Name: __________________________
Class: __________________________
Date: __________________________

Time: 297 minutes
Marks: 294 marks
Comments:
Q1.  
Figure 1 shows an animal cell.

Figure 1

© alex-mit/iStock/Thinkstock

(a) What is structure A?
Tick one box.

- Cell membrane
- Cell wall
- Chromosome
- Cytoplasm

(b) What is structure B?
Tick one box.

- Chloroplast
- Mitochondria
- Nucleus
- Vacuole

(c) Figure 2 shows a sperm cell.
Describe how a sperm cell is adapted to carry out its function.

___________________________________________________________________

___________________________________________________________________

(1)

(d) Substances can move into and out of cells by three processes.

The diagrams show the concentration of different substances inside and outside a root hair cell.

How would each substance move into the root hair cell?

Draw one line from each root hair cell to the correct process.

<table>
<thead>
<tr>
<th>Root hair cell</th>
<th>Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water molecule</td>
<td>Active transport</td>
</tr>
<tr>
<td>Nitrate ion</td>
<td>Diffusion</td>
</tr>
<tr>
<td>Magnesium ion</td>
<td>Osmosis</td>
</tr>
</tbody>
</table>

(2)

(Total 5 marks)

Q2.

The figure below shows a scale drawing of one type of cell in blood.
(a) Use the scale to determine the width of the cell.

Give your answer to the nearest micrometre.

___________________________________________________________________

___________________________________________________________________

Width of cell = _________________ micrometres

(1)

(b) Complete the table below.

<table>
<thead>
<tr>
<th>Part of the blood</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Carries oxygen around the body</td>
</tr>
<tr>
<td></td>
<td>Protects the body against infection</td>
</tr>
<tr>
<td>Plasma</td>
<td></td>
</tr>
</tbody>
</table>

(3)

(c) Platelets are fragments of cells.

Platelets help the blood to clot.

Suggest what might happen if the blood did **not** clot.

___________________________________________________________________

___________________________________________________________________

(1)

(Total 5 marks)

Q3.

Substances can move into cells and out of cells.
(a) Draw a ring around the correct answer to complete each sentence.

Water moves into cells and out of cells by

- active transport.
- osmosis.
- reabsorption.

The water moves through a

- freely permeable
- non-permeable
- partially permeable

(b) Students put plant cells into two different strengths of sugar solutions, A and B.

The diagram below shows what the cells looked like after 1 hour.

Cell in sugar solution A (after 1 hour)  Cell in sugar solution B (after 1 hour)

(i) Describe two ways in which the cell in sugar solution B is different from the cell in sugar solution A.

1. __________________________________________________________
   __________________________________________________________

2. __________________________________________________________
   __________________________________________________________

(ii) A student put red blood cells into water.

Suggest what would happen to the cells.

____________________________________________________________

____________________________________________________________

____________________________________________________________

(c) In the human body, glucose is absorbed into the blood from the small intestine.
The small intestine contains many villi.

Which two of the following help the absorption of glucose in the small intestine?

Tick (✓) two boxes.

- Villi have a cell wall.
- Villi are covered in thick mucus.
- Villi give the small intestine a large surface area.
- Villi have many blood capillaries.

(2)
(Total 7 marks)

Q4.

The diagram shows some of the stages in IVF (in vitro fertilisation).

(a) Use words from the box to name structures A, B, C and D.

<table>
<thead>
<tr>
<th></th>
<th>egg</th>
<th>embryo</th>
<th>fertilised egg</th>
<th>ovary</th>
<th>sperm</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(4)

(b) What do doctors do next with structure D?

___________________________________________________________________
(c) The table gives statistics for an IVF clinic.

<table>
<thead>
<tr>
<th>Age of women treated</th>
<th>Below 35 years</th>
<th>35 – 37 years</th>
<th>38 – 39 years</th>
<th>40 – 42 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of women treated</td>
<td>414</td>
<td>207</td>
<td>106</td>
<td>53</td>
</tr>
<tr>
<td>Number of women who produced one baby</td>
<td>90</td>
<td>43</td>
<td>17</td>
<td>1</td>
</tr>
<tr>
<td>Number of women who produced twins</td>
<td>24</td>
<td>8</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Number of women who produced triplets</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

(i) About what proportion of the treated women aged 35 – 37 years produced one or more babies?

Draw a ring around your answer.

one quarter  one third  half

(ii) This clinic does not give IVF treatment to women over 42 years of age.

Use data from the table to explain why.

(iii) The committee which regulates IVF treatment now advises that only one embryo is used in each treatment.

Suggest one reason for this.
Q5.
Substances can move into and out of cells.

(a) (i) How does oxygen move into and out of cells?

Draw a ring around one answer.

- diffusion
- digestion
- photosynthesis

(b) (i) How does water move into and out of cells?

Draw a ring around one answer.

- breathing
- osmosis
- respiration

(ii) Differences in the concentration of sugars in cells cause water to move into or out of cells at different rates.

Diagram 2 shows three different cells, P, Q and R.

The information shows the percentage concentration of sugar solution in cells P, Q and R.
Water can move from cell to cell. 

Into which cell, P, Q or R, will water move the fastest? 

(1) 
(Total 4 marks)

Q6. 
Villi are found in some parts of the digestive system. 

Diagram 1 shows two villi. 

Diagram 1

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

(i) Structure A is a 

- muscle. 
- nerve. 
- capillary. 

(ii) The villi absorb the products of digestion by 

- dialysis. 
- diffusion. 

(1)
(b) **Diagram 2** shows the digestive system.

![Diagram 2](image)

(i) In which part of the digestive system, X, Y or Z, are most villi found? (1)

(ii) There are about 2000 villi in each cm$^2$ of this part of the digestive system.

Why is it helpful to have lots of villi?

________________________________________________________________________
________________________________________________________________________

(1)

(Total 4 marks)

**Q7.**

The drawing shows a white blood cell ingesting a bacterium.
(i) Use words from the list to label the parts of the white blood cell.

**cell membrane  cell wall  cytoplasm  nucleus  vacuole**

(ii) The scale shows that the white blood cell is 10 micrometres long.

How long is the bacterium? Show your working.

____________ micrometres

(Total 5 marks)

**Q8.**

The photograph shows part of the surface of a plant root. This part of the root is covered with hundreds of structures like the one labelled X.
(a) What is the name of structure X?
   Draw a ring around one answer.

   root hair  stoma  villus

   (1)

(b) (i) Use the scale to measure the length Y–Z on the photograph.

   On the photograph, length Y–Z = ________________ mm.

   (1)

(ii) The photograph shows the root magnified 100 times.

   Calculate the actual length Y–Z.

   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________

   Actual length Y–Z = ________________ mm.

   (2)

(iii) Structure X is very small. There are thousands of structures like X on a plant root.

   How does this help the plant?

   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
   __________________________________________________________________________________
Q9.

Diagram 1 shows an animal cell and some of the structures inside the cell.

