



**1 Cell biology higher (import)**

Name: \_\_\_\_\_

Class: \_\_\_\_\_

Date: \_\_\_\_\_

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Time: **48 minutes**

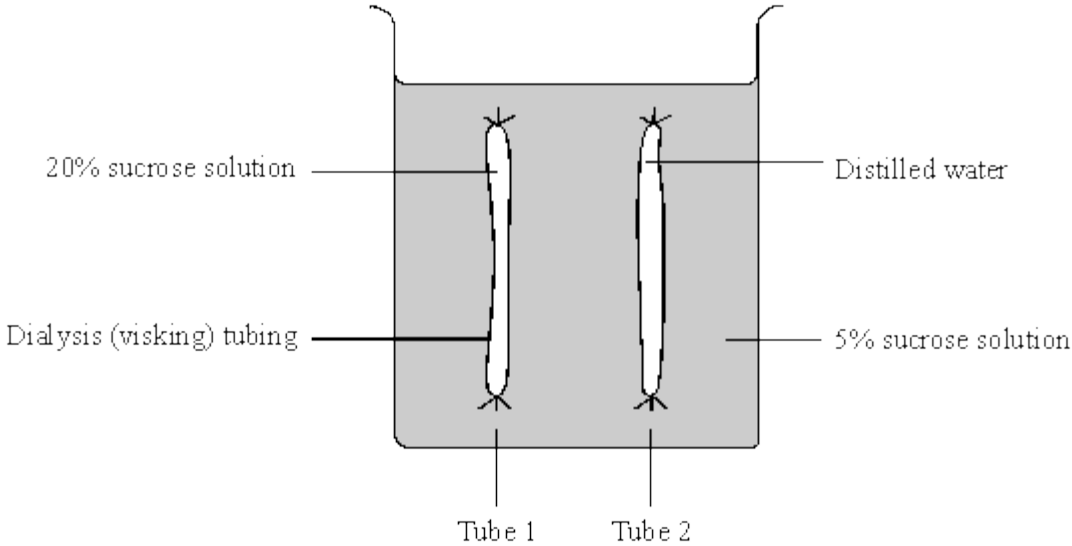
Marks: **48 marks**

Comments:

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1

Some students set up this experiment to investigate osmosis. They filled two pieces of dialysis [visking] tubing with different liquids and left them both in a beaker of 5% sucrose solution for an hour.



(a) Describe and explain the likely results after one hour.

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....

(6)

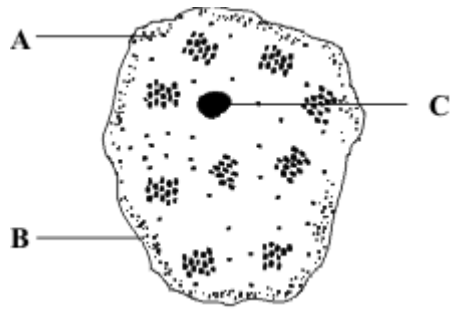
(b) Describe **two** examples where osmosis is used in living things.

.....  
.....  
.....  
.....

(2)  
(Total 8 marks)

2

The diagram shows an animal cell.



(a) Name **each** labelled part and give its function.

**A** Name .....

Function .....

.....

**B** Name .....

Function .....

.....

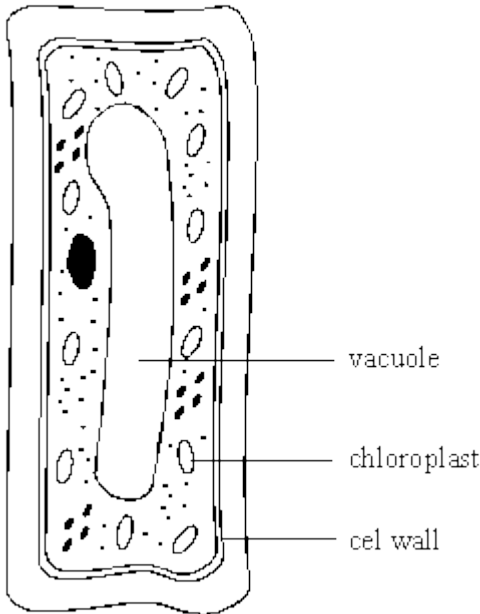
**C** Name .....

Function .....

.....

(6)

(b) (i) This plant cell also contains chloroplasts, a cell wall and a vacuole. Label **each** of these parts on the diagram.



(ii) Give the function of these parts of a plant cell.

Chloroplast function .....

.....

Cell wall function .....

.....

