Cell Biology part 11 AQA Combined Science

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Name: _____

Class: _____

Date: _____

Time: **64 minutes**

Marks: **57 marks**

Comments:

Q1.

Some infections are caused by bacteria.

(a) The genetic material is arranged differently in the cells of bacteria compared with animal and plant cells.

Describe **two** differences.

_____

_____

_____

_____

(2)

(b) Tuberculosis (TB) is an infection caused by bacteria.

The table below shows the number of cases of TB in different regions of southern England from 2000–2011.

Number of cases of TB per 100 000 people

Year	London	South East	South West
2000	37	5	3
2001	36	6	4
2002	42	6	6
2003	42	7	4
2004	42	7	5
2005	49	8	5
2006	44	8	3
2007	43	8	5
2008	44	8	5
2009	44	9	6
2010	42	9	5
2011	45	10	5

(i) How does the number of cases of TB for London compare with the rest of southern England?

_____

_____

_____

(1)

(ii) Describe the pattern in the data for cases of TB in the South East.

_____

_____

(1)

(iii) Describe the pattern in the data for cases of TB in the South West.

_____

_____

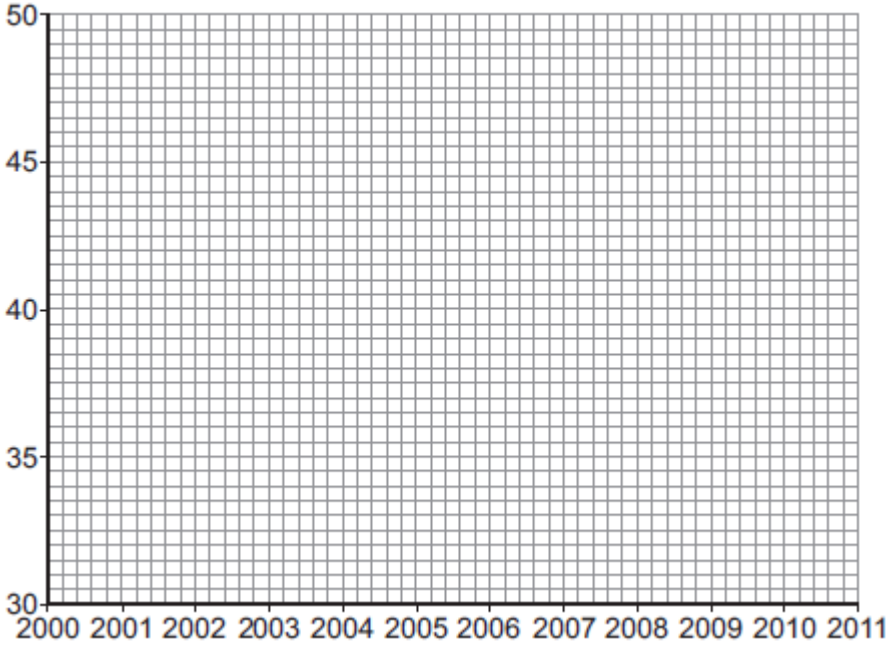
_____

_____

(2)

(c) (i) On the graph paper below:

- plot the number of cases of TB in **London**
- label both the axes on the graph
- draw a line of best fit.



(4)

(ii) Suggest why a student thought the value for 2005 in London was anomalous.

_____

_____

(1)

(d) People can be vaccinated against TB.

Suggest how a vaccination programme would reduce the number of people with TB.

Details of how a vaccine works are **not** required.

_____

_____

_____

_____

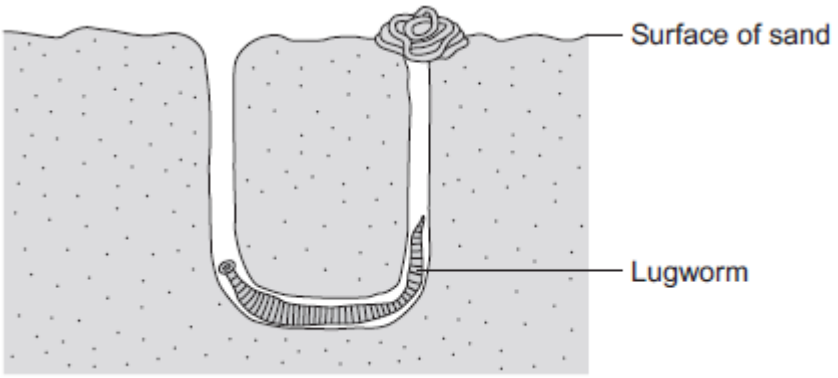
(2)

(Total 13 marks)

Q2.

