Cell Biology part 9 AQA Combined Science

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Name: _____

Class: _____

Date: _____

Time: **74 minutes**

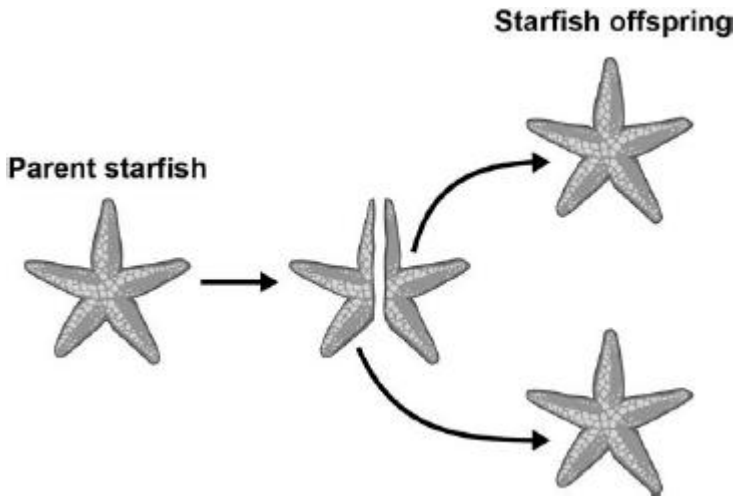
Marks: **73 marks**

Comments:

Q1.

Starfish can split in half. Each half can then grow new arms to form offspring.

This process is shown in the figure below.



(a) What process produces the starfish offspring?

Tick **one** box.

Asexual reproduction	☐
Fertilisation	☐
Selective breeding	☐
Sexual reproduction	☐

(1)

(b) More cells are produced as the starfish grows more arms.

What process will produce more cells in the starfish as they grow?

_____

(1)

(c) All the offspring produced are genetically identical.

What name is given to genetically identical organisms?

_____

(1)

(d) Each body cell of the parent starfish contains 44 chromosomes.

How many chromosomes are in each body cell of the offspring?

_____

(1)

(Total 4 marks)

Q2.

Students used quadrats to estimate the population of dandelion plants on a field.

(a) Describe how quadrats should be used to estimate the number of dandelion plants in a field.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(b) The field measured 40 m by 145 m.

The students used 0.25 m^2 quadrats.

The students found a mean of 0.42 dandelions per quadrat.

Estimate the population of dandelions on the field.

_____

_____

_____

_____

Estimated population of dandelions = _____

(2)

(c) In one area of the field there is a lot of grass growing in the same area as dandelions.

Suggest why the dandelions may **not** grow well in this area.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(Total 10 marks)

Q3.

Different antibiotics destroy bacteria in different ways.

- Some antibiotics disrupt the bacterial cell membrane.
- Some antibiotics disrupt the bacterial cell wall.

(a) Antibiotics that disrupt the bacterial cell membrane often cause more side effects in humans compared with antibiotics that disrupt bacterial cell walls.

Suggest why.

_____

(1)

(b) Some antibiotics prevent ribosomes functioning.

Suggest how this damages the bacterium.

_____

(1)

(c) Drug manufacturers are spending less on research into new antibiotics.

One reason why is because new antibiotics are rarely prescribed.

Some people think that governments should pay drug manufacturers to develop new antibiotics.

Suggest why.

