Questions

Q1.

Figure 19 shows a diagram of a red blood cell from a turtle and a diagram of a red blood cell from a human.

Figure 19

(i) These cells are animal cells.

Animal cells do not have

(1)

- ☒ A cytoplasm
- ☒ B a cell membrane
- ☒ C a cell wall
- ☒ D mitochondria

(ii) The actual length of the red blood cell from a turtle is 20.5 µm.

Calculate the length of the magnified image of the red blood cell of the turtle when magnified 400 ×.

(2)

..... µm

(iii) The width of the human red blood cell, when magnified 400 ×, is 3.08 mm.

Calculate the actual width of the cell and show your answer in standard form.

(2)

..... mm

(Total for question = 5 marks)

Q2.

A plant leaf cell is 0.04 mm long.

Calculate the length of the image after this cell has been magnified 500 times.

(2)

length of image = ... mm

(Total for question = 2 marks)

Q3.

As we grow, we make new cells by mitosis and meiosis.

(i) The cells that are made can become specialised.

Figure 13 shows a diagram of a sperm cell.

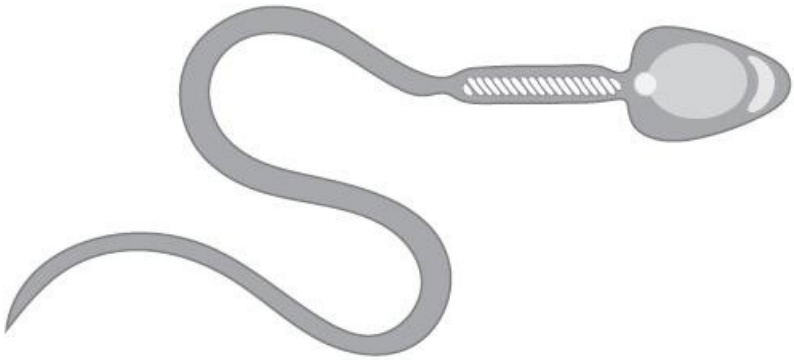

Figure 13

Describe two ways that the sperm cell is specialised.

(2)

1 .....

.....

2 .....

.....

(ii) Complete the table to show the results when a cell divides by mitosis or meiosis in humans.

Human body cells, except gametes, have 23 pairs of chromosomes.

(4)

	mitosis	meiosis
number of daughter cells produced		
number of chromosomes in each daughter cell		

(Total for question = 6 marks)

Q4.

Figure 4 shows the equipment used to prepare a microscope slide of onion cells.

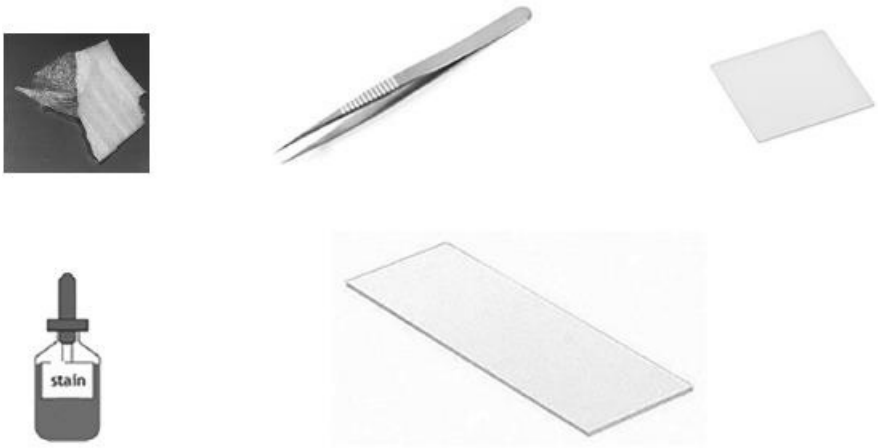

Figure 4

Describe how this equipment could be used to prepare a slide of onion cells to view under a microscope.

(3)

.....

.....

.....

.....

.....

.....

(Total for question = 3 marks)

Q5.

Figure 14 shows a banana plantation.

Figure 14

After the bananas have been harvested, the old plants are cut down.

The suckers then develop into mature plants producing the next crop of bananas.

The tip of each sucker contains a group of cells called a meristem.

(i) Describe the function of a meristem in the growth of a plant.