(a) Use words from the box to label structures A, B and C, on Diagram 1.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Chromosome</th>
<th>Gamete</th>
<th>Gene</th>
<th>Nucleus</th>
</tr>
</thead>
</table>

(b) Factors that may affect characteristics include genes and the environment.

Diagram 2 shows some of the characteristics of a girl.

Draw one line from each characteristic in List A to the factor(s) that affect the characteristic in List B.

List A | Characteristic
--- | ---
Blue eyes | Scar on arm | Height 162 cm

List B | Factor(s) that affect the characteristic
--- | ---
Affected by genes only
Blue eyes
Affected by environment only

Height 162 cm
Affected by both genes and the environment

Scar on arm
Affected by neither genes nor the environment

Q10.

Cells called receptors detect stimuli in the environment.

The diagram shows a light receptor cell.

Use words from the box to label structures A, B and C.

<table>
<thead>
<tr>
<th>Cell membrane</th>
<th>Cytoplasm</th>
<th>Nucleus</th>
<th>Synapse</th>
</tr>
</thead>
</table>

Q11.

Complete the table by writing the correct process next to its description.

Choose your answers from the list in the box

breathing diffusion digestion osmosis respiration

<table>
<thead>
<tr>
<th>Description</th>
<th>Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moving air in and out of the lungs</td>
<td></td>
</tr>
</tbody>
</table>
Q12.
The diagram shows an animal cell.

(a) (i) Name structures A and B by choosing the correct words from the box.

<table>
<thead>
<tr>
<th>cell membrane</th>
<th>cell wall</th>
<th>cytoplasm</th>
<th>nucleus</th>
<th>vacuole</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structure A: ___________________________________________________</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structure B: ___________________________________________________</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(ii) Which structure named in the box controls the passage of substances in and out of the cell?

___________________________

(b) Distance P to Q on the diagram is the diameter of the cell. This distance was measured on three cells using a microscope. The results were as follows:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>cell 1: 63 micrometres</td>
<td>cell 2: 78 micrometres</td>
<td>cell 3: 69 micrometres</td>
</tr>
</tbody>
</table>

Calculate the average diameter of these cells. Show clearly how you work out your final answer.
Average diameter = ________________ micrometres (2)

Q13.  
(a) Put a tick (✓) in the correct boxes in the table below to show which of the parts given are present in the cells and organisms listed.

<table>
<thead>
<tr>
<th>CYTOPLASM</th>
<th>NUCLEUS</th>
<th>CELL WALL</th>
<th>GENES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leaf mesophyll cell</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Sperm</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(b)  
(i) What is the main job of a leaf mesophyll cell?

______________________________________________________________________________

______________________________________________________________________________

(1)

(ii) Explain one way in which the structure of the leaf mesophyll cell helps it to carry out its job.

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

______________________________________________________________________________

(2)  
(Total 5 marks)

Q14.  
The diagram shows an alveolus and a blood capillary in the lung.
During gaseous exchange, oxygen and carbon dioxide are exchanged across the wall of the alveolus. **On the diagram**, carefully draw **two** arrows to show the paths taken by oxygen and by carbon dioxide during this process. **Label each arrow.**

(i)

(ii) Name the process by which oxygen moves across the wall of the alveolus.

___________________________________________________________________

___________________________________________________________________

(iii) Each lung contains about 350 million alveoli. How does this help gaseous exchange?

___________________________________________________________________

___________________________________________________________________

(Total 5 marks)

Q15.

The diagram shows a cell from a plant leaf.
(a) Name the part of this cell that:

(i) controls the passage of substances in and out of the cell

__________________________________________________________________________ (1)

(ii) is filled with cell sap.

__________________________________________________________________________ (1)

(b) Give the names of two parts of the leaf cell that would not be found in a human liver cell.

__________________________________________________________________________ (2)

(c) The chloroplasts produce oxygen.

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

The oxygen produced by the chloroplasts passes out of the cell by ___________.

- diffusion.
- digestion.
- respiration.

(1)

(Total 5 marks)

Q16.

The diagram shows a group of muscle cells from the wall of the intestine.
(a) On the diagram, use words from the box to name the structures labelled A, B and C.

| cell membrane | cell wall | chloroplast | cytoplasm | nucleus |

(b) How are these muscle cells adapted to release a lot of energy?

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

(Total 5 marks)

Q17.
The diagram shows a small part of a lung.
The arrow on the diagram shows the movement of oxygen from the air in the alveolus to cell X.

Complete the sentences by drawing a ring around the correct answer.

(i) Cell X is a red cell

(i) platelet

(ii) Oxygen moves from the air in the alveolus into cell X by

(ii) diffusion

(iii) The substance in cell X that combines with oxygen is called

(iii) glycogen

(iv) Cell X does not have a cell membrane, cytoplasm, or a nucleus.

(b) On the diagram, draw an arrow to show the movement of carbon dioxide during gas exchange.

(Total 5 marks)

Q18.
The diagram shows a cell from the lining of the lung. This cell is specialised to allow gases to pass through quickly.

(a) Use words from the box to label structures A, B and C.

(b) (i) Which feature of this cell allows oxygen to pass through quickly?

Put a tick (✓) in the box next to your choice.

- It is thin.
- It has a large nucleus.
- It has many mitochondria.

(ii) Complete the sentence by drawing a ring around the correct answer in the box.
Q19.

(a) The diagrams show cells containing and surrounded by oxygen molecules. Oxygen can move into cells or out of cells.

Into which cell, A, B, C or D, will oxygen move the fastest?

Write your answer, A, B, C or D, in the box.  

(b) Draw a ring around the correct word to complete each sentence.

(i) Oxygen is taken into cells by the process of diffusion, osmosis or respiration.

(Total 5 marks)
Q20.
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

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

Diagram 2
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. __________________________________________________________

(ii) Give two disadvantages of using stem cells.
   1. __________________________________________________________
   2. __________________________________________________________

Q21.
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

(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.

(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
(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.

- alleles
- screened cells
- stem cells

(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

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

_____________________________________________________________________________________________________________________________

_____________________________________________________________________________________________________________________________

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

Give one reason why.

_____________________________________________________________________________________________________________________________

_____________________________________________________________________________________________________________________________

_____________________________________________________________________________________________________________________________

(Total 9 marks)
Diagram 1 shows a cell from a leaf.

(a) How is the leaf cell specialised to carry out photosynthesis?

Tick (✓) one box.

- It has a permanent vacuole.
- It has many chloroplasts.
- It has cytoplasm.
- It has many mitochondria.

(b) Diagram 2 shows another type of plant cell.

Give two ways in which this cell is different from an animal cell.

1. ____________________________________________________________________

2. ____________________________________________________________________
Q23.
This question is about cells.

(a) (i) The diagram shows a sperm cell.

Use words from the box to label parts A and B.

| cell membrane | cytoplasm | nucleus |

(ii) The diagram shows a cell from a leaf.

Give the letters of two parts of the leaf cell which would not be found in a sperm cell. □ and □.

(b) Sperm cells have many mitochondria.