_____

_____

_____

_____

_____

_____

_____

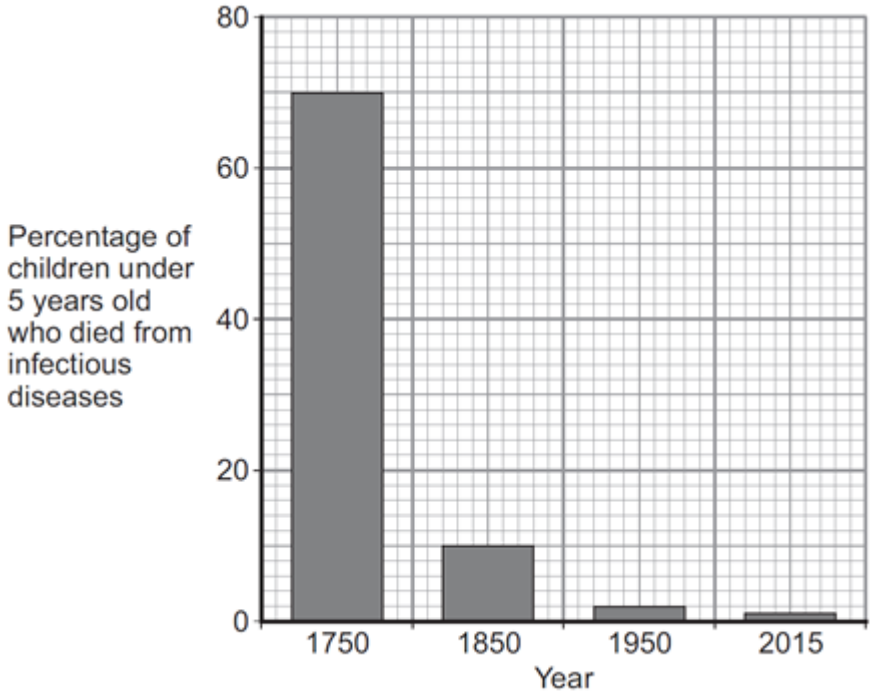
(3)

(Total 5 marks)

Q4.

Pathogens are microorganisms that cause infectious diseases.

(a) The graph shows the percentage of children under 5 years old who died from infectious diseases, in the UK, in four different years.



(i) Between 1750 and 1850 vaccinations were also developed.
What is in a vaccine?

Tick (✓) **one** box.

large amounts of dead pathogens ☐

large amounts of live pathogens ☐

small amounts of dead pathogens ☐

(1)

(ii) The advances in medicine had an effect on death rate.

Describe the effect these advances had between 1750 and 1850.

To gain full marks you should include data from the graph above.

_____

_____

_____

(2)

(b) Antibiotics were developed in the 1940s. Antibiotics kill bacteria.

(i) Which **one** of the following is an antibiotic?

Draw a ring around the correct answer.

cholesterol **penicillin** **thalidomide**

(1)

(ii) The use of antibiotics has **not** reduced the death rate due to all diseases to zero.

Suggest **two** reasons why.

1. _____

_____

2. _____

_____

(2)

(c) In school laboratories, bacteria should be grown at a maximum temperature of 25 °C.

Give **one** reason why companies testing new antibiotics grow bacteria at 37 °C.

_____

_____

(1)

(Total 7 marks)

Q5.

Living organisms are made of cells.

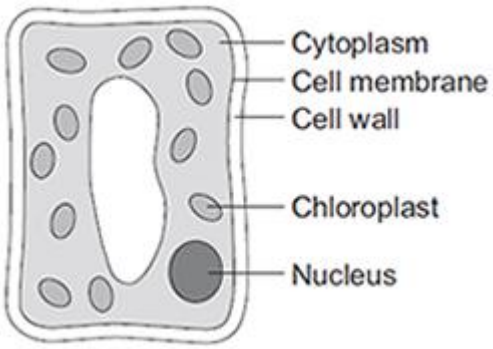
(a) Animal and plant cells have several parts. Each part has a different function.

Draw **one** line from each cell part to the correct function of that part.

Cell part	Function
Cell membrane	Where most energy is released in respiration
Mitochondria	Controls the movement of substances into and out of the cell
Nucleus	Controls the activities of the cell
	Where proteins are made

(3)

(b) The diagram below shows a cell from a plant leaf.



Which **two** parts in the diagram above are **not** found in an animal cell?