(2)

.....

.....

.....

.....

(ii) A student took a sample of cells from a meristem to view under a light microscope.
Describe how the student would prepare a microscope slide using these cells.

(3)

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.....

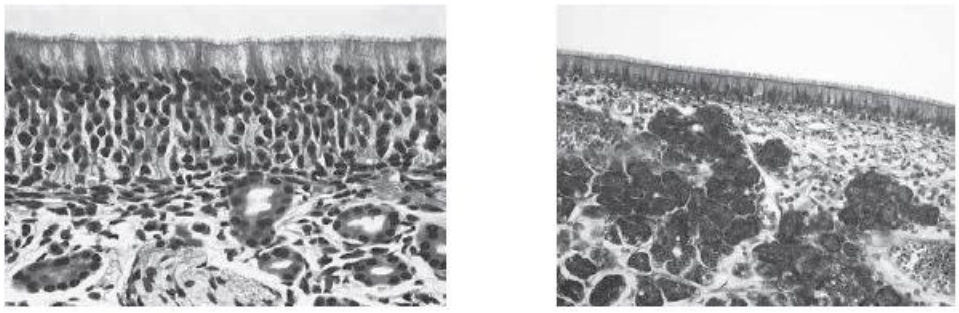
.....

.....

(Total for question = 5 marks)

Q6.

The development of electron microscopes has increased our understanding of cells and their features.
Figure 8 shows two images of ciliated epithelium, one taken using a light microscope and one using an electron microscope.



Light microscope

Electron microscope

(Science photolibrary Epithelium C022/2228 ©Steve Gschmeissner/Science Photolibrary

Figure 8

Explain how the electron microscope image helps us to understand more about ciliated epithelium.

(3)

.....

.....

.....

.....

.....

.....

(Total for question = 3 marks)

Q7.

Explain one advantage of using an electron microscope to observe plant cells.

(2)

.....

.....

.....

.....

(Total for question = 2 marks)

Q8.

(i) Figure 5 shows a sperm cell.

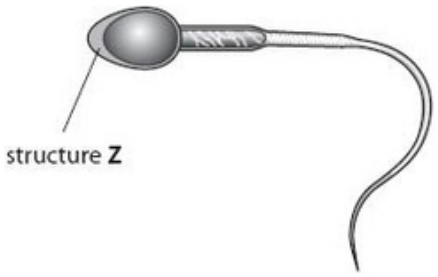


Figure 5

Explain the role of structure Z in fertilisation.

(2)

.....

.....

.....

.....

(ii) Sperm cells have haploid nuclei.

Explain how a cell with a diploid nucleus can produce cells that have a haploid nucleus.

(3)

.....

.....

.....

.....

.....

.....

.....

(Total for question = 5 marks)

Q9.

A student cut a piece of onion and placed it on a microscope slide.

The student then placed this slide on the stage of a light microscope and looked through the eyepiece.
No cells could be seen in the piece of onion.

Explain two ways this method could be improved to see details of the onion cells.

(4)

1 .....

.....

.....

.....

2 .....

.....

.....

.....

(Total for question = 4 marks)

Q10.

Figure 1 shows human blood seen using a light microscope.

Explain why using an electron microscope shows the structures in the white blood cells more clearly.

(2)

.....

.....

.....

.....

.....

(Total for question = 2 marks)

Q11.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Figure 4 shows three cells.

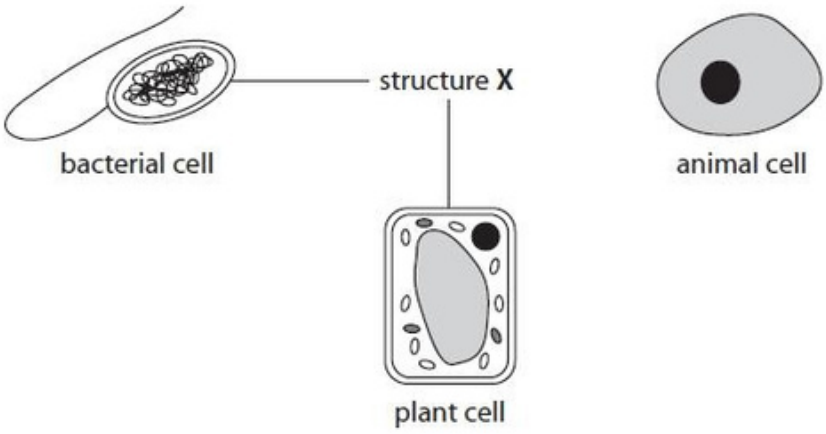


Figure 4

(i) What is structure X?