Why do sperm cells need many mitochondria?

Tick (✓) one box.

- Sperm cells are involved in fertilisation. □
- Sperm cells are produced in very large numbers. □
- Sperm cells need a lot of energy to swim. □
Q24.
The diagram shows part of a plant root. A large number of structures like the ones labelled $X$ grow out of the surface of the root.

(a) (i) What is the name of structure $X$?
Draw a ring around one answer.

- root hair
- stoma
- villus

(ii) Name two substances which structure $X$ absorbs from the soil.

1. ________________________________
2. ________________________________

(b) The substances in (a)(ii) are transported from the roots to the leaves. Carbon dioxide also enters the leaves.

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

(i) Carbon dioxide enters leaves through

- alveoli.
- stomata.
- villi.

(ii) Carbon dioxide enters leaf cells by

- active transport.
- diffusion.
- reabsorption.

(Total 5 marks)
Q25.
(a) **List A** gives four structures in the human body.

**List B** gives the functions of some structures in the body.

Draw a straight line from each structure in **List A** to the correct function in **List B**.

<table>
<thead>
<tr>
<th>List A – Structure</th>
<th>List B – Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alveoli</td>
<td>Surround and protect the lungs</td>
</tr>
<tr>
<td>Veins</td>
<td>Filter the blood</td>
</tr>
<tr>
<td>Villi</td>
<td>Carry blood towards the heart</td>
</tr>
<tr>
<td>Ribs</td>
<td>Absorb digested food</td>
</tr>
<tr>
<td></td>
<td>Allow oxygen to enter the blood</td>
</tr>
</tbody>
</table>

(b) Draw a ring around the correct answer to complete the sentence.

In the lungs, oxygen enters the blood from the air by __________.

- diffusion.
- filtration.
- respiration.

(Total 5 marks)

Q26.
The diagrams show four types of cell, **A**, **B**, **C** and **D**.
Two of the cells are plant cells and two are animal cells.
(a) (i) Which two of the cells are plant cells?
Tick (✓) one box.

A and B

A and D

C and D

(ii) Which part is found only in plant cells?
Draw a ring around one answer.

| cell membrane | cell wall | nucleus |

(1)

(b) (i) Which cell, A, B, C or D, is adapted for swimming?

(1)
(ii) Which cell, A, B, C or D, can produce glucose by photosynthesis?

(c) Cells A, B, C and D all use oxygen.
For what process do cells use oxygen?
Draw a ring around one answer.

osmosis photosynthesis respiration

(Question 27)

The diagram shows part of the lining of the small intestine.

(a) (i) Name structure X.
Draw a ring around one answer.

alveolus thorax villus

(ii) Choose three ways in which structure X is adapted to help the absorption of soluble food.
Tick (✓) three boxes.

It is ventilated.

Its outer surface is one cell thick.
It has a large surface area. 

It contains a layer of muscle. 

It has a good blood supply. 

Its cells contain haemoglobin. 

(b) Name the process by which soluble food enters the blood.

Draw a ring around one answer.

diffusion  fermentation  transpiration

(1) (Total 5 marks)

Q28.
Humans reproduce sexually.

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

(a) (i) At fertilisation genes join together.

sex cells

(ii) At fertilisation a single cell forms, which has new pairs of nuclei.

sex cells.

(1)

(b) Cystic fibrosis can be inherited by children whose parents do not have it.

(i) A person who has cystic fibrosis has copies of the cystic fibrosis allele.

two

three four

large.

(ii) The cystic fibrosis allele is recessive.

(1)
(c) The diagram shows a human body cell.

Choose the correct answer from the box to complete each sentence.

<table>
<thead>
<tr>
<th>cell membrane</th>
<th>cell wall</th>
<th>cytoplasm</th>
<th>nucleus</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(i) The part of the cell labelled B is the ________________________________ (1)

(ii) The part of the cell labelled C is the ________________________________ (1)

(d) Which part of the cell, A, B, C or D:

(i) contains the allele for cystic fibrosis

(ii) is affected by cystic fibrosis?

(Q29.
Leaves are made from layers of cells.
The diagram shows a section through part of a leaf.)
(a) (i) Which word in the table describes layer A?
Tick (✓) one box.

<table>
<thead>
<tr>
<th>Layer A</th>
<th>Tick (✓)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tissue</td>
<td></td>
</tr>
<tr>
<td>Organ</td>
<td></td>
</tr>
<tr>
<td>Cell</td>
<td></td>
</tr>
</tbody>
</table>

(ii) Which word describes a whole leaf?
Draw a ring around one answer.

organ    tissue    organism

(1)

(b) (i) Which two layers of cells, A, B, C and D, can photosynthesise?
Use information from the diagram to help you.
Tick (✓) two boxes.

Layer A   


(ii) Give one reason for your answer.

______________________________________________________________

______________________________________________________________

(1)

(c) List X gives the names of two parts of a cell. List Y gives information about parts of a cell.

Draw one line between each part of the cell in list X and information about it in list Y.

<table>
<thead>
<tr>
<th>List X</th>
<th>List Y Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part of a cell</td>
<td>Controls the passage of substances into the cell</td>
</tr>
<tr>
<td>Vacuole</td>
<td>Contains the cell sap</td>
</tr>
<tr>
<td>Nucleus</td>
<td>Controls the activities of the whole cell</td>
</tr>
</tbody>
</table>

(2)

(Total 7 marks)

Q30.
The diagram shows a plant cell from a leaf.
(a) List A gives the names of three parts of the cell. List B gives the functions of parts of the cell.

List A
Parts of the cell

- Nucleus
- Cytoplasm
- Chloroplast

List B
Functions

- Where most of the chemical reactions take place
- Absorbs light energy to make food
- Strengthens the cell
- Controls the activities of the cell

(b) Respiration takes place in the cell.

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

All cells use respiration to release

energy
oxygen.
sugar.
Q31.
Villi are found in some parts of the digestive system.

Diagram 1 shows two villi.

Diagram 1

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

(i) Structure A is a
    - muscle.
    - nerve.
    - capillary.

(ii) The villi absorb the products of digestion by
    - dialysis.
    - diffusion.
    - osmosis.

(b) Diagram 2 shows the digestive system.
In which part of the digestive system, X, Y or Z, are most villi found? (1)

There are about 2000 villi in each cm² of this part of the digestive system. Why is it helpful to have lots of villi? (1)

Q32.

Substances can move into and out of cells.

(a) (i) How does oxygen move into and out of cells?

Draw a ring around one answer.

diffusion digestion photosynthesis

(1)

(ii) Diagram 1 shows the percentage concentration of oxygen in three cells, A, B and C.
Oxygen can move from cell to cell.

Into which cell, A, B or C, will oxygen move the fastest?

(b) (i) How does water move into and out of cells?

Draw a ring around one answer.

breathing  osmosis  respiration

(ii) Differences in the concentration of sugars in cells cause water to move into or out of cells at different rates.

Diagram 2 shows three different cells, P, Q and R.

