Question 1:

Characteristic	Example of this process
they require nutrition	eating food
they respire	releasing energy from carbohydrate
movement / eq;	some animals can fly
they control their internal conditions	**blood glucose / blood pressure /body temperature / sweating / osmoregulation / eq;**
reproduce / eq;	increase of the population of foxes
they grow	**cells divide / increase in mass / size / get bigger / increase in height / eq;**

Question 2:

2	(a)	(i)	correctly labelled;	ignore other labels if label line goes to wall and membrane = 0	1
		(ii)	cell wall; chloroplast; vacuole;	ignore chlorophyll	3

(iii)   **Ribosomes synthesis/production of proteins**

Question 3:

Question number		Answer	Notes	Marks
3(a)	(i)	safety glasses / wear gloves ;	Ignore lab coat / tie hair back / eq	1
	(ii)	11/ eleven;		1
(b)	(i)	remove starch / solution from surface of syringe / eq;	Ignore get into syringe	1
				1
	(ii)	mix <u>contents</u> / mix <u>amylase and starch</u> / eq;	Mix alone = 0 Allow enzyme and starch	1
	(iii)	keep at correct temperature / keep temperature constant / eq;	Ignore fair test	

Question number		Answer	Notes	Marks
(c)	(i)	1. volume / concentration of amylase; 2. volume / concentration of starch; 3. volume / concentration of iodine / drops of iodine; 4. volume / concentration of mixture;	Allow amount only once	2
	(ii)	temperature;	Ignore time	1
(d)		1. 6 minutes / between 5 and 6 minutes / eq; 2. iodine stays yellow / orange / brown / iodine stays same colour / colourless / not blue black; 3. no starch present; 4. digested/broken down ;	Reject 6-7 mins	3

| Question number	Answer	Notes	Marks
(e)(i)	1. fewer wells with blue black colour / more wells yellow / orange / brown / colourless / eq; 2. starch digested sooner / quicker / reaction completed sooner / eq;		2
(ii)	1. enzymes work faster at 40^{0}C / ref to optimum / eq; 2. more (kinetic) energy / molecules move faster / eq; 3. more collisions / more enzyme substrate complexes /eq;	Ignore ref to denature	2

Question 4:

Answer 2c

(c) The image size of the cell is...

- Rearrange equation: image size = actual size x magnification: [1 mark]
- Sub in numbers: image size = 2 x 50 000 = 100 000μm: [1 mark]
- Convert units: 100 000μm = 100mm: [1 mark]

Full marks for correct answer with no working shown

[Total: 3 marks]

Ribosomes

Length =
2 micrometers

Magnification x 50000
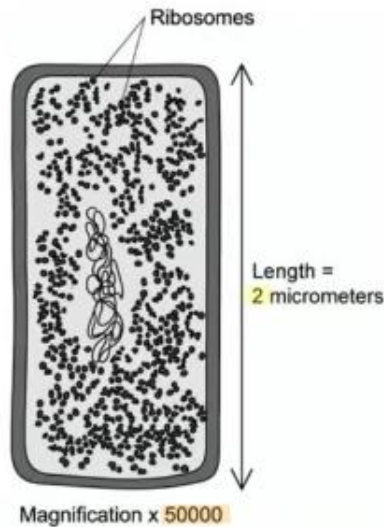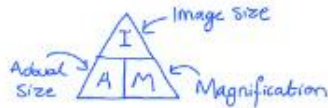
Use the following equation to calculate the image size of this bacterium cell.

Give your answer in mm.

$$Magnification = \frac{Image\ size}{Actual\ size}$$

Image Size = Actual Size × magnification [1 mark]

Image Size = 2 × 50 000

= 100 000μm [1 mark]

1mm = 1000 μm So...

100 000 ÷ 1000 = 100 mm [1 mark]

3 marks for the correct answer with no working shown

Question 5:

(a) (i) One type of organelle visible is...