(1)

☒ A cell membrane

☒ B cell wall

☒ C cytoplasm

☒ D nucleus

(ii) The bacterial cell in Figure 4 has a flagellum.

State the function of a flagellum.

(1)

.....

.....

(iii) Give one other difference between the bacterial cell and the animal cell shown in Figure 4.

(1)

.....

.....

(Total for question = 3 marks)

Q12.

Figure 6 shows a diagram of a cell.

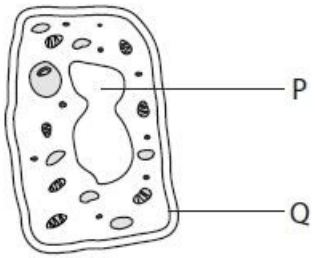


Figure 6

(i) Which row of the table identifies both structure P and structure Q?

(1)

		structure P	structure Q
☐	**A**	nucleus	cell membrane
☐	**B**	nucleus	cell wall
☐	**C**	vacuole	cell membrane
☐	**D**	vacuole	cell wall

(ii) Plant cells have a cell wall and a large vacuole.

Draw one straight line from each structure to its function.

(2)

structure	function
	where respiration occurs
cell wall	contains cellulose to provide support
	where photosynthesis occurs
large vacuole	controls the cell
	stores cell sap

(Total for question = 3 marks)

Q13.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

A student is preparing a microscope slide of plant cells.

(i) State what can be added to the slide to make the plant cells more visible.

(1)

.....

(ii) The microscope has two lenses:

- an eyepiece lens with ×10 magnification
- an objective lens with ×40 magnification

Which is the total magnification of this microscope?

(1)

- ☒ A ×4
- ☒ B ×30
- ☒ C ×50
- ☒ D ×400

(Total for question = 2 marks)

Q14.

Answer the questions with a cross in the boxes you think are correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Animals and plants are made of cells.

Figure 1 shows two types of cell from a human.

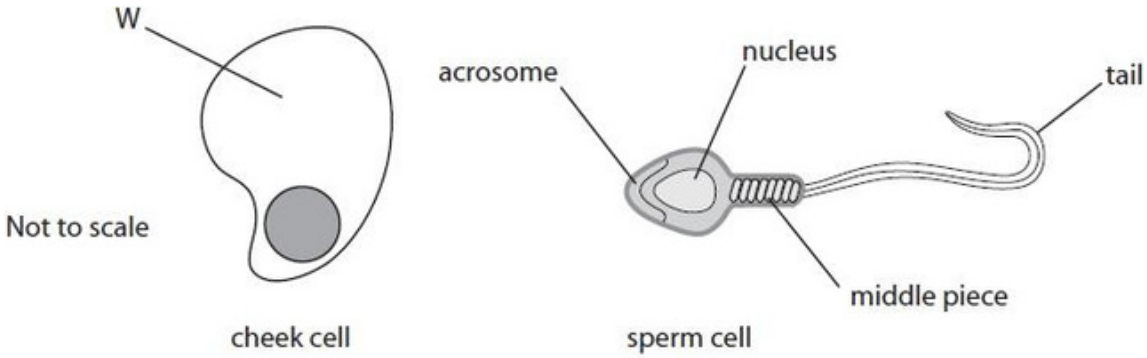


Figure 1

(i) Which part of the cheek cell is labelled W?

(1)

- ☒ A cell wall
- ☒ B nucleus
- ☒ C cell membrane
- ☒ D cytoplasm

(ii) Which labelled part of the sperm cell is also found in the cheek cell?

(1)

- ☒ A nucleus
- ☒ B tail
- ☒ C middle piece
- ☒ D acrosome

(Total for question = 2 marks)

Q15.

Answer the questions with a cross in the boxes you think are correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Lymphocytes are white blood cells that produce large amounts of protein.

(i) Which organelle is needed to produce large amounts of protein?

(1)

- ☐ A ribosome
- ☐ B vacuole
- ☐ C chloroplast
- ☐ D flagellum

A small lymphocyte has a diameter of 10 µm (micrometres).

A microscope magnifies this lymphocyte 400 times.

(ii) Calculate the diameter of the image of the lymphocyte seen using this microscope.

(2)

image size ..... µm

(iii) How many micrometres are in 1 mm (millimetre)?

(1)

- ☐ A 10
- ☐ B 100
- ☐ C 1 000
- ☐ D 10 000

(Total for question = 4 marks)

Q16.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

Figure 1 shows human blood seen using a light microscope.

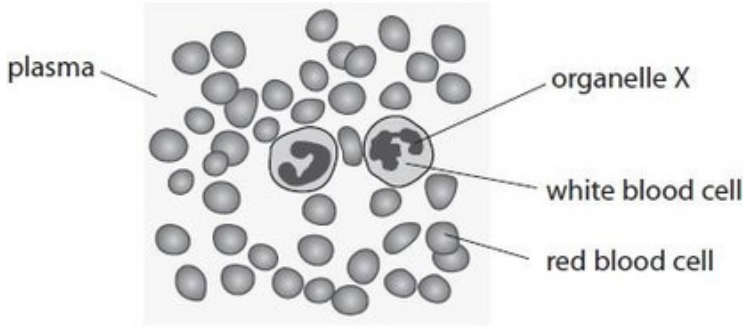


Figure 1

(i) The organelle labelled X controls the activities of the white blood cell.

What is the name of organelle X?

(1)

- ☒ A mitochondrion
- ☒ B ribosome
- ☒ C chromosome
- ☒ D nucleus

(ii) Use words from the box to complete the sentences.

(2)

gas	haemoglobin	hormone
liquid	platelet	solid

Red blood cells contain the substance ..... .
Blood plasma is a ..... .

(iii) Describe two ways that white blood cells protect the body from disease.

(2)

1 .....

.....

2 .....

.....

(Total for question = 5 marks)

Q17.

Figure 3 shows a diagram of a plant cell.

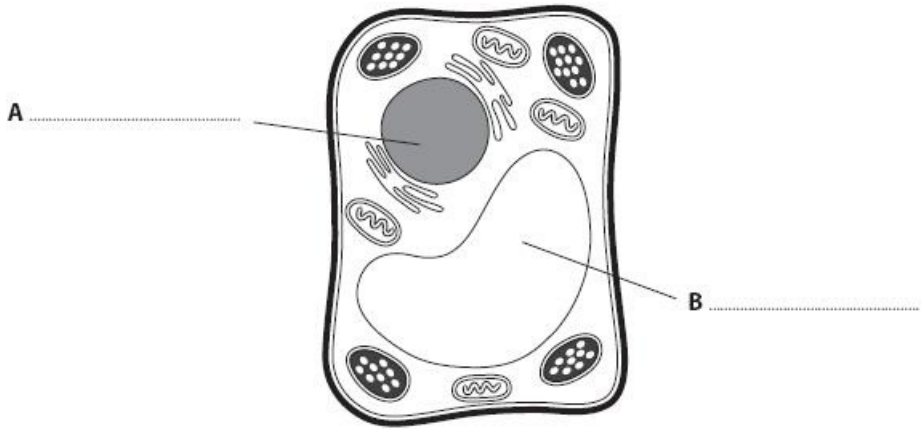


Figure 3

(i) Label structure A and structure B on Figure 3.

(2)

(ii) Give one difference between an animal cell and the plant cell shown in Figure 3.

(1)

.....

.....