The information shows the percentage concentration of sugar solution in cells P, Q and R.

Diagram 2

Water can move from cell to cell.
Into which cell, P, Q or R, will water move the fastest? 

(1) 
(Total 4 marks)

Q33.

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.

<table>
<thead>
<tr>
<th>asexual</th>
<th>differentiation</th>
<th>embryos</th>
<th>fertilisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>gametes</td>
<td>genes</td>
<td>mitosis</td>
<td>sexual</td>
</tr>
</tbody>
</table>

(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)

Q34.

(a) The diagram shows the structure of a bacterial cell.
(i) On the diagram use words from the box to label structures A, B and C.

<table>
<thead>
<tr>
<th>cell membrane</th>
<th>cell wall</th>
<th>chloroplast</th>
<th>cytoplasm</th>
<th>plasmid</th>
</tr>
</thead>
</table>

(ii) Give one difference between the structure of the bacterial cell and an animal cell.

______________________________________________________________

(1)

(iii) Name one structure that is found in a plant cell but is not found in a bacterial or an animal cell.

______________________________________________________________

(1)

(b) Cells can be specialised for a particular job.

The diagram shows the structure of a human sperm cell.

Describe how the long tail and the mitochondria help the sperm to do its job.

Long tail ___________________________________________________________
_________________________________________________________________
_________________________________________________________________
Mitochondria _______________________________________________________
_________________________________________________________________
_________________________________________________________________

(4)
(Total 9 marks)

Q35.

The diagrams show four types of cell, A, B, C and D. Two of the cells are plant cells and two are animal cells.
(a) (i) Which **two** of the cells are plant cells?

Tick (✓) **one** box.

- A and B
- A and D
- C and D

(1)

(ii) Give **one** reason for your answer.

________________________________________________________________________

________________________________________________________________________

(1)

(b) (i) Which cell, A, B, C or D, is adapted for swimming?  

(1)

(ii) Which cell, A, B, C or D, can produce glucose by photosynthesis?  

(1)
(c) Cells A, B, C and D all use oxygen. For what process do cells use oxygen? Draw a ring around one answer.

- osmosis
- photosynthesis
- respiration

(Total 5 marks)

Q36.
The diagram shows an alveolus and a blood vessel in the lung.

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

(i) Blood vessel X is
   - an artery.
   - a capillary.
   - a vein.

(ii) Gases pass across the wall of the alveolus by
   - diffusion.
   - evaporation.
   - fermentation.

(iii) The table compares the concentrations of some gases in inhaled air and
Complete the table. Write ‘lower’ or ‘higher’ in each box. One line has been completed for you as an example.

<table>
<thead>
<tr>
<th>Gas</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Inhaled air</td>
</tr>
<tr>
<td>Water vapour</td>
<td>lower</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td></td>
</tr>
<tr>
<td>Oxygen</td>
<td></td>
</tr>
</tbody>
</table>

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

(i) Oxygen is carried in the blood mainly in

- blood plasma.
- red blood cells.
- white blood cells.

(ii) In the blood, the oxygen combines with

- carbon dioxide.
- haemoglobin.
- urea.

Q37.

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.

<table>
<thead>
<tr>
<th>Stem cells from human embryos</th>
<th>Stem cells from adult bone marrow</th>
</tr>
</thead>
<tbody>
<tr>
<td>It costs £5000 to collect a few cells.</td>
<td>It costs £1000 to collect many cells.</td>
</tr>
<tr>
<td>There are ethical issues in using embryo stem cells.</td>
<td>Adults give permission for their own bone marrow to be collected.</td>
</tr>
<tr>
<td>The stem cells can develop into most other types of cell.</td>
<td>The stem cells can develop into only a few types of cell.</td>
</tr>
<tr>
<td>Each stem cell divides every 30</td>
<td>Each stem cell divides every four</td>
</tr>
</tbody>
</table>
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. _________________________________________________________________

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

1. _________________________________________________________________
2. _________________________________________________________________
3. _________________________________________________________________

(Total 6 marks)

Q38.

The diagrams show four cells, A, B, C and D.

Use letters A, B, C or D to answer these questions.

(a) Which cell can photosynthesise?
Q39. People have different shaped ear lobes, either 'hanging' or 'attached'.

The diagrams show the two shapes of ear lobe.

A gene controls the shape of a person’s ear lobes.

The diagram shows a family tree.

Parents A and B both have hanging ear lobes.

(a) The key does not show the symbol for a female with attached ear lobes.

Draw the symbol for the key to show a female with attached ear lobes.

Use information in the family tree and the key.

Symbol = ______________________________

(b) Look at the family tree.
What does the information in the family tree tell you about the allele for hanging ear lobes?

Draw a ring around the correct word to complete the sentence.

The allele for hanging ear lobes is

- dominant.
- weak.
- recessive.

(c) (i) Parents A and B have three children, C, D and E. All three children are boys.

What are the chances that the next child of parents A and B will be a girl?

Draw a ring around one answer.

- no chance (0 %)
- a half (50 %)
- certain (100 %)

(ii) Which statement explains your answer to part (c)(i)?

Tick (✔) one box.

- Some of B’s sperm cells have an X chromosome.
- Some of A’s egg cells have a Y chromosome
- All of B’s sperm cells have an X chromosome.

(Q40.

The diagram shows a section through a plant leaf.)
(a) Use words from the box to name **two** tissues in the leaf that transport substances around the plant.

<table>
<thead>
<tr>
<th>epidermis</th>
<th>mesophyll</th>
<th>phloem</th>
<th>xylem</th>
</tr>
</thead>
</table>

_________________________________________ and ____________________________________________

(1)

(b) Gases *diffuse* between the leaf and the surrounding air.

(i) What is diffusion?

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

____________________________________________________________________________________

(2)

(ii) Name one gas that will diffuse from point A to point B on the diagram on a sunny day.

____________________________________________________________________________________

(1)

(Total 4 marks)

**Q41.**

In sexual reproduction, an egg fuses with a sperm.

(a) (i) Draw a ring around the correct answer to complete the sentence.
An egg and a sperm fuse together in the process of fertilisation.

(i) Egg cells and sperm cells each contain the structures given in the box.

| chromosome | gene | nucleus |

List these three structures in size order, starting with the smallest.

1. ________________________________ (smallest)
2. ________________________________
3. ________________________________ (largest)

(ii) The egg and the sperm contain genetic material.

The genetic material is made of

- carbohydrate.
- DNA.
- protein.

(iii) The diagram below shows the inheritance of X and Y chromosomes.

(b) The diagram below shows the inheritance of X and Y chromosomes.

(i) Draw a tick (✔️) on the part of the diagram that shows a sperm cell.

(ii) What is the chance of having a female child?

Give the reason for your answer.

________________________________________________________________________
Q42.

The diagrams show an animal cell and a bacterial cell.

(a) (i) Structures A and B are found in both the animal cell and the bacterial cell.

Use words from the box to name structures A and B.