1. _____

2. _____

(2)

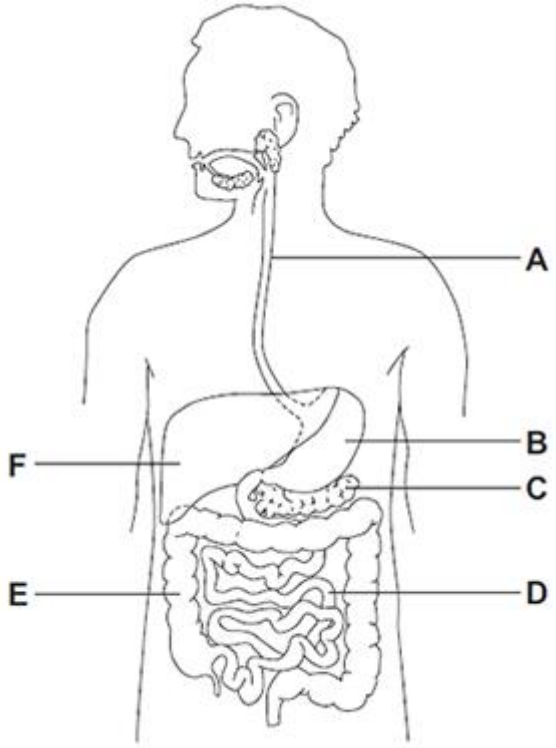
(Total 5 marks)

Q6.

The digestive system breaks down food into small molecules.

The small molecules can be absorbed into the blood.

The diagram below shows the human digestive system.



(a) (i) Which letter, **A**, **B**, **C**, **D**, **E** or **F**, shows each of the following organs?

Write **one** letter in each box.

large intestine ☐

small intestine ☐

stomach ☐

(3)

(ii) Different organs in the digestive system have different functions.

Draw **one** line from each function to the organ with that function.

Function	Organ
Digestion of fat	Large intestine
Absorption of water into the blood	Liver
Production of hydrochloric acid	Small intestine
	Stomach

(3)

(b) Glucose is absorbed into the blood in the small intestine.

Most of the glucose is absorbed by diffusion.

How does the glucose concentration in the blood compare to the glucose concentration in the small intestine?

Tick (✓) **one** box.

- The concentration in the blood is higher. ☐
- The concentration in the blood is lower. ☐
- The concentration in the blood is the same. ☐

(1)

(Total 7 marks)

Q7.

Enzymes are made and used in all living organisms.

(a) What is an enzyme?

_____

_____

_____

_____

(2)

(b) Many enzymes work inside cells.

In which part of a cell will most enzymes work?

Draw a ring around the correct answer.

cell membrane **cytoplasm** **nucleus**

(1)

(c) We can also use enzymes in industry.

Hydrogen peroxide is a chemical that can be used to preserve milk.

Adding a small amount of hydrogen peroxide to the milk kills the bacteria that cause decay. Hydrogen peroxide does not kill all disease-causing bacteria.

The enzyme catalase can be added later to break down the hydrogen peroxide to oxygen and water.

A different way of preserving the milk is by heating it in large machines to 138 °C for a few seconds.

Suggest **one** advantage and **one** disadvantage of using hydrogen peroxide and catalase to preserve milk instead of using heat treatment.

Advantage of hydrogen peroxide and catalase _____

_____

_____

Disadvantage of hydrogen peroxide and catalase _____

_____

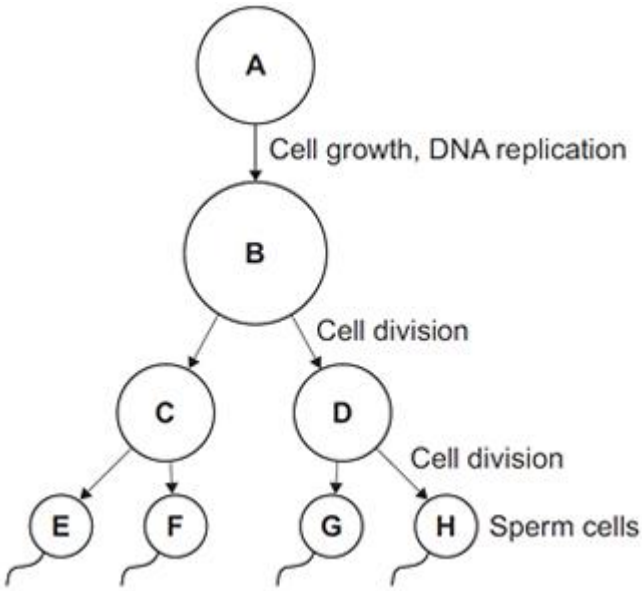
_____

(2)

(Total 5 marks)

Q8.