The lugworm lives in a U-shaped burrow in the sand on the seashore.

The diagram below shows a lugworm in its burrow.



(a) Some scientists investigated the effect of different salt concentrations on lugworms.

The scientists:

- collected 50 lugworms from the seashore
- separated them into five groups of 10 lugworms
- weighed each group of 10 lugworms
- placed each group into a different concentration of salt solution and left them for 8 hours
- took each lugworm out of the solution and placed it on blotting paper for 30 seconds
- re-weighed each group of 10 lugworms.

(i) Why did the scientists use groups of 10 lugworms and not just 1 lugworm at each concentration?

_____

_____

(1)

(ii) Suggest why the scientists placed each lugworm on blotting paper for 30 seconds before they reweighed the groups of lugworms.

_____

_____

(1)

(iii) How might the method of blotting have caused errors in the results?

_____

_____

(1)

(iv) Suggest **one** improvement the scientists could make to their investigation.

_____

(1)

(b) The table below shows the scientists' results.

Concentration of salt in arbitrary units	Mass of 10 lugworms at start in grams	Mass of 10 lugworms after 8 hours in grams	Change in mass in grams	Percentage (%) change in mass
1.0	41.2	61.8	+20.6	+50
2.0	37.5	45.0	+7.5	
3.0	55.0	56.1	+1.1	+2
4.0	46.2	22.2	-24.0	-52
5.0	45.3	22.6	-22.7	-50

(i) The scientists calculated the **percentage** change in mass at each salt concentration.

Why is the **percentage** change in mass more useful than just the change in mass in grams?

Use information from the table in your answer.

_____

_____

_____

_____

(2)

(ii) Calculate the percentage change in mass for the 10 lugworms in the salt solution with a concentration of 2.0 arbitrary units.