<table>
<thead>
<tr>
<th>cell membrane</th>
<th>chloroplast</th>
<th>cytoplasm</th>
<th>vacuole</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(ii) Both cells contain genetic material.

Name the structure in the animal cell that contains genetic material.

___________________________________________________________________________

(1)

(b) List A gives three structures found in animal cells.

List B gives four functions of cell structures.

Draw one line from each structure in List A to its correct function in List B.

<table>
<thead>
<tr>
<th>List A – Structure</th>
<th>List B – Function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Controls what substances enter the cell</td>
</tr>
</tbody>
</table>
Q43.

(a) (i) Mitosis and meiosis are types of cell division.

For each feature in the table, tick (✓) one box to show if the feature occurs:

- only in mitosis
- only in meiosis.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Only in mitosis (✓)</th>
<th>Only in mitosis (✓)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Produces new cells during growth and repair</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Produces gametes (sex cells)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Produces genetically identical cells</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(ii) Name the organ that produces gametes (sex cells) in:

- a man ______________________
- a woman ____________________

(b) **X** and **Y** chromosomes are the sex chromosomes. They determine a person’s sex.

What sex chromosomes will be found in the body cells of:

(i) a man ______________________
Q44.

The diagram shows a cell.

(a) (i) Use words from the box to name the structures labelled A and B.

<table>
<thead>
<tr>
<th>cell membrane</th>
<th>chloroplast</th>
<th>cytoplasm</th>
<th>nucleus</th>
</tr>
</thead>
</table>

A ______________________
B ______________________

(ii) The cell in the diagram is an animal cell.

How can you tell it is an animal cell and not a plant cell?

Give two reasons.

1. ____________________________________________________________
   ____________________________________________________________

2. ____________________________________________________________
   ____________________________________________________________

(b) Oxygen will diffuse into the cell in the diagram.
Why?
Use information from the diagram.


(c) The cell shown in the diagram is usually found with similar cells.

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

Scientists call a group of similar cells

an organ.
a system.
a tissue.

(Total 6 marks)

Q45.

When an organism grows, new cells are produced by cell division.

(a) What type of cell division happens to produce new body cells?

Tick one box.

Differentiation

Meiosis

Mitosis

(b) Why can cancers grow very large?

Tick one box.

Cancer cells are specialised

Cell division is slow

Cell division is uncontrolled

(c) Give one factor which increases the risk of getting cancer.
(d) Survival rates for people with cancer have improved a lot.

People who are alive 10 years after diagnosis are usually considered to be cured.

The figure below shows data for people diagnosed with cancer in 1961 and 2001.

78% of people diagnosed with breast cancer in 2001 were alive 10 years later.

Complete the figure above to show this information.

(e) Which type of cancer diagnosed in 1961 had the highest survival rate?

Tick one box.

- Breast
- Prostate
- Skin
- Testicular

(f) Which type of cancer shows the biggest improvement in the percentage of people
alive after 10 years?

Tick one box.

Breast

Prostate

Skin

Testicular

(g) Suggest two reasons why the survival rates for all cancers have increased.

1. _________________________________________________________________
__________________________________________________________________
2. _________________________________________________________________
__________________________________________________________________

(Total 8 marks)

Q46.

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.

(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?
(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

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

| cystic fibrosis | paralysis | polydactyly |

Human stem cells can be used to treat

Q47.

(a) Some antibiotics work by destroying the cell membranes of bacteria.

Suggest why these antibiotics may have side effects in the animals that are given these antibiotics.

(b) Each arrow on the figure below shows the date of discovery of each new type of antibiotic.


In which 10 year period were most new types of antibiotic discovered?

(c) The figure above shows 22 new types of antibiotic. These were discovered before 2010.

Determine the percentage of types of antibiotic that have been discovered between 1980 and 2010.

Use information from the figure above.

Give your answer to 2 significant figures.
(d) Bacteria can evolve rapidly.

Many bacteria can develop into new strains which are resistant to antibiotics.

Complete the table below to show if each action is **more likely** or **less likely** to help bacteria to become antibiotic resistant.

Put a tick in each row.

<table>
<thead>
<tr>
<th>Action</th>
<th>More likely</th>
<th>Less likely</th>
</tr>
</thead>
<tbody>
<tr>
<td>Take painkillers for headache</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Washing with antiseptic hand gel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adding antibiotics to food for cows</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Giving antibiotics for colds and flu</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stopping antibiotics as soon as you feel better</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Total 8 marks)

Q48.

The image below shows some cells in the lining of the stomach.

(a) (i) Use words from the box to name structures A and B.

<table>
<thead>
<tr>
<th>cell membrane</th>
<th>chloroplast</th>
<th>cytoplasm</th>
<th>vacuole</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(ii) What is the function of the nucleus?

Tick (✓) one box.
To control the activities of the cell

To control movement of substances into and out of the cell

To release energy in respiration

(b) Draw one line from each part of the human body to its correct scientific name.

<table>
<thead>
<tr>
<th>Part of human body</th>
<th>Scientific name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Layer of cells lining the stomach</td>
<td>An organ</td>
</tr>
<tr>
<td>Stomach</td>
<td>An organism</td>
</tr>
<tr>
<td>Mouth, stomach, intestines, liver and pancreas</td>
<td>An organ system</td>
</tr>
<tr>
<td></td>
<td>A tissue</td>
</tr>
</tbody>
</table>

Q49.
The diagram below shows the parts of the body that digest and absorb food.

It also shows some details about the structure of the stomach.
(a) Complete the table to show whether each structure is an organ, an organ system or a tissue.

For each structure, tick (\checkmark) one box.

<table>
<thead>
<tr>
<th>Structure</th>
<th>Organ</th>
<th>Organ system</th>
<th>Tissue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stomach</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cells lining the stomach</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mouth, oesophagus, stomach, liver, pancreas, small and large intestine</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(b) (i) The blood going to the stomach has a high concentration of oxygen. The cells lining the stomach have a low concentration of oxygen.

Complete the following sentence.

Oxygen moves from the blood to the cells lining the stomach by the process of ________________________________ .

(ii) What other substance must move from the blood to the cells lining the stomach so that respiration can take place?

Draw a ring around the correct answer.

- glucose
- protein
- starch
(iii) In which part of a cell does aerobic respiration take place?

Draw a ring around the correct answer.

- cell membrane
- mitochondria
- nucleus

(Total 5 marks)

Q50.

Plants need different substances to survive.

**Figure 1** shows the roots of a plant.

(a) (i) Mineral ions are absorbed through the roots.

Name **one** other substance absorbed through the roots.

(ii) The plant in **Figure 1** has a higher concentration of mineral ions in the cells of its roots than the concentration of mineral ions in the soil.

Which **two** statements correctly describe the absorption of mineral ions into the plant’s roots?

Tick (√) **two** boxes.

- The mineral ions are absorbed by active transport.
- The mineral ions are absorbed by diffusion.
- The mineral ions are absorbed down the concentration gradient.
The absorption of mineral ions needs energy.