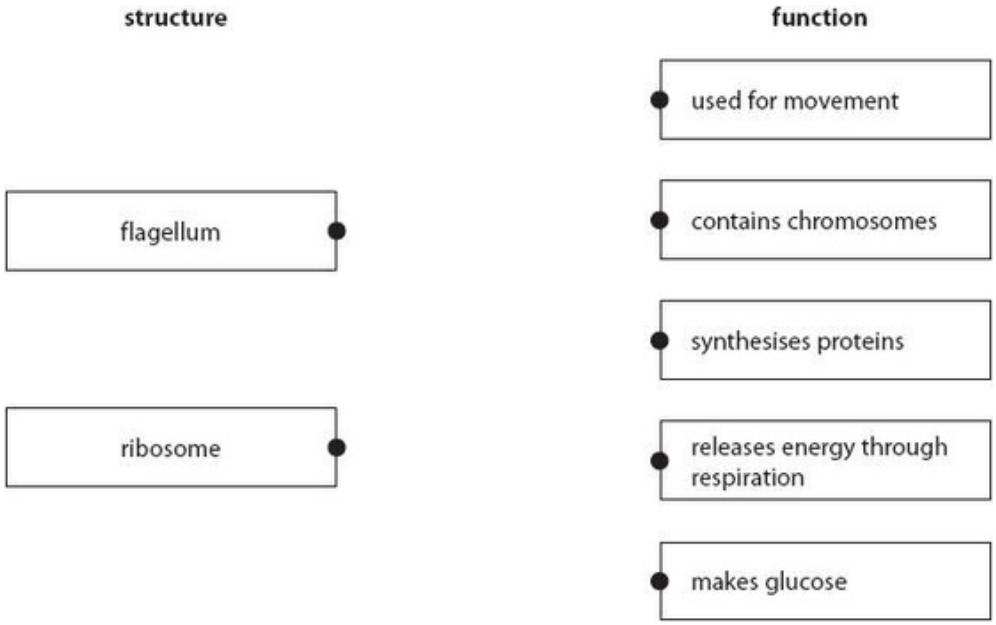
(Total for question = 3 marks)

Q18.

Bacteria can be genetically modified to produce human proteins.

Draw one straight line from each bacterial structure to its function.

(2)



(Total for question = 2 marks)

Q19.

Figure 15 is a drawing of a eukaryotic cell.

Structure Z is found in plant leaf cells.

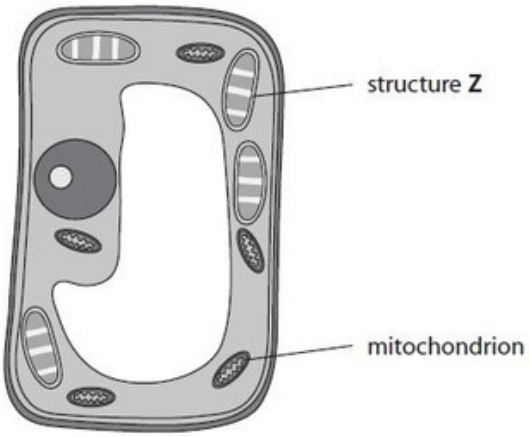


Figure 15

(i) Name structure Z.

(1)

.....

(ii) Give one function of the mitochondrion.

(1)

.....

.....

.....

(Total for question = 2 marks)

Q20.

Name one part of a light microscope that can be moved to obtain a clear image of plant cells.

.....

(Total for question = 1 mark)

Q21.

Figure 9 shows two sperm cells.

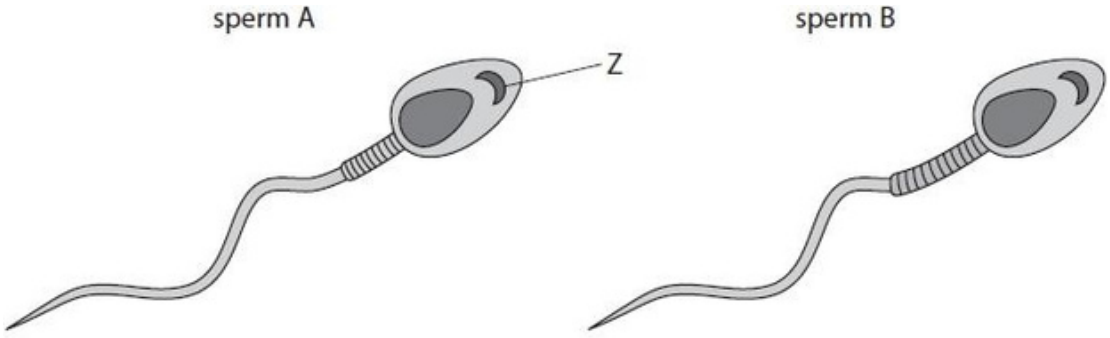


Figure 9

(i) Name structure Z.

(1)

.....

(ii) Sperm B has a larger middle section than sperm A.

Explain why sperm B will be more likely to fertilise an egg than sperm A if they were both released at the same time.

(3)

.....

.....

.....