The diagram below shows the production of human sperm cells.



(a) Name the organ where the processes shown in the diagram above take place.

_____

(1)

(b) (i) Not every cell in the diagram above contains the same amount of DNA.

Cell **A** contains 6.6 picograms of DNA (1 picogram = 10^{-12} grams).

How much DNA is there in each of the following cells?

Cell **B** _____ picograms

Cell **C** _____ picograms

Cell **E** _____ picograms

(2)

(ii) How much DNA would there be in a fertilised egg cell?

_____ picograms

(1)

(iii) A fertilised egg cell divides many times to form an embryo.

Name this type of cell division.

_____

(1)

(c) After a baby is born, stem cells may be collected from the umbilical cord. These can be frozen and stored for possible use in the future.

(i) What are stem cells?

_____

_____

_____

_____

(2)

(ii) Suggest why it is ethically more acceptable to take stem cells from an umbilical cord instead of using stem cells from a 4-day-old embryo produced by In Vitro Fertilisation (IVF).

_____

_____

(1)

(iii) Stem cells taken from a child's umbilical cord could be used to treat a condition later in that child's life.

Give **one** advantage of using the child's own umbilical cord stem cells instead of using stem cells donated from another person.

_____

_____

(1)

(iv) Why would it **not** be possible to treat a genetic disorder in a child using his own umbilical cord stem cells?

_____

_____

(1)

(Total 10 marks)

Q9.

Cells, tissues and organs are adapted to take in different substances and get rid of different substances.

The table shows the concentration of four ions outside cells and inside cells.

Ion	Concentration outside cells in mmol per dm^3	Concentration inside cells in mmol per dm^3
Sodium	140	9
Potassium	7	138
Calcium	2	27
Chloride	118	3

(a) Use information from the table above to complete the following sentences.

Sodium ions will move into cells by the process

of _____ .

Potassium ions will move into cells by the process

of _____ .

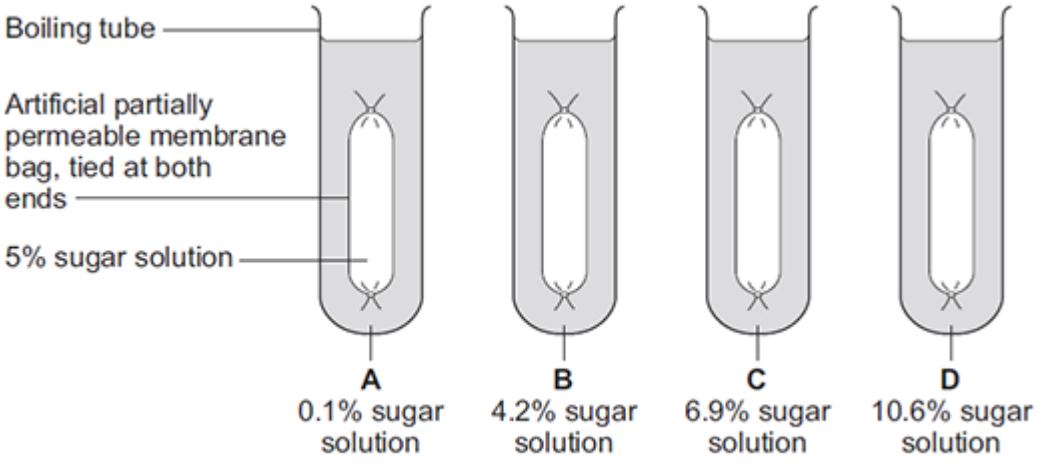
(2)

(b) Some students investigated the effect of the different concentrations of sugar in four drinks, **A**, **B**, **C** and **D**, on the movement of water across a partially permeable membrane.

The students:

- made four bags from artificial partially permeable membrane
- put equal volumes of 5% sugar solution in each bag
- weighed each bag containing the sugar solution
- placed one bag in each of the drinks, **A**, **B**, **C** and **D**
- after 20 minutes removed the bags containing the sugar solution and weighed them again.

The diagram below shows how they set up the investigation.



(i) The bag in drink **A** got heavier after 20 minutes.

Explain why.

_____

_____

_____

_____

(3)

(ii) In which drink, **A**, **B**, **C** or **D**, would you expect the bag to show the smallest change in mass?

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

(1)

(iii) Explain why you think the bag you chose in part **(b)(ii)** would show the smallest change.

_____

_____

_____

_____

(2)

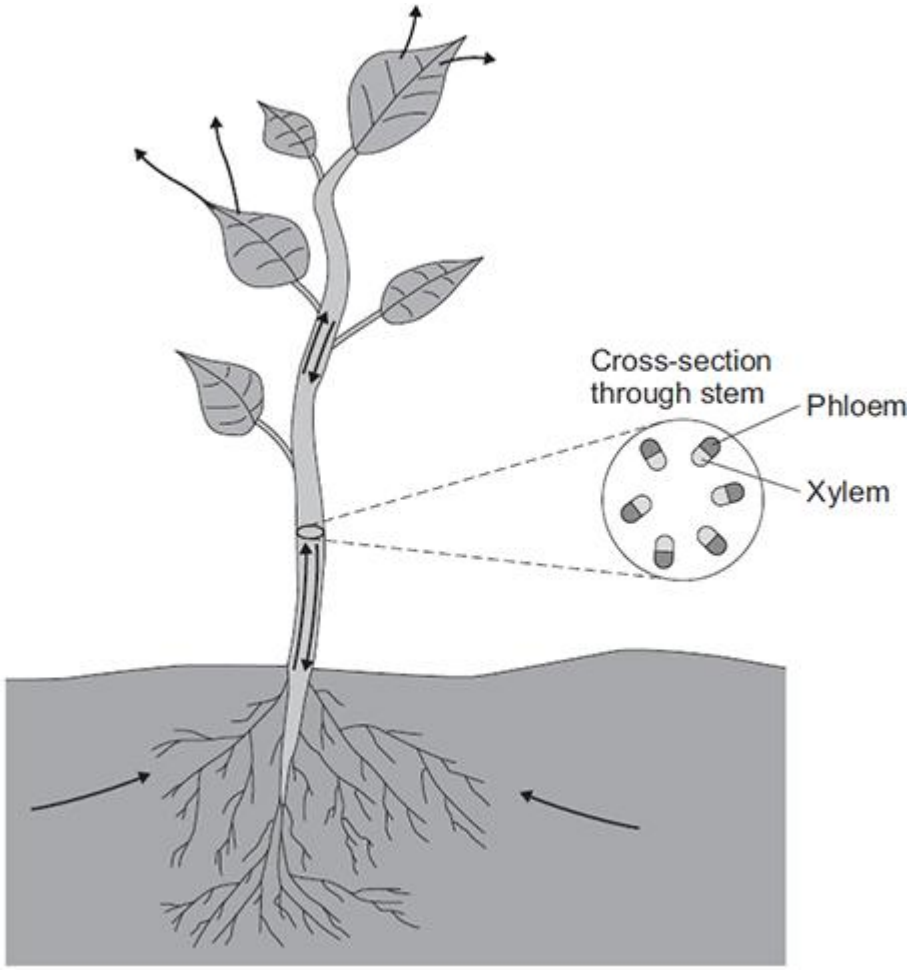
(Total 8 marks)

Q10.

In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

Plants transport many substances between their leaves and roots.

The diagram below shows the direction of movement of substances through a plant.



Describe how **ions**, **water** and **sugar** are obtained and transported through plants.

In your answer you should refer to materials moving upwards in a plant and to materials moving downwards in a plant.

(Total 6 marks)

Q11.

(a) In humans there are two types of cell division: **mitosis** and **meiosis.**

The table below gives statements about cell division.

Tick (✓) **one** box in each row to show if the statement is true for mitosis only, for meiosis only, or for both mitosis **and** meiosis.

The first row has been done for you.