(iii) The plant in Figure 1 has roots adapted for absorption. Figure 2 shows a magnified part of a root from Figure 1.

Describe how the root in Figure 2 is adapted for absorption.

________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________
________________________________________________________________________________________

(b) The leaves of plants have stomata. What is the function of the stomata?

________________________________________________________________________________________
________________________________________________________________________________________

(c) Figure 3 shows the underside of two leaves, A and B, taken from a plant in a man's house.
(i) In Figure 3, the cells labelled X control the size of the stomata.

What is the name of the cells labelled X?

Tick (✓) one box.

Guard cells

Phloem cells

Xylem cells

(ii) Describe how the appearance of the stomata in leaf B is different from the appearance of the stomata in leaf A.

________________________________________________________________________

________________________________________________________________________

(iii) The man forgets to water the plant.

What might happen to the plant in the next few days if the stomata stay the same as shown in leaf A in Figure 3?

________________________________________________________________________

________________________________________________________________________

Q51.

Our lungs help us to breathe.
The image below shows the human breathing system.

(a) (i) Name part A.

______________________________________________________________ (1)

(ii) Give one function of the ribs.

______________________________________________________________ (1)

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

<table>
<thead>
<tr>
<th>active transport</th>
<th>diffusion</th>
<th>osmosis</th>
</tr>
</thead>
</table>

Oxygen moves from the air inside the lungs into the blood by the process of __________________________. (1)

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

<table>
<thead>
<tr>
<th>arteries</th>
<th>capillaries</th>
<th>veins</th>
</tr>
</thead>
</table>

Oxygen moves from the lungs into the blood through the walls of the __________________________. (1)

(iii) Inside the lungs, oxygen is absorbed from the air into the blood.

Give two adaptations of the lungs that help the rapid absorption of oxygen into the blood.

1. __________________________________________________________

______________________________________________________________
Q52.
Pathogens cause infectious diseases in animals and plants.

(a) Draw one line from each disease to the type of pathogen that causes the disease.

<table>
<thead>
<tr>
<th>Disease</th>
<th>Type of pathogen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gonorrhoea</td>
<td>Bacterium</td>
</tr>
<tr>
<td>Malaria</td>
<td>Fungus</td>
</tr>
<tr>
<td>Measles</td>
<td>Protist</td>
</tr>
<tr>
<td></td>
<td>Virus</td>
</tr>
</tbody>
</table>

(b) Some parts of the human body have adaptations to reduce the entry of live pathogens.

Look at Figure 1.

Figure 1

Trachea

Explain how the trachea is adapted to reduce the entry of live pathogens.

___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
___________________________________________________________________
(c) Malaria is a serious disease that can be fatal.

Malaria is spread to humans by infected mosquitoes.

Scientists investigated the behaviour of mosquitoes to understand how the spread of malaria could be controlled.

Figure 2 shows the equipment the scientists used.

![Figure 2](image)

This is the method used.

1. 30 mosquitoes **infected with malaria** were placed in Container A.
2. 30 **uninfected** mosquitoes were placed in Container B.
3. The total number of times the mosquitoes landed on the socks was recorded.

Name the dependent variable and suggest one control variable in this investigation.

Dependent variable ____________________________________________________________

Control variable __________________________________________________________

(d) Infected mosquitoes landed on the socks three times more often than uninfected mosquitoes.

Explain how this information can be used to reduce the spread of malaria.

____________________________________________________________________________

____________________________________________________________________________
(e) Tobacco mosaic virus (TMV) affects many species of plant.

**Figure 3** shows a leaf infected with TMV.

**Figure 3**

© Nigel Cattlin/Getty Images

TMV destroys chloroplasts in the leaf.

Explain how this could affect the growth of the plant.

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

___________________________________________________________________

(Total 14 marks)
Mark schemes

Q1.
(a) cell membrane
   *extra boxes ticked negates mark*

(b) nucleus
   *extra boxes ticked negates mark*

(c) has a tail so it can swim (to an egg)
   *accept has many mitochondria to release energy to swim*

(d) [Diagram showing active transport, diffusion, osmosis, water molecule, nitrate ion, magnesium ion]
   *all three correct for 2 marks*
   *one or two correct for 1 mark*

Q2.
(a) 8 (micrometres)

(b) red blood cell(s)

white blood cell(s)
   *accept named cell*
   *eg phagocyte / lymphocyte*
(plasma) transports proteins / dissolved substances / food (molecules) / urea / hormones / blood cells

(c) any one from:
   • you could lose a lot of blood
   • bleed internally
     allow bleeding would not stop
     allow could bleed to death

Q3.
   (a) osmosis
   partially permeable

   (b) (i) any two from:
      allow correct answers in terms of A
      • vacuole is small(er)
      • cytoplasm has shrunk
        allow cytoplasm is smaller
      • gap between cytoplasm and cell wall
      • cell wall curves inwards
        allow cell B is flaccid or cell A is turgid
      • the (cell) membrane has moved away from the wall

      (ii) any one from:
      • water will move / diffuse in
      • (cells) will swell
      • (cells) will burst
        ignore turgid

   (c) villi give the small intestines a large surface area
   villi have many blood capillaries

Q4.
   (a) A sperm
   B egg
C fertilised egg

D embryo

(b) insert into mother
   
   ignore fertilise / check fertilisation / check viability

womb / uterus

(c) (i) one quarter

(ii) no / little chance of success over 42

reference to table of only two women in the age bracket 40-42 years became pregnant

the statement 'only 2 out of 53 40-42 year old women became pregnant / had babies' gains 2 marks

(iii) so fewer twins / multiple births
     or
     multiple births more dangerous

Q5.

(a) (i) diffusion
     apply list principle

(ii) A
     apply list principle

(b) (i) osmosis
     apply list principle

(ii) R
     apply list principle

Q6.

(a) (i) capillary

(ii) diffusion

(b) (i) Z
     ignore any names
(ii) large / increased surface / area
   allow all food absorbed
   or to absorb more food
   or improved diffusion

Q7.
   (i) cytoplasm
       (cell) membrane
       nucleus
       all correctly labelled
       each for 1 mark

   (ii) 0.5
       gains 2 marks
       (5/100 × 10 or ½ /1 gains 1 mark if 0.5 not given)

Q8.
   (a) root hair

   (b) (i) 85
       if incorrect unit added = 0

   (ii) 0.85
       ignore working or lack of working
       accept correct answer from candidate’s (i) for 2 marks
       \[ \frac{85}{100} \]
       with no answer or wrong answer gains 1 mark

   (iii) absorb more water / ions
       allow ‘get / collect / take in / take up / soak up / suck up’ for absorb
       allow ‘lots’ for more
       allow ‘moisture’ for water
       allow ‘minerals / salts / nutrients’ for ions
       do not allow food or named foods
       absorb water / ions gains 1 mark

   or

   large surface area to absorb water / ions (2)
   large surface area linked to incorrect function = 1
   ignore small so short diffusion pathway
Q9.