.....

.....

.....

(Total for question = 4 marks)

Q22.

Name the part of a plant cell that gives the cell support and protection.

.....

(Total for question = 1 mark)

Q23.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

A student is preparing a microscope slide of plant cells.

(i) State what can be added to the slide to make the plant cells more visible.

(1)

.....

(ii) The microscope has two lenses:

- an eyepiece lens with × 10 magnification
- an objective lens with × 40 magnification

Which is the total magnification of this microscope?

(1)

- ☒ A × 4
- ☒ B × 30
- ☒ C × 50
- ☒ D × 400

(Total for question = 2 marks)

Mark Scheme

Q1.

Question number	Answer	Mark
(i)	C a cell wall **1. The only correct answer is C** ***A*** *is not correct because both plant and animal cells have cytoplasm* ***B*** *is not correct because both plant and animal cells have a cell membrane* ***D*** *is not correct because both plant and animal cells have mitochondria*	**(1)** AO 1 1

Question number	Answer	Additional guidance	Mark
(ii)	substitution 20.5 x 400 (1) evaluation 8 200 µm	award full marks for correct answer with no working	**(2)** AO 1 2

Question number	Answer	Additional guidance	Mark
(iii)	substitution (3.08 ÷ 400) = 0.0077 (1) evaluation 7.7×10^{-3}	award full marks for correct answer with no working accept 0.008 accept 8×10^{-3}	**(2)** AO 2 2

Q2.

Question number	Answer	Additional guidance	Mark
	Substitution 500 x 0.04 (1) Evaluation 20 (mm)	 award two marks for correct answer with no working	**(2)** AO2 2

Q3.

Question number	Answer	Additional guidance	Mark
(i)	A description including any **two** from: • tail / flagellum (1) • acrosome / sac with enzymes (1) • (many) mitochondria (1) • streamlined (1) • haploid / has 23 chromosomes (1)	accept has enzymes to digest the membrane around the egg	**(2)** **AO1 1**

Question number	Answer	Mark
(ii)	Award one mark for each correct square in the table.	**(4)** **AO1 1**

	mitosis	meiosis
number of daughter cells produced	2	4
number of chromosomes in each daughter cell	46 / 23 pairs	23

For mitosis (number of chromosomes) ignore 23 on its own, must be qualified as 23 pairs

Q4.

Question Number	Answer	Mark
	A description linking three from: • use forceps to {pick up / peel} a (thin layer of) onion (cells) (1) • place (onion cells) onto microscope slide (1) • add a drop of stain / named stain (1) • place coverslip on top (of onion) (1) • lower coverslip slowly / at an angle (1)	**(3)** **AO1 2**

Q5.

Question number	Answer	Additional guidance	Mark
(i)	Two from: • (meristem cells) are undifferentiated (1) • (meristem cells) divide / produce more cells (1) • by mitosis (1)	accept are stem cells accept (the cells produced) can differentiate /become specialised/elongate (1)	**(2)** AO1 1

Question number	Answer	Additional guidance	Mark
(ii)	An answer including • use a thin section of {cells/meristem} (1) • add a stain / named stain (1) • place a cover slip on top of the sample (1)	accept add a sample of the cells to the microscope slide accept a description of a coverslip	**(3)** AO1 2

Q6.

Question number	Answer	Mark
	An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (2 marks): • higher magnification can be used (1) • so the cilia are more visible (1) • and the sub-cellular structures are visible (1)	(3)

Q7.

Question Number	Answer	Mark
	One advantage explained: • higher resolution (1) • so more detail seen/higher magnification can be used (1) or • higher magnification (1) • so more detail seen (1)	(2) AO 1 1

Q8.

Question number	Answer	Additional guidance	Mark
(i)	An explanation that combines identification - knowledge (1 mark) and reasoning/justification - understanding (1 mark): • the {head/structure Z} contains enzymes/ (structure Z) is the acrosome (1) • which digests the outer layer of the egg cell (1)	ignore references to shape and streamline accept to penetrate the egg / to enter the egg	(2)

Question number	Answer	Additional guidance	Mark
(ii)	An explanation that combines identification - knowledge (1 mark) and reasoning/justification - understanding (2 marks): • (this process of cell division is) meiosis (1) • which produces 4 daughter cells (1) • each with half of genetic material / 23 chromosomes (1)	accept cell divides twice (1)	(3)

Q9.

Question Number	Answer	Additional guidance	Mark
	Any two linked pairs from: • a single/thin layer (of cells) needs to be used (1) • so light passes through (the cells) (1) OR • use a stain/named stain(1) • to stain structures/see parts of the cell (1) OR • adjust focus of microscope (1) • to see cells/structures clearly (1) OR • select a higher power lens (1) • to increase magnification (1) OR • change light intensity/adjust mirror (1) • to see cells/structures clearly (1)	accept dye (1) accept to make cells/structures more visible (1) ignore zoom in/out accept clearer image/greater resolution accept increase magnification(1) accept to see cells/ structures clearly (1)	(4) AO 3 3b

Q10.

Question Number	Answer	Additional guidance	Mark
	An explanation including any **two** from: • greater resolution (1) • so greater magnification is possible (1) • so smaller structures can be seen / identified (1)	accept more detail of cell structures can be seen accept electrons (with a shorter wavelength) are used (instead of light) (1)	**(2)** **AO1.1**

Q11.

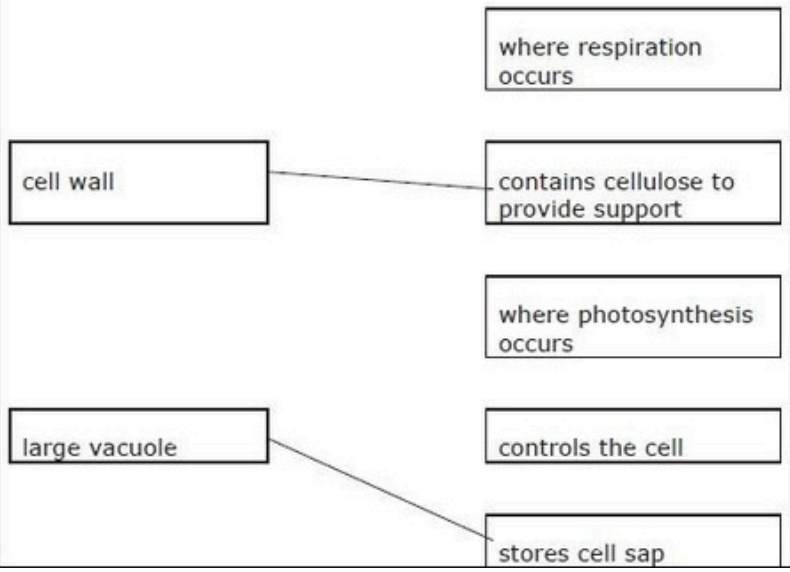
Question number	Answer	Mark
(i)	B cell wall **The only correct answer is B** ***A*** *is not correct because X is not the cell membrane* ***C*** *is not correct because X is not the cytoplasm* ***D*** *is not correct because X is not the nucleus*	**(1)** AO1 1

Question number	Answer	Mark
(ii)	(allows) movement / swim / motility	**(1)** AO1 1

Question number	Answer	Additional guidance	Mark
(iii)	• (bacteria) have no nucleus / have chromosomal DNA / have a cell wall	accept converse for all differences	(1) AO1 1

Q12.

Question number	Answer	Mark
(i)	C	(1)

Question number	Answer	Mark
(ii)	One mark for each correct line  	(2)

Q13.

Question Number	Answer	Additional guidance	Mark
(i)	use a stain / named stain	accept dye accept add a cover slip	(1) AO2 2

Question Number	Answer	Mark
(ii)	D x 400 **The only correct answer is D** ***A*** *is not correct because the total magnification is not x 4* ***B*** *is not correct because the total magnification is not x 30* ***C*** *is not correct because the total magnification is not x 50*	**(1)** **AO2 2**

Q14.

Question Number	Answer	Mark
(i)	D cytoplasm **The only correct answer is D** ***A*** *is not correct because W is not the cell wall* ***B*** *is not correct because W is not the nucleus* ***C*** *is not correct because W is not the cell membrane*	**(1)** **AO1 1**

Question Number	Answer	Mark
(ii)	A nucleus **The only correct answer is A** ***B*** *is not correct because a tail is not found in cheek cells* ***C*** *is not correct because a middle piece is not found in cheek cells* ***D*** *is not correct because an acrosome is not found in cheek cells*	**(1)** **AO2 1**

Q15.

Question Number	Answer	Mark
(i)	A ribosomes **The only correct answer is A** ***B*** *is not correct because vacuoles, although important in secreting the proteins do not produce them.* ***C*** *is not correct because lymphocytes do not contain chloroplasts* ***D*** *is not correct because lymphocytes do not have flagella*	**(1)** **AO2 1**

Question Number	Answer	Additional guidance	Mark
(ii)	10 x 400 (1) 4000 (*µm*)	award full marks for correct answer with no working	**(2)** **AO2 2**

Question Number	Answer	Mark
(iii)	C 1000 **The only correct answer is C** ***A*** *is not correct because there are 1000 µm in 1 mm* ***B*** *is not correct because there are 1000 µm in 1 mm* ***D*** *is not correct because there are 1000 µm in 1 mm*	**(1)** **AO1 1**

Q16.

Question Number	Answer	Mark
(i)	D nucleus **The only correct answer is D** ***A** is not correct because mitochondria do not control the white blood cell* ***B** is not correct because ribosomes do not control the white blood cell* ***C** is not correct because chromosomes are only part of organelle X*	**(1)** **AO1.1a**

Question Number	Answer	Additional guidance	Mark
(ii)	haemoglobin (1) liquid (1)	answers must be in correct order	**(2)** **AO2.1**

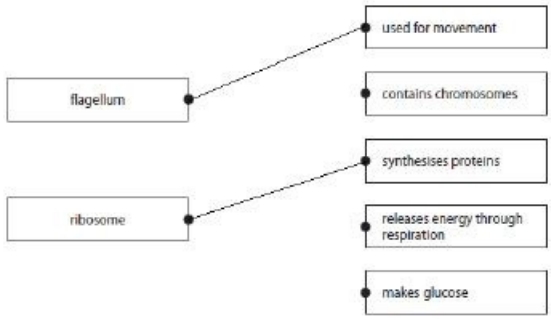
Question Number	Answer	Additional guidance	Mark
(iii)	A description including **two** from: • make antibodies • {surround / engulf / digest} {pathogens / bacteria / viruses} • remembers pathogens / bacteria / viruses (so can react quickly to secondary infection)	 accept produce memory cells	**(2)** **AO1.1**

Q17.

Question number	Answer	Additional guidance	Mark
(i)	A – nucleus B – vacuole/large vacuole		**(2)**

Question number	Answer	Additional guidance	Mark
(ii)	animal cells have {no chloroplasts / no large vacuole /no cell wall}	accept plant cell {stores sap/ photosynthesises} ignore references to shape ignore animal cell only has a cell membrane	(1)

Q18.

Question number	Answer	Mark
	 reject mark if more than one line drawn from a structure	(2)

Q19.

Question number	Answer	Mark
(i)	chloroplast / chloroplasts accept phonetically correct misspellings	(1) AO1 1

Question number	Answer	Additional guidance	Mark
(ii)	(aerobic) respiration / release energy	ignore make / produce energy accept word equation for respiration accept to produce ATP	**(1)** AO1 1

Q20.

Question Number	Answer	Additional guidance	Mark
	focusing wheel	accept (move the) stage / lens (up and down) accept (adjust) mirror	**(1)** **AO1 1**

Q21.

Question number	Answer	Additional guidance	Mark
(i)	acrosome	Reject achromosome / chromosome / head	**(1)** AO1 (1)

Question number	Answer	Mark
(ii)	Any three from: • (middle section) contains mitochondria (1) • so has **more** mitochondria (in middle piece of sperm B) (1) • (sperm B can) release more energy / has a faster rate of respiration (1) • (sperm B) swims faster / greater distance (1)	**(3)** AO2 1

Q22.

Question Number	Answer	Mark
	cell wall	**(1)** **AO1 1**

Q23.

Question Number	Answer	Additional guidance	Mark
(i)	use a stain / named stain	accept dye accept add a cover slip	**(1)** **AO2 2**

Question Number	Answer	Mark
(ii)	D x 400 **The only correct answer is D** ***A*** *is not correct because the total magnification is not x 4* ***B*** *is not correct because the total magnification is not x 30* ***C*** *is not correct because the total magnification is not x 50*	**(1)** **AO2 2**