Statement	**Mitosis only**	**Meiosis only**	**Both mitosis and meiosis**
How cells are replaced	✓		
How gametes are made			
How a fertilised egg undergoes cell division			
How copies of the genetic information are made			
How genetically identical cells are produced			

(4)

(b) Stem cells can be taken from human embryos.

In therapeutic cloning, an embryo is produced that has the same genes as the patient.

(i) Name **one** source of human stem cells, other than human embryos.

_____

(1)

(ii) Stem cells from embryos can be transplanted into patients for medical treatment.

Give **one** advantage of using stem cells from embryos, compared with cells from the source you named in part (i).

_____

_____

(1)

(Total 6 marks)

Q1.

(a) asexual reproduction

1

(b) mitosis

1

(c) clones

1

(d) 44

1

[4]

Q2.

(a) (placed) randomly

allow description of placement

1

sufficient number (of quadrats) used

1

count (dandelions) in each quadrat

1

use mean number of dandelions, area of quadrat and area of field to estimate population

accept (area of field / area quadrat) × mean number of dandelions per quadrat

1

(b) (40 × 145) / 0.25 = 23 200

1

(0.42 × 23 200 =) 9744

*allow 9744 with no working shown for **2** marks*

*allow ecf from correct attempt at the previous step) × 0.42 for **1** mark*

1

(c) **Level 2 (3–4 marks):**
A detailed and coherent explanation is given. Logical links between clearly identified relevant points are made to explain why dandelion growth may be limited.

Level 1 (1–2 marks):
Discrete relevant points are made. The logic may be unclear.

0 marks:
No relevant content

Indicative content

factors that may be considered:

competition for resources including:
- light
- water
- space
- mineral ions (allow nutrients / salts / ions from the soil)

reference to why growth may be limited:
- (light) energy for photosynthesis
- water as a raw material for photosynthesis / support
- surface area exposed to light
- sugar / glucose produced in photosynthesis
- (space) to grow bigger
- (space) for growth of root system
- (mineral ions) for growth
- (mineral ions / sugar) for production of larger molecules **or** named example

4

[10]

Q3.

(a) human cells have cell membrane
or
human cells have no cell wall

1

(b) can no longer synthesise proteins

1

(c) antibiotics are being developed at a slower rate than emergence of new resistant strains

1

resistant strains mean we cannot treat (common) infections

1

reduce (future) cost of antibiotic resistant infections

1

[5]

Q4.

(a) (i) small amounts of dead pathogens

1

(ii) decrease

1

by 60 (%)
allow from 70(%) to 10(%)
allow other correct data treatment

1

(b) (i) penicillin

1

(ii) any **two** from:
- antibiotics only kill bacteria
allow antibiotics do not kill viruses

- some bacteria are resistant (to antibiotics)
  allow MRSA not killed by antibiotics
- (correct) antibiotics not always used
  allow course not completed
- deficiency disease(s) not caused by bacteria **or** cannot be treated by antibiotics
- inherited disease(s) not caused by bacteria **or** cannot be treated by antibiotics
- 'lifestyle' diseases not caused by bacteria **or** cannot be treated by antibiotics
  eg heart disease / cancer

  *if no other mark given allow **1** mark for not all diseases are caused by bacteria **or** some diseases are caused by viruses*

2

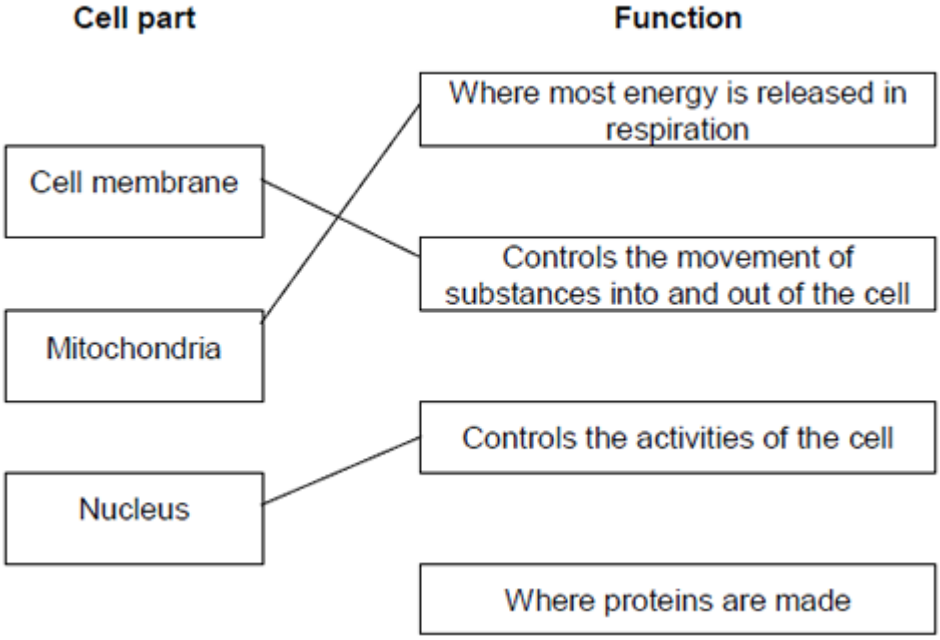
(c) bacteria grow faster

allow this is body temp (at which pathogens grow)

1

[7]

Q5.



(a)

extra lines cancel

3

(b) Cell wall

in either order

1

Chloroplast

allow (permanent) vacuole

1

[5]

Q6.

(a) (i) large intestine = **E**

1

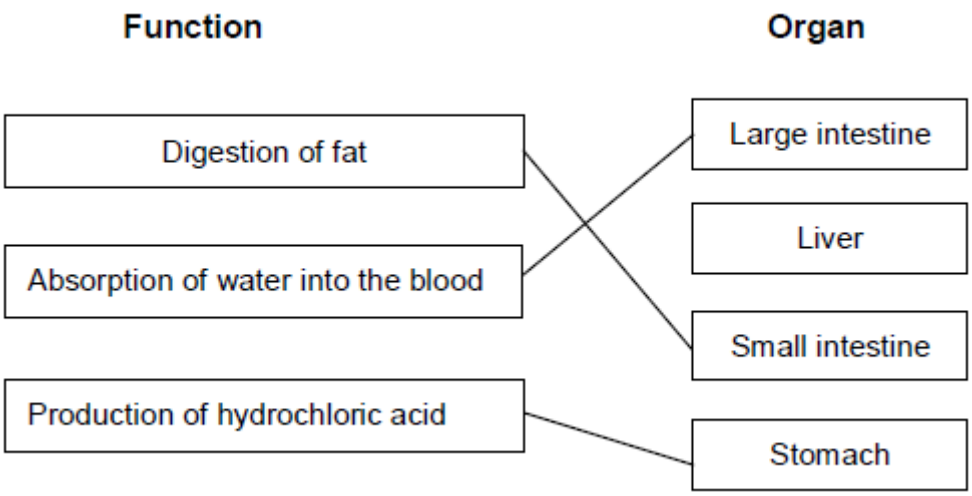
small intestine = **D**

1

stomach = **B**

1

(ii)



extra lines cancel

3

(b) The concentration in the blood is lower.

1

[7]

Q7.

(a) a catalyst / speeds up a reaction

ignore it is not used up

1

it is a protein **or** it is specific / described **or** it has an active site

allow it only acts on one molecule

1

(b) cytoplasm

1

(c) **Advantage:**

any **one** from:
- heat would denature proteins in milk
- heat alters texture or flavour of milk
- catalase / enzyme is specific **or** only affects hydrogen peroxide
- less energy / fuel / lower temperature used so less expensive **or** less pollution

1

Disadvantage:

any **one** from:
- (some pathogens may survive) causing illness
- catalase / enzyme left in milk **or** may cause allergies **or** may alter taste

1

[5]

Q8.