_____

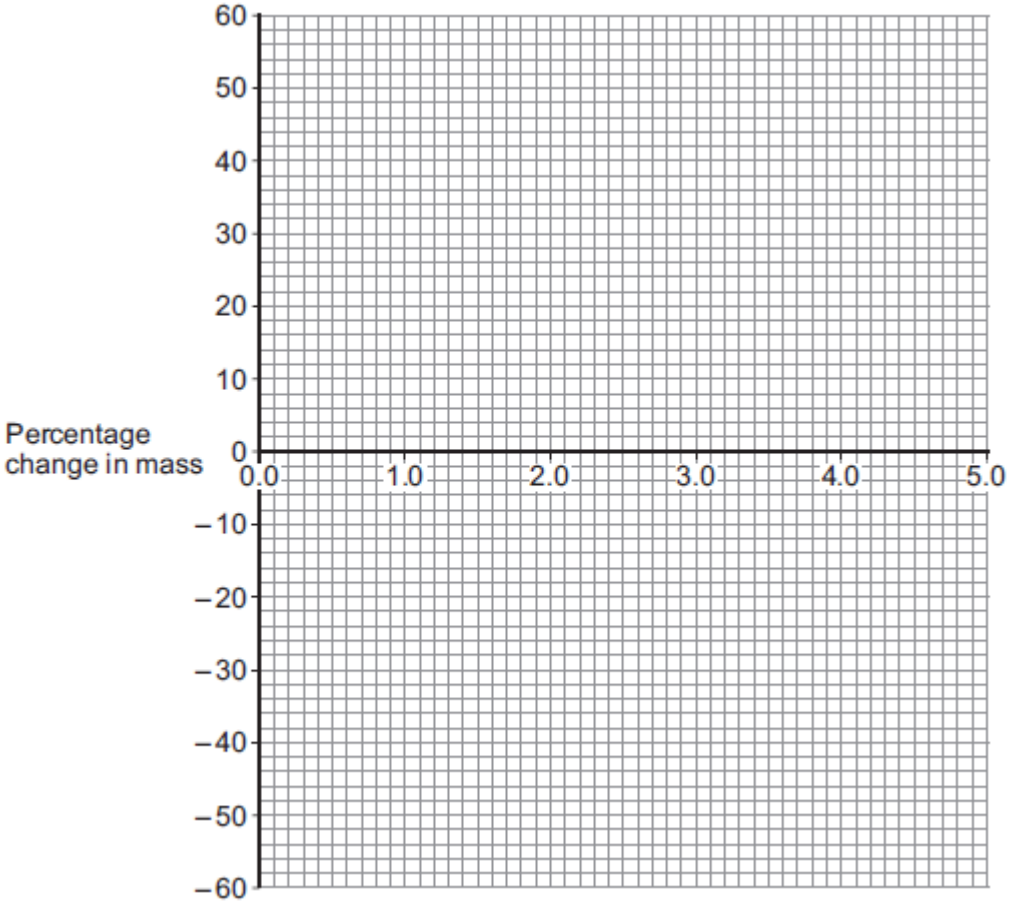
_____

Percentage change in mass = _____ %

(2)

(c) (i) On the graph paper below, draw a graph to show the scientists' results:

- plot the **percentage** change in mass
- label the horizontal axis
- draw a line of best fit.



(4)

(ii) The scientists thought one of their results was anomalous.

Draw a ring around the anomalous result on your graph.

(1)

(iii) Suggest what might have happened to cause this anomalous result.

_____

_____

(1)

(d) (i) What do you think is the concentration of salts in the lugworm's natural environment?

Use information from your graph to give the reason for your answer.

Concentration = _____ %

Reason _____

_____

_____

_____

(2)

(ii) The mass of the lugworms decreased in the salt solution with a concentration of 5.0 arbitrary units.

Explain what caused this.

_____

_____

_____

_____

_____

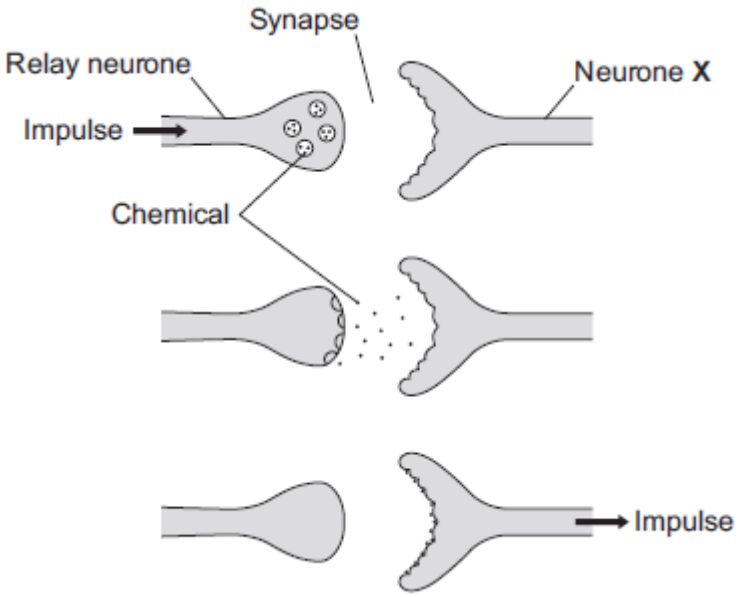
_____

(3)

(Total 19 marks)

Q3.

The diagram below shows how a nerve impulse passing along a relay neurone causes an impulse to be sent along another type of neurone, neurone **X**.



(a) What type of neurone is neurone **X**?

_____

(1)

(b) Describe how information passes from the relay neurone to neurone **X**.
Use the diagram to help you.

_____

_____

_____

_____

_____

_____

(3)

(c) Scientists investigated the effect of two toxins on the way in which information passes across synapses. The table below shows the results.

Toxin	Effect at the synapse
Curare	Decreases the effect of the chemical on neurone **X**
Strychnine	Increases the amount of the chemical made in the relay neurone

Describe the effect of each of the toxins on the response by muscles.

Curare _____

_____

_____

Strychnine _____

_____

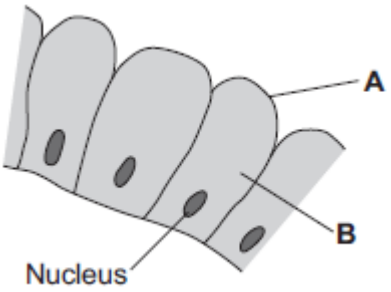
_____

(2)

(Total 6 marks)

Q4.

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**.

cell membrane	**chloroplast**	**cytoplasm**	**vacuole**

A _____

B _____

(2)

(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 ☐

(1)

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

Part of human body	**Scientific name**
Layer of cells lining the stomach	An organ
Stomach	An organism
Mouth, stomach, intestines, liver and pancreas	An organ system
	A tissue

(3)

(Total 6 marks)

Q5.

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

Diffusion is an important process in animals and plants.

The movement of many substances into and out of cells occurs by diffusion.

Describe why diffusion is important to animals and plants.

In your answer you should refer to:

- animals
- plants
- examples of the diffusion of named substances.

Extra space

(Total 6 marks)

Q6.

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

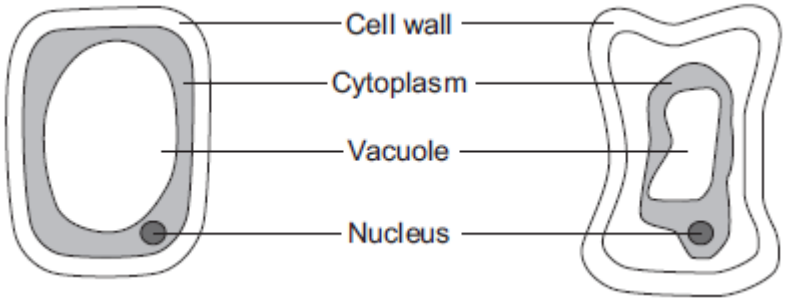
freely permeable
non-permeable
partially permeable

membrane.

(2)

(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. _____

(2)

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

Suggest what would happen to the cells.

_____

_____

_____

(1)

(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)

Q1.

(a) any **two** from:

- only one 'chromosome'
  allow one strand of DNA
- circular
  allow loop
- may have plasmids
- not in a nucleus / no nucleus

2

(b) (i) any **one** from:

- London is much higher
  or converse
- more variable / wider range
  allow 'on average it is 5 / 6 times greater'

1

(ii) increases
Included figures must be correct

1

(iii) overall slight increase
accept 'doesn't change much'

1

variable / goes up and down

1

(c) (i) both axes correctly labelled

x = Year

y = Number of cases

1

correct points
*all correct = **2** marks*
*1-2 errors = **1** mark*
*> 2 errors = **0** marks*

2

suitable line of best fit
accept straight line or smooth curve

1

(ii) doesn't fit the pattern / line of best fit

1

(d) provides immunity / protection (to TB)
ignore 'stops people catching it'

ignore 'resistance'

1

prevents TB spreading

accept ref to herd immunity

1

[13]

Q2.

(a) (i) variation in masses / more representative / more typical / more reliable / average / mean / reference to anomalies

or

one worm to light to measure change

do not allow more accurate / more precise

ignore fair test / valid / repeatable / reproducible

1

(ii) remove solution / liquid (on outside of worm)

allow 'water'

1

(iii) variable amounts removed from each worm

ignore reference to length of timing

1

(iv) equal sizes of worm / more worms (in each group) / wash off all the sand / repeats / use more accurate balance / use smaller concentration intervals

allow reference to improve blotting technique eg blot before / blot more thoroughly

1

(b) (i) different (starting) masses / sizes / weights (at different concentrations)

1

allows comparisons / shows pattern / shows trend

1

(ii) (+)20

*correct answer = **2** marks, with or without working*

or

$$\frac{7.5}{37.5} \times 100 \quad / \quad \frac{7.5}{37.5} \quad / \quad \left(\frac{45.0}{37.5} - 1\right) \times 100$$

*for **1** mark*

2

(c) (i) graph:

points correct

allow ± 1 mm

*–**1** mark per error*

allow ecf from part b(ii)

2

label on x-axis including units – ie Concentration of salt in arbitrary units

1

line of best fit = smooth curve / ruled straight line

anomaly (4.0, –52) either plotted and ignored re. line

***or** not plotted*

do not allow point to point

allow best fit for ecf from 2bii

1

(ii) on graph:

ring drawn around point at (4.0, –52)

allow (5.0, –50) if cand. line indicates this

1

(iii) sensible suggestion – eg used wrong solution / used 5.0% instead of 4.0% / different length of time in solