for the rest of their life to prevent rejection.
- Collecting and growing stem cells is expensive.

Use **only** the information above to answer these questions.

(i) Give **two** advantages of using stem cells.

1 .....

.....

2 .....

.....

(2)

(ii) Give **two** disadvantages of using stem cells.

1 .....

.....

2 .....

.....

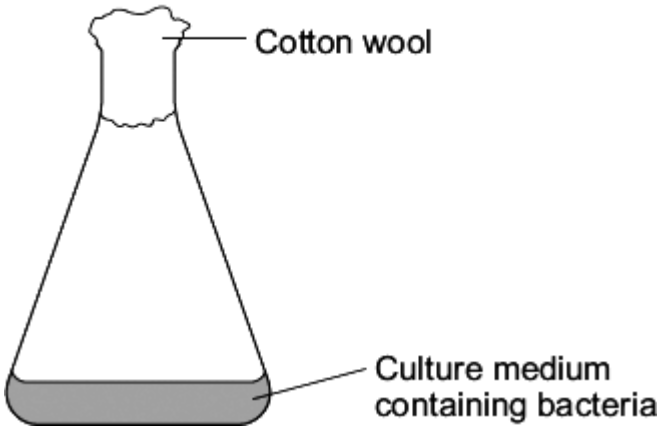
(2)

(Total 6 marks)

Q3. Some students grew one species of bacterium in a flask.

Diagram 1 shows the flask.

Diagram 1



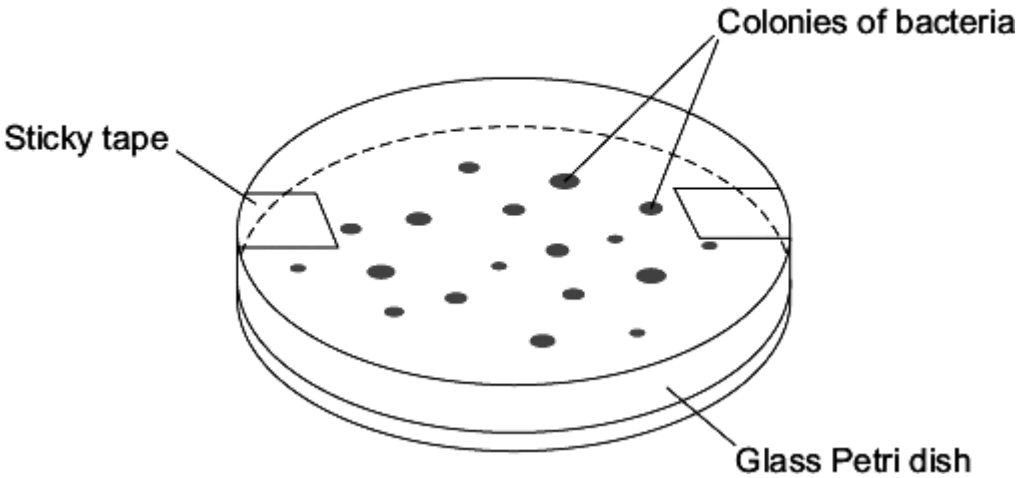
The students wanted to find the number of bacteria in 1 cm^3 of the culture medium.

The students:

- diluted 1 cm^3 of the culture medium from the flask with 999 cm^3 of water
- added 1 cm^3 of diluted culture to sterilised nutrient agar in a Petri dish
- placed the Petri dish in an incubator at 25 °C.

Diagram 2 shows the Petri dish after 3 days in the incubator.

Diagram 2



(a) Each colony of bacteria is formed where one bacterium landed on the agar jelly.

How is each colony formed?

.....

.....

(1)

(b) Complete the following calculation to find how many bacteria there were in 1 cm^3 of the undiluted culture.

Number of colonies of bacteria in the Petri dish = ...

These colonies were formed from 1 cm^3 of the culture diluted × 1000.

Therefore, number of bacteria in 1 cm^3 of undiluted culture = ...

(2)

(c) It is important to sterilise the culture medium and all the apparatus before use.

Explain why.

.....

.....

.....

.....

(2)

(d) The bacteria would grow faster at 35 °C. In a school laboratory, the Petri dish should **not** be incubated at a temperature higher than 25 °C.

Why?

.....

.....

(1)

(e) The students decided to repeat their investigation.

Why?

.....

.....

(1)

(Total 7 marks)

Q4. The diagram shows a strawberry plant.

The parent plant grows side shoots.

New plants grow on the side shoots.

The new plants will all have the same inherited characteristics as the original parent plant.

Complete the sentences to explain why.

Use words from the box.

asexual	**differentiation**	**embryos**	**fertilisation**
gametes	**genes**	**mitosis**	**sexual**

(a) The new plant is produced by ..... reproduction.

(1)

(b) In this type of reproduction, body cells divide by .....

(1)

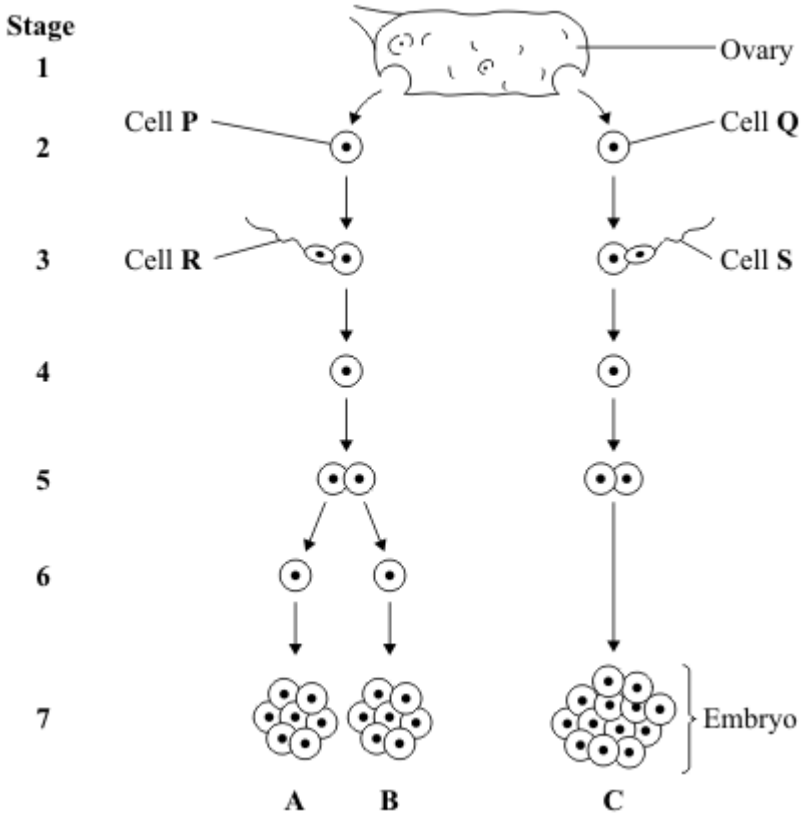
(c) The new plant has the same ..... as the parent plant.

(1)

(Total 3 marks)

Q5. A woman gives birth to triplets.
Two of the triplets are boys and the third is a girl.
The triplets developed from two egg cells released from the ovary at the same time.

The diagram shows how triplets **A**, **B** and **C** developed.



(a) Which stages on the diagram show gametes?

Draw a ring around your answer.

1 and 2 **2 and 3** **3 and 7** **1 and 7**

(1)

(b) Embryo **B** is male.

Which of the following explains why embryo **B** is male?

Tick (✓) **one** box.

Cell **P** has an X chromosome; cell **R** has an X chromosome. ☐

Cell **P** has a Y chromosome; cell **R** has an X chromosome. ☐

Cell **P** has an X chromosome; cell **R** has a Y chromosome. ☐

(1)

(c) The children that develop from embryos **A** and **C** will **not** be identical.

Explain why.

You may use words from the box in your answer.

egg	**genes**	**sperm**

.....

.....

.....

.....

.....

(2)

(d) Single cells from an embryo at **Stage 7** can be separated and grown in a special solution.

(i) What term describes cells that are grown in this way?

Draw a ring around your answer.

lleles **screened cells** **stem cells**

(1)

(ii) What happens when the cells are placed in the special solution?

Tick (✓) **two** boxes.

The cells divide ☐

The cells fertilise ☐

The cells differentiate ☐

The cells separate ☐

(2)

(iii) Give **one** use of cells grown in this way.

.....

.....

(1)

(iv) Some people might object to using cells from embryos in this way.

Give **one** reason why.

.....

.....

.....

(1)

(Total 9 marks)

Q6. Stem cells can be collected from human embryos and from adult bone marrow. Stem cells can develop into different types of cell.

The table gives information about using these two types of stem cell to treat patients.

Stem cells from human embryos	Stem cells from adult bone marrow
It costs £5000 to collect a few cells.	It costs £1000 to collect many cells.
There are ethical issues in using embryo stem cells.	Adults give permission for their own bone marrow to be collected.
The stem cells can develop into most other types of cell.	The stem cells can develop into only a few types of cell.
Each stem cell divides every 30 minutes.	Each stem cell divides every four hours.
There is a low chance of a patient's immune system rejecting the cells.	There is a high chance of a patient's immune system rejecting the cells.
More research is needed into the use of these stem cells.	Use of these stem cells is considered to be a safe procedure.

Scientists are planning a new way of treating a disease, using stem cells.

Use **only** the information above to answer these questions.

(a) Give **three** advantages of using stem cells from embryos instead of from adult bone marrow.

1 .....

2 .....

3 .....

(3)

(b) Give **three** advantages of using stem cells from adult bone marrow instead of from embryos.

1 .....

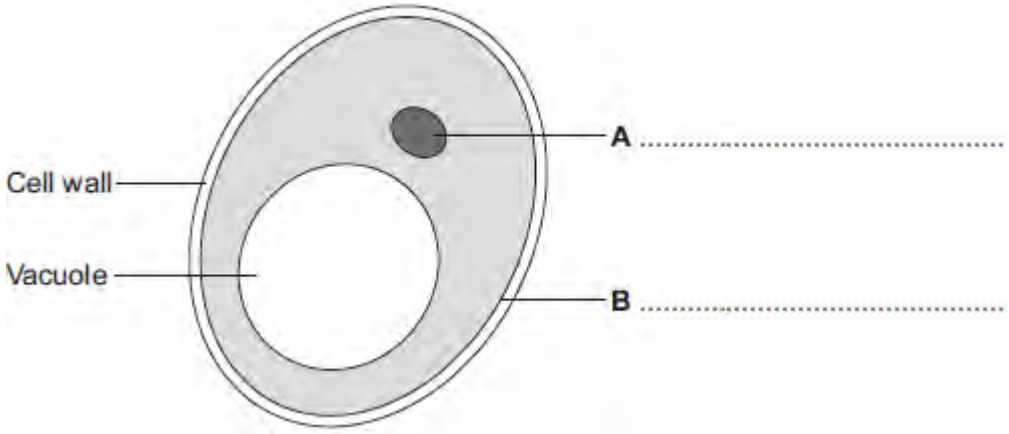
2 .....

3 .....

(3)
(Total 6 marks)

Q7. Human cells and yeast cells have some parts that are the same.

(a) The diagram shows a yeast cell.



Parts **A** and **B** are found in human cells and in yeast cells. On the diagram, label parts **A** and **B**.

(2)

(b) Many types of cell can divide to form new cells.

Some cells in human skin can divide to make new skin cells.

Why do human skin cells need to divide?

.....

.....

(1)

(c) Human stem cells can develop into many different types of human cell.

(i) Use the correct answer from the box to complete the sentence.

embryos	**hair**	**nerve cells**

Human stem cells may come from

.....

(1)

(ii) Use the correct answer from the box to complete the sentence.

cystic fibrosis	**paralysis**	**polydactyly**

Human stem cells can be used to treat

.....

(1)
(Total 5 marks)