Any **one** of the following:

- Nucleus; [1 mark]
- Chloroplast; [1 mark]
- Vacuole; [1 mark]

Ignore cell wall, cell membrane and cytoplasm.

(a) (ii) Types of cell visible include...

Any **two** of the following:

- Palisade (mesophyll) cell; [1 mark]
- Guard cell; [1 mark]
- Epidermis cell; [1 mark]
- Spongy mesophyll cell; [1 mark]
- Xylem cell/vessel; [1 mark]

Ignore phloem as this is not a cell type.

(a) (iii) Types of tissue visible include...

Any **two** of the following:

- Epidermis/dermal (tissue); [1 mark]
- Palisade mesophyll (tissue); [1 mark]
- Spongy mesophyll (tissue); [1 mark]

(b) The leaf is an example of an organ because...

- It contains a group/collection of / several tissues; [1 mark]
- Which work together to carry out photosynthesis; [1 mark]

(a) The image below shows the structure of a leaf in a green plant magnified 220 times.

6 cm
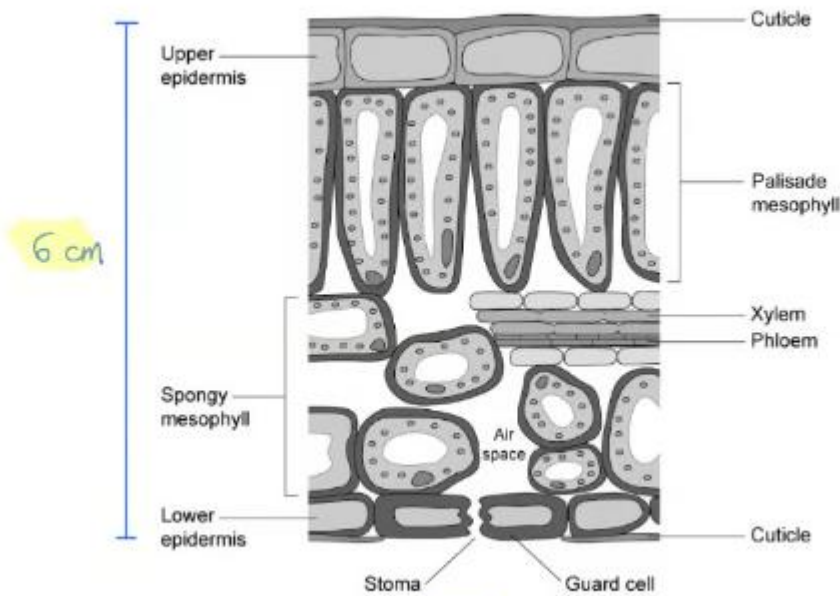
(c) The leaf image in part (a) measures 6 cm from top to bottom.

Use the formula below to calculate the actual thickness of the leaf. Give your answer in mm.

$$\text{Actual thickness} = \frac{\text{Image thickness}}{\text{Magnification}}$$

Convert measurement into mm:

6 cm = 60 mm — There are 10mm in a cm.

Enter numbers into formula:

Actual width = $\frac{60}{220}$ [1 mark]

= 0.27 mm [1 mark]

Question 6:

1) D

2) B

3) C

Question 7:

Question Number	Answer	Additional guidance	Mark
4(a) (i)	• (substance that) speeds up (chemical) reactions (1)	**Allow** correct reference to activation energy **Ignore** catalyses	**1**

Question Number	Answer	Mark
4(a) (ii)	• (chemical) reactions / processes in cells / cytoplasm / body /organisms (1)	**1**

Question Number	Answer	additional guidance	Mark
4(b) (i)	An answer that includes: • scale linear and half of grid (1) • lines drawn neatly between points (1) • axis correct way around (1) • points correctly plotted (1) • axes labelled with (concentration in) **number of discs** (of potato) **and oxygen (production) in cm³ min⁻¹ or cm³ per min** (1)	lose L if extrapolated bar charts lose L	**5**

Question Number	Answer	Additional guidance	Mark
4(b) (ii)	An explanation that makes reference to the following points: • as enzyme concentration increases so does oxygen production / rate / it increases / eq (1) • up to 8 (discs) / 8.2 (cm³ min⁻¹) / levels off after / from 8 (discs) / 8.2 (cm³ min⁻¹) / eq (1) • more enzyme (molecules) available to react with / break down hydrogen peroxide / substrate / form enzyme substrate complexes / more collisions / eq (1) • until all substrate molecules / hydrogen peroxide are combined with enzyme molecules / substrate limiting (1)	must give value for discs or rate **Ignore** faster collisions	**3**

Question Number	Answer	Mark
4(b) (iii)	• use (gas) syringe / (inverted) measuring cylinder / eq (1)	**1**

Question Number	Answer	additional guidance	Mark
4(b) (iv)	An explanation that makes reference to the following points: • only one variable is changed / one independent variable / control variable / carry out valid experiment / produce accurate results / eq (1) • these (also) affect / change the rate (1)	**allow** make it a fair test **allow** so that they are controlled	2

Question Number	Answer	additional guidance	Mark
4(b) (v)	• temperature / pH / type / eq of potato / eq (1)	**ignore** time	1

Question 8:

(i) The type of respiration being investigated is...

- Anaerobic; [1 mark]

(ii) We know this because...

- The paraffin will prevent oxygen reaching the yeast/solution / keeps oxygen out (so forcing the yeast to respire anaerobically); [1 mark]

(b) Identify the gas in the bubbles produced by the yeast in part (a).

Answer

The gas in the bubbles produced is...

- Carbon dioxide; [1 mark]

Answer

The student would need to control the following factors...

Any **two** of the following...

- The volume of yeast solution / the number of yeast cells in the solution; [1 mark]

- The concentration of sugar in the solution; [1 mark]

- The type of sugar in the solution; [1 mark]

- The depth of the paraffin layer; [1 mark]

- The length of time for which bubbles are counted; [1 mark]

- The time that the test tubes spend in the water bath before starting the bubble count; [1 mark]

Statement	Respiration Type
Produces lactic acid as a waste product	Anaerobic respiration
Produces ethanol when it occurs in yeast	Anaerobic respiration; [1 mark]
Produces lots of ATP	Aerobic respiration; [1 mark]
Releases energy from glucose	Both; [1 mark]
Increases during intense exercise	Anaerobic respiration; [1 mark]

Question 9:

The cell better adapted for diffusion is...

- Cell X; [1 mark]

- (Because) it has a larger surface area to volume ratio / a folded membrane which gives a bigger surface for diffusion; [1 mark]

Allow any description of the folded membrane

Do not allow 'X has villi'

Answer

The potato disks in Beaker 5 decreased in mass because...

Any **two** from the following:

- Water moved out of the potato; [1 mark]

- By osmosis; [1 mark]

- From a high water potential (in the potato) to a low water potential (in the sucrose solution); [1 mark]

[Total: 2 marks]

Answer

The correct answer is C because..

Keeping the potato pieces the same size (and the same total mass) makes this a fair test, which is what a control variable should do.

A is incorrect because the sugar concentration is the independent variable, the thing that the student is deliberately changing to examine the effects of changing it.

B is incorrect because repeating the experiment will add reliability but does not control any of the variables of the experiment.

D is incorrect because calculating an average (the mean) does not control the variables that might affect the results.

[Total: 1 mark]

Question 10:

a)

- (Unspecialised cells) develop into specialised cells / cells with specific functions; [1 mark]
- To produce tissues / organs / example of tissue or organ; [1 mark]

- Cells from embryos can make any cell type / many more cell types / adult stem cells can become fewer cell types **OR** only embryonic stem cells are totipotent; [1 mark]
- However, there are ethical issues about the use of embryonic cells **OR** people object to killing embryos (for the stem cells) / embryos are potential human lives; [1 mark]