(a) A – nucleus

B – chromosome

C – gene

(b) extra line from statement cancels the mark

Q10.

A – (cell) membrane

B – cytoplasm

C – nucleus

must be in correct order
accept phonetic spelling – see marking guidance 3.6

Q11.

in correct sequence:

breathing

diffusion

respiration

[3]

Q12.

(a) (i) A = nucleus
$B = \text{(cell) membrane}$

(ii) (cell) membrane

(b) $70$

\[ \frac{63 + 78 + 69}{3} \text{ for 1 mark} \]

Q13.

(a) mesophyll // // (all correct) sperm // x // (all correct)

for 1 mark each

(b) (i) absorbs light/to produce food/photosynthesis

(allow references to gaseous exchange)

for 1 mark

(ii) has chlorophyll/chloroplasts to absorb light/produce food

for 1 mark each

(if linked to gas exchange allow – moist surface/dissolve gases)

Q14.

(i) On diagram:

oxygen arrow to blood from air and CO$_2$ arrow to air from blood

oxygen arrow to red blood cell

CO$_2$ arrow from plasma

(ii) diffusion

(iii) large surface or large area

\textit{do not accept space}

Q15.

(a) (i) (cell) membrane
(ii) vacuole

(b) any two from:
- (cell) wall
- chloroplast(s)  
  *ignore chlorophyll*
- vacuole  
  *ignore cell sap*

(c) diffusion

Q16.
(a) A nucleus
B (cell) membrane
C cytoplasm

(b) any two from:
- (contain mitochondria
- many (mitochondria)
- respiration (occurs in mitochondria)

Q17.
(a) (i) red cell
(ii) diffusion
(iii) haemoglobin
(iv) a nucleus

(b) (on diagram) arrow from any part of blood to air

Q18.
(a) A nucleus
B (cell) membrane

C cytoplasm

(b) (i) it is thin

(ii) diffusion

Q19.
(a) A

(b) (i) diffusion

(ii) respiration

(iii) mitochondria

(iv) photosynthesis

Q20.
(a) chromosomes

(b) diagram showing four separate chromosomes two long and two short (as in diagram 1)

   allow each chromosome shown as two joined chromatids
   do not allow if chromosomes touching each other

(c) (i) any two from:
   • can grow into any type of tissue / named tissue
   • used in medical research
   • used to treat human diseases
   • large numbers can be grown

(ii) any two from:
   • expensive
   • grow out of control / ref cancers
   • may be rejected
   • need for drugs (for rest of life)
Q21.
(a) 2 and 3
(b) cell P has an X chromosome; cell R has a Y chromosome
(c) any two from:
   • (formed from) different egg / 2 eggs
   • (formed from) different sperm / 2 sperm
   • have different genes / alleles / chromosomes / DNA
     allow genetics
(d) (i) stem cells
    (ii) the cells divide
      the cells differentiate
    (iii) (medical) research / named eg growing organs
      or
      medical / patient treatment
      allow (embryo) cloning
      do not allow designer babies / more babies
(iv) any one from:
   • ethical / moral / religious objections
     ignore cruel / not natural / playing God
   • potential harm to embryo
     allow deformed
     ignore harm to mother

Q22.
(a) it has many chloroplasts.
(b) (has) cell wall
   (has) vacuole or large / permanent vacuole
   do not allow chloroplasts
   assume plant cell throughout
Q23.
(a) (i) A cytoplasm
   accept clear indications
   B nucleus

(ii) any two from:
   two required for 1 mark
   • P
   • R
   • T
   accept lower case letters

(b) sperm cells need a lot of energy to swim

Q24.
(a) (i) root hair

(ii) any two from:
   ignore food
   • water
   • ions / minerals / nutrients / salts / correct named eg nitrates
   ignore N,P,K
   • oxygen

(b) (i) stomata

(ii) diffusion

Q25.
(a)
4 correct = 4 marks
3 correct = 3 marks
2 correct = 2 marks
1 correct = 1 mark
extra line from a structure cancels the mark

(b) diffusion

Q26.
(a) (i) C and D
(ii) cell wall
(b) (i) A
(ii) D
(c) respiration

Q27.
(a) (i) villus
(ii) its outer surface is one cell thick
cancel 1 mark for each extra box ticked
it has a large surface area
it has good blood supply
(b) diffusion

Q28.
(a) (i) sex cells
(ii) chromosomes
(b) (i) two
(ii) recessive
(c) (i) cell membrane
   allow membrane
(ii) cytoplasm
(d) (i) A
(ii) B

Q29.
(a) (i) tissue
   extra box ticked cancels the mark
(ii) organ
   extra ring drawn cancels the mark
(b) (i) Layer B
   each extra box ticked cancels 1 mark
Layer C
(ii) (contain) chloroplasts / chlorophyll
   other parts disqualify
(c)
Q30.

(a) 

Controls the passage of substances into the cell

Vacuole

Contains the cell sap

Nucleus

Controls the activities of the whole cell

two correct = 2 marks
one correct = 1 mark
extra line from a part of a cell cancels the mark

(b) energy
Q31.  
(a) (i) capillary  
(ii) diffusion  
(b) (i) Z  
    ignore any names  
(ii) large / increased surface / area / or to absorb more food or improved diffusion  
    allow all food absorbed

Q32.  
(a) (i) diffusion  
(ii) A  
(b) (i) osmosis  
(ii) R

Q33.  
(a) asexual  
(b) mitosis  
(c) genes

Q34.  
(a) (i) A – (cell) wall  
    B – cytoplasm  
    C – plasmid  
(ii) bacterium cell has cell wall / no nucleus / no mitochondria / plasmids present  
    accept its DNA / genetic material is not enclosed / it has no
nuclear membrane
it = bacterium cell
accept converse for animal cell
ignore flagella

(iii) any one from:
  • chloroplast
    ignore chlorophyll
  • (permanent) vacuole

(b) (Long tail) moves the sperm / allows the sperm to swim
towards the egg
  allow correct reference to other named parts of the female
  reproductive system

(Mitochondria) release energy (for movement / swimming)
  allow supply / produce / provide
in respiration

Q35.
(a) (i) C and D
    no mark if more than one box is ticked

(ii) any one from:
    do not allow if other cell parts are given in a list
    • (have) cell wall(s)
    • (have) vacuole(s)

(b) (i) A
    apply list principle

(ii) D
    apply list principle

(c) respiration
    apply list principle

Q36.
(a) (i) capillary
(ii) diffusion

(iii) Carbon dioxide

<table>
<thead>
<tr>
<th></th>
<th>low(er)</th>
<th>high(er)</th>
</tr>
</thead>
</table>

| Oxygen | high(er) | low(er) |

1 mark for each correct row

(b) (i) red blood cells

(ii) haemoglobin

Q37.
(a) comparisons are not required but should be credited
    accept a clear indication of the statement even if incomplete
    can develop into most other types of cell
    each cell divides every 30 minutes
    low chance of rejection by the patient’s immune system

(b) any three from:

• cheaper / only costs £1000
  *this must be comparative
  ignore costs £1000

• can collect many (stem) cells

• adults give permission for their own bone marrow to be collected
  *comparisons are not required but should be credited

• safe

3 [6]

Q38.
(a) B

(b) D

(c) A
Q39. (a) the shape must be (roughly) circular and not shaded, for the mark
accept the shape drawn in the key if it is not contradictory 1
(b) dominant 1
(c) (i) a half (50%) 1
(ii) Some of B’s sperm cells have an X chromosome 1

Q40. (a) xylem and phloem
either order
allow words ringed in box
allow mis-spelling if unambiguous 1
(b) (i) movement / spreading out of particles / molecules / ions / atoms
ignore names of substances / ‘gases’ from high to low concentration
accept down concentration gradient
ignore ‘along’ / ‘across’ gradient
ignore ‘with’ gradient 1
(ii) oxygen / water (vapour)
allow O₂ / O2
ignore O² / O
allow H₂O / H₂O
ignore H²O 1

Q41. (a) (i) fertilisation 1
(ii) in sequence:
accept 1 next to gene, 2 next to chromosome and 3 next to nucleus in box
1 gene
2 chromosome
3 nucleus
*allow 1 mark for smallest or largest in correct position*

(iii) DNA

(b) (i) On diagram:
tick drawn next to X and/or Y from Parent 1
tick(s) must be totally outside grid squares
*allow ticks around “parent”*
*extra ticks elsewhere cancel*

(ii) 0.5 / ½ / 50% / 1:1 / 50:50 / 1 in 2
*allow 2/4 / 2 in 4 / 2 out of 4 / “even(s)” / “fifty-fifty”*
do not allow 1:2 or “50/50” or “50–50”

2 (out of 4) boxes are XX

or

half of the sperm contain an X-chromosome
*allow XY is male and 2 (out of 4) boxes are XY*

[7]

Q42.

(a) (i) A = cytoplasm

B = (cell) membrane

(ii) nucleus
*accept chromosome / DNA / genes*
*accept phonetic*

(b)
Q43.

(a) (i) | Feature | Mitosis only | Meiosis only |
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Produces new cells during growth and repair</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Produces gametes (sex cells)</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Produces genetically identical cells</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All 3 correct = 2 marks
2 correct = 1 mark
0 or 1 correct = 0 marks

(ii) (a man) testis / testes
accept testicle(s)

(a woman) ovary / ovaries

*do not* accept ‘ova’ / ovule

(b) (i) XY / YX
or
X and Y

(ii) XX
or
X and X or 2 X’s
accept X

(c) ½ / 0.5 / 50% / 1:1 / 1 in 2

*do not* accept 1:2 / 50/50
allow 50:50
allow 2 in 4

Q44.
(a) (i) A = nucleus

B = (cell) membrane

(ii) any two from:

ignore shape

• no (cell) wall
• no (large / permanent) vacuole
• no chloroplasts / chlorophyll

(b) because high to low oxygen / concentration or down gradient

allow ‘more / a lot of oxygen molecules outside’

ignore along / across gradient

(c) a tissue

Q45.
(a) mitosis

extra box ticked negates mark

(b) cell division is uncontrolled

extra box ticked negates mark

(c) any one from:

• smoking / tar
• alcohol
• carcinogens

allow named chemical

• viruses (living in cells)
• (ionising) radiation

accept UV / X-rays / gamma waves

(d) bar plotted at 78%

ignore width of bar

(e) testicular

extra box ticked negates mark
(f) prostate

extra box ticked negates mark

(g) any two from:

• improved treatment / drugs
• earlier diagnosis
• more cancer screening
• improved patient knowledge (of risk factors)

allow improved patient diet / lifestyle

Q46.

(a) A = nucleus

allow phonetic spelling

B = (cell) membrane

(b) for repair / growth or to replace cells

ignore new cells / skin

(c) (i) embryos

(ii) paralysis

Q47.

(a) animal cells also have cell membrane

(b) 1945–1955

allow 1946–1956

or 1947–1957

(c) \( \frac{2}{22} = 9.09 \% \)

allow 9.09 (%) or 9 (%) with no working shown for 1 mark

9.1 (%)

allow 9.1 (%) with no working shown for 2 marks

(d)

<table>
<thead>
<tr>
<th>More likely</th>
<th>Less likely</th>
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<tbody>
<tr>
<td></td>
<td>✔</td>
</tr>
</tbody>
</table>
allow 3 marks for 4 correct
allow 2 marks for 3 correct
allow 1 mark for 2 correct

more than one tick in a row negates a mark

Q48.
(a) (i) A = (cell) membrane

B = cytoplasm

*do not accept cytoplast*

(ii) To control the activities of the cell

(b)

extra lines cancel

Q49.
(a) | Structure | Organ | Organ system | Tissue |
---|---|---|---|
| Stomach | ✓ | | |
136 x 782

<table>
<thead>
<tr>
<th>Cells lining the stomach</th>
<th></th>
<th>✓</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mouth, oesophagus, stomach, liver, pancreas, small and large intestine</td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

all 3 correct = 2 marks
2 correct = 1 mark
1 or 0 correct = 0 marks

(b) (i) diffusion

allow phonetic spelling

(ii) glucose

(iii) mitochondria

Q50.

(a) (i) water / H₂O

accept oxygen

allow H₂O

do not allow H₂O or H₂O

(ii) the mineral ions are absorbed by active transport

the absorption of mineral ions needs energy

(iii) have (many root) hairs

(which) give a large surface area (for absorption)

(b) carbon dioxide in

or oxygen out

or

control water loss

accept gas exchange

ignore gases in and out

ignore gain / lose water

(c) (i) guard cells

(ii) (stomata are) closed
allow there is no gap / space

(iii) plant will wilt / droop
    ignore die

Q51.
(a) (i) alveoli / alveolus

    allow air sacs
    allow phonetic spelling

    (ii) any one from:
    • protection (of lungs / heart)
    • help you breathe / inflate lungs.

(b) (i) diffusion

(ii) capillaries

(iii) any two from:
• (have many) alveoli
  allow air sacs
• large surface / area
• thin (exchange) surface or short diffusion pathway
  accept only one / two cell(s) thick
• good blood supply / many capillaries
  allow (kept) ventilated or maintained concentration gradient.

Q52.
(a)

(b) (trachea) has mucus
to trap pathogens

(trachea) has cilia
to move mucus out of trachea

(c) dependent variable:
number of times mosquitoes landed on socks

control variable:
any one from:

- number of mosquitoes in each container
- length of time socks worn
- dampness of socks
- same type of socks
- size of container
- time
- temperature
- species of mosquito
- age of mosquito

(d) use worn socks
or
use chemical from worn socks
to attract / trap infected mosquitoes

or accept:
wear clean socks / change socks regularly (1)
to reduce the chance of attracting mosquitoes (1)

(e) less chlorophyll present

(so) less light absorbed

(so) reduced photosynthesis
or
(so) less sugar / food made

[14]