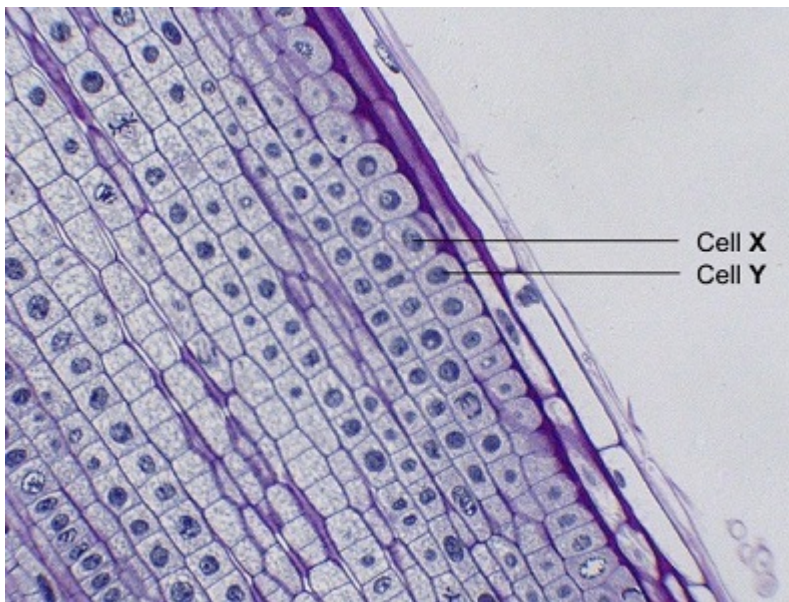
Vacuole function .....

.....

(3)  
(Total 12 marks)

3

The photograph shows some cells in the root of an onion plant.



By UAF Center for Distance Education [CC BY 2.0], via Flickr

(a) Cells X and Y have just been produced by cell division.

(i) Name the type of cell division that produced cells X and Y.

.....

(1)

(ii) What happens to the genetic material before the cell divides?

.....

(1)

(b) A gardener wanted to produce a new variety of onion.

Explain why sexual reproduction could produce a new variety of onion.

.....

.....

.....

.....

.....

.....

**(3)**  
**(Total 5 marks)**

**4**

Meiosis and mitosis are different types of division in human cells. Compare the two processes by referring to where each takes place and the kind of products that are made.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

**(Total 6 marks)**

5

Some students investigated the effect of pH on the growth of one species of bacterium.

They transferred samples of bacteria from a culture of this species to each of eight flasks. Each flask contained a solution of nutrients but at a different pH.

After 24 hours, the students measured the amount of bacterial growth.

- (a) It was important that the flasks in which the bacteria grew were not contaminated with other microorganisms.

Describe **two** precautions the students should have taken to prevent this contamination.

1 .....

.....

2 .....

.....

(2)

- (b) To see the effect of pH on the growth of the bacteria, other conditions should be kept constant.

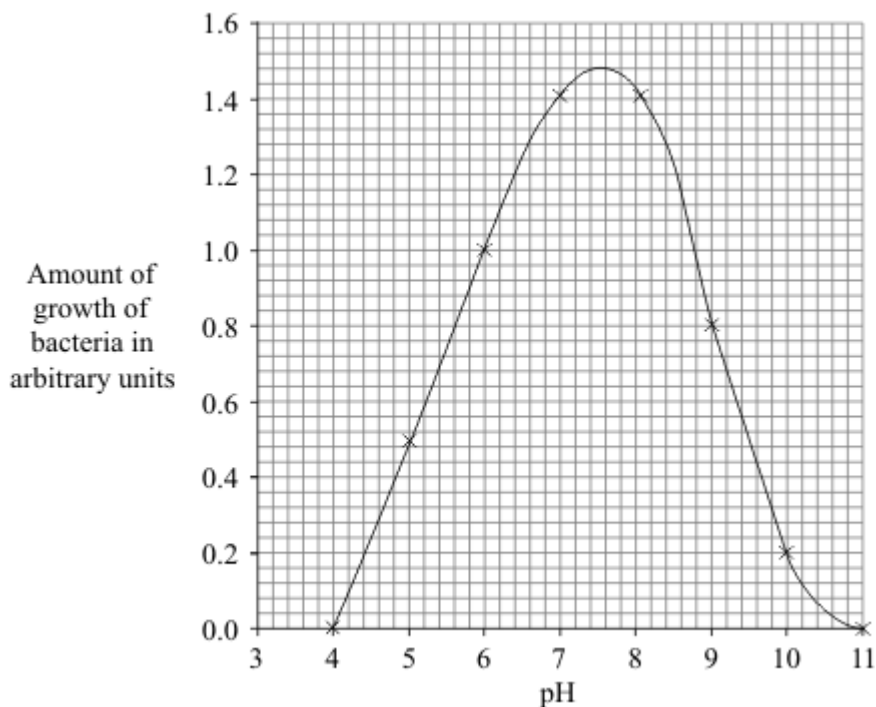
Suggest **two** conditions which should have been kept constant for all eight flasks.

1 .....

2 .....

(2)

- (c) The graph shows the results of the investigation.



The students wanted to find the best pH for the growth of this species of bacterium.

- (i) Use the graph to estimate the pH at which the bacteria would grow best.

pH .....

(1)

- (ii) What could the students do to find a more accurate value for the best pH for growth of the bacteria?

.....  
.....

(1)

(Total 6 marks)

6

Plant roots obtain some of their mineral salts from the soil by active transport.

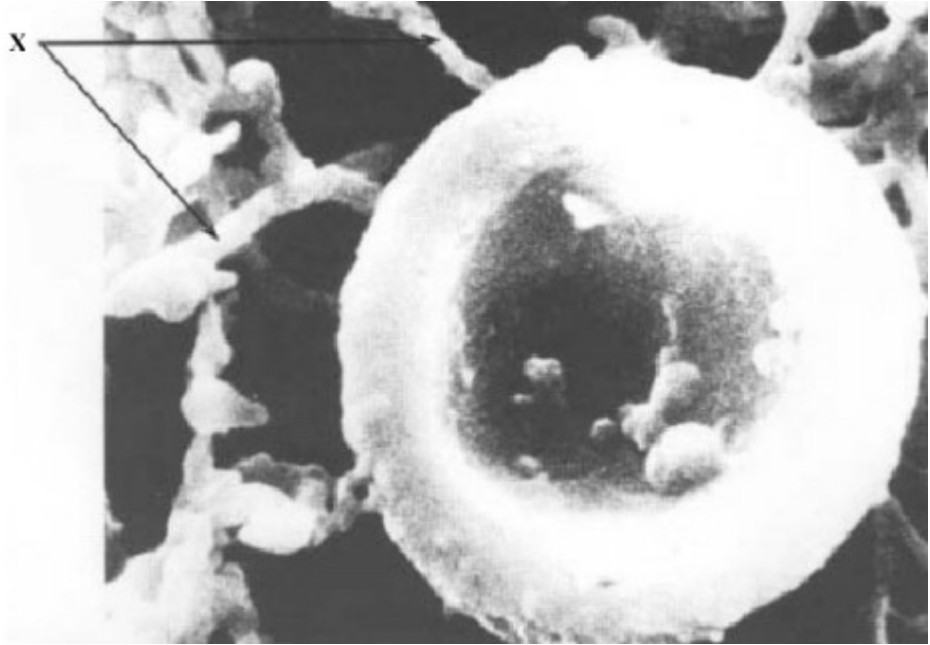
What is involved in *active transport*?

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....

(Total 4 marks)

7

The photograph shows a red blood cell in part of a blood clot. The fibres labelled X are produced in the early stages of the clotting process.



(a) Suggest how the fibres labelled X help in blood clot formation.

.....

(1)

(b) The average diameter of a real red blood cell is 0.008 millimetres. On the photograph, the diameter of the red blood cell is 100 millimetres.

Use the formula to calculate the magnification of the photograph.

Diameter on photograph = Real diameter x Magnification

.....  
.....  
.....

Magnification = .....

(2)

(c) Some blood capillaries have an internal diameter of approximately 0.01 millimetres.

(i) Use information given in part (b) to explain why only one red blood cell at a time can pass through a capillary.

.....

(1)



(ii) Explain the advantages of red blood cells passing through a capillary one at a time.

.....

.....

.....

.....

.....

.....

**(3)**  
**(Total 7 marks)**

## Mark schemes

1

- (a) award **3** marks per tube for each key idea

for tube 1:

expands **or** gets firmer **or** bigger **or** inflates

it gains water

because the concentration of water is less than its surroundings

*make sure answer is about water movement and not sucrose solution*

3

for tube 2

gets floppy **or** flaccid **or** contracts

it loses water

because the concentration of water is greater than its surroundings

3

- (b) any **2** from:

uptake of water by root (hair) **or**  
movement from cell to cell within  
plant

*do **not** credit references to diffusion unless it is clear that the candidate is referring to the diffusion of water*

guard cell function

maintain turgor

water absorption in the large intestine

reabsorption of water from the  
nephron **or** collecting duct or in  
kidney **or** osmoregulation in kidney

*allow osmosis in other animals if some use is shown*

2

[8]

2

(a) A cytoplasm

1

where (chemical) reactions take place

*do not accept where cell functions take place*

1

**or**

carries/holds the organelles/named organelles / named chemicals (including nutrients)

*do not accept keeps the shape of the cell*

**or**

contains water

**or**

presses out on the membrane

*allow: keeps cell turgid*

*allows transport through the cell*

B membrane

*do not accept by themselves:*

*protects cell*

*gives shape*

1

controls what enters/leaves the cell

1

**or**

contains the cell/holds the cell together

*do not accept keeps harmful substances out*

**or**

allows movement into and out of the cell C nucleus

1

contains the genetic  
material/DNA/genes/chromosomes

*do not accept:*

*brain of the cell*

*stores information/instructions*

*tells cell what to do*

**or**

controls (the activity) of the cell

1

- (b) (i) one mark for each correctly labelled part  
*cell wall*  
*do **not** accept anything inboard of the inner edge vacuole*  
*accept anything inboard of transplast*

chloroplast: site of photosynthesis/ for photosynthesis  
*accept word equation **or** balanced equation*

1

cell wall: supports the cell/keeps the shape/keeps it rigid  
*do **not** accept protects the cells*

2

- (ii) vacuole: acts as reservoir for water / chemicals/(cell)/sap

3

**or**  
 keeps cell turgid/pushes content to edge

**or**  
 maintains concentration gradient

**or**  
 allows cell elongation (not growth)

1

[12]

- 3** (a) (i) mitosis

*correct spelling only*

1

- (ii) replicates / doubles / is copied / duplicates  
*accept cloned*  
*ignore multiplied / reproduced*

1

- (b) fertilisation occurs / fusion (of gametes)  
*accept converse for asexual, eg none in asexual / just division in asexual*

1

so leading to mixing of genetic information / genes / DNA / chromosomes  
*genes / DNA / chromosomes / genetic information comes from 1 parent in asexual*  
*ignore characteristics*

1

one copy (of each allele / gene / chromosome) from each parent

**or**

gametes produced by meiosis

**or**

meiosis causes variation

*meiosis must be spelt correctly*

1

[5]

4

**one** mark for each of the following comparisons to a maximum of **6**

*candidates **must** make a clear comparison*

**meiosis**

**mitosis**

sexual

asexual

gametes

growth

ovary **or** testes  
**or** gonads

all other cells

half number  
of chromosomes

same number  
of chromosomes

haploid **or**  
23 chromosomes

diploid **or**  
46 chromosomes

reassortment **or**  
variation possible  
**or** not identical

no reassortment  
**or** no variation  
**or** identical

4 cells produced

2 cells produced

2 divisions

1 division

[6]

5

(a) any **two** from:

- sterilise / kill microorganisms  
*ignore 'cleaning' / 'disinfect'*  
*ignore 'germs'*
- method of sterilisation eg apparatus / media sterilised in oven / autoclave  
*allow pressure cooker / boiling water*
- pass flask mouth / pipette tip / loop / test tube mouth through flame
- work near a flame
- minimise opening of flask / test tube **or** hold non-vertical  
*allow idea of sealing / covering **or** prevent entry of air*

2

(b) any **two** from:

- temperature  
*ignore references to time / type of bacterium*
- concentration / amount of nutrients / ions
- type of nutrient
- volume / amount of solution
- amount of bacteria added
- agitation **or** amount of oxygen

2

(c) (i) 7.5

*accept in range 7.4 – 7.6*

1

(ii) use more pH values around / close to pH 7.5 / between 7 and 8

1

[6]

6

any **four** from

molecules / ions

*do not credit mineral salts*

move(d) through / across the cell

wall / membrane

against (a / the) concentration

gradient

by a series of chemical

reactions

(because) diffusion cannot occur

energy (required)

(supplied by) respiration

oxygen required for respiration (to occur)

[4]

7

(a) hold cells together **or** prevent flow of cells **or** trap cells

1

(b) 12500

*if correct answer, ignore working / lack of working*

$$\frac{100}{0.008} \text{ for 1 mark}$$

*ignore any units*

2

- (c) (i) size RBC approximately same size capillary **or**  
no room for more than one cell **or**  
only one can fit **or**  
RBC is too big  
*allow use of numbers*  
*do **not** accept capillaries are narrow*

1

- (ii) more oxygen released (to tissues) **or**  
more oxygen taken up (from lungs)

1

and any **two** from:

- slows flow **or** more time available
- shorter distance (for exchange) **or** close to cells / capillary wall
- more surface area exposed

2

[7]