(a) testis / testes

allow testicle(s)

1

(b) (i) **B** = 13.2
C = 6.6
E = 3.3

all 3 correct = 2 marks

2 or 1 correct = 1 mark

*If no marks awarded allow ecf for C **and** E based on answer to B*

ie C = ½ B and E = ½ C for one mark

2

(ii) 6.6

*allow twice answer for cell **E** in part bi*

1

(iii) mitosis

correct spelling only

1

(c) (i) any **two** from:

- cells that are able to divide
- undifferentiated cells / not specialised
- can become other types of cells / tissues **or** become specialised /differentiated

allow pluripotent

2

(ii) 4-day embryo is a (potential) human life

or

destroying/damaging (potential) human life

allow cord would have been discarded anyway

ignore reference to miscarriage

allow cannot give consent

1

(iii) perfect tissue match **or** hard to find suitable donors

allow same/matching antigens

allow no danger of rejection

allow no need to take immunosuppressant drugs (for life)

*ignore genetically identical **or** same DNA*

1

(iv) stem cells have same faulty gene / allele / DNA / chromosomes

allow genetically identical

ignore cells have the same genetic disorder

1

[10]

Q9.

(a) diffusion

1

active transport

1

this order only

(b) (i) concentration (of sugar) in the bag was higher (than in the drink)

allow concentration (of sugar) in the drink was lower (than in the bag)

or

higher concentration of water outside the bag **or** in the drink / boiling tube

*allow higher water potential outside the bag **or** lower water potential inside the bag*

1

(so) water moved in (to the tubing)

*allow water moves down **its** concentration gradient*

*do **not** allow sugar moving*

1

by osmosis

allow diffusion (of water)

*do **not** allow sugar moving by osmosis **or** water moving by active transport*

1

(ii) **B**

1

(iii) close(st) to the concentration in the bag **or** to 5%

*allow small(est) diffusion gradient **or** close(st) to an equilibrium*

1

(so rate of) diffusion / osmosis is slow

allow (so) less water moves in (to the bag)

ignore ref. to sugar

1

[8]

Q10.

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response.

Level 3 (5–6 marks):
Processes used for obtaining specified materials are given.
and
correctly linked to the vessels that the materials are transported in
or
correctly linked to a description of the direction of movement of the materials.
For full credit, in addition to the above descriptors at least **one** of the processes must be linked to the vessel that the material is transported in **and** the direction of the movement of the material.

Level 2 (3–4 marks):
At least **one** process for obtaining a specified material is given
and
is correctly linked to the vessel that the material is transported in
or
correctly linked to a description of the direction of movement of the material

Level 1 (1–2 marks):
At least **one** process (P) for obtaining a material is given
or
at least **one** vessel (V) and the material it carries is given
or
there is a description of the direction of movement (M) for at least **one** material

0 marks:
No relevant points are made

examples of points made in the response Ions:
(P) taken up by diffusion or active transport
- from an area of high to low concentration (diffusion) **or** an area of low to high concentration (active transport)

(V) travels in the xylem
(M) to the leaves **or** from the roots / soil

Water:
(P) taken up by osmosis
- from an area of low to high concentration

allow high concentration of water to low concentration of water

allow from high water potential to low water potential

ignore along a concentration gradient

(V) travels in the xylem
(M) to the leaves **or** from the roots / soil
(P) transpiration stream
- movement replaces water as it evaporates from leaves

(V) in the xylem

Sugar:
(P) made during photosynthesis
(V) travels in the phloem
(M) to other parts of the plant **or** to storage organs **or** travels up and down

[6]

Q11.

(a)

	Mitosis only	Meiosis only	Both mitosis and meiosis
How cells are replaced	✓		
How gametes are made		✓	
How a fertilised egg undergoes cell division	✓		
How copies of the genetic information are made			✓
How genetically identical cells are produced	✓		

if more than one tick per row then no mark

ignore first row

1
1
1
1

(b) (i) (adult) bone marrow

accept (umbilical) cord blood, skin, amniotic fluid / membrane

1

(ii) cells will not be rejected by the patient's body (if they have been produced by therapeutic cloning)

allow easier to obtain linked to embryo stem cells

or

(embryo stem cells) can develop into many different types of cells

allow doesn't need an operation linked to bone marrow

or

(embryo stem cells) not yet differentiated / specialised or undifferentiated

accept embryo cells are pluripotent

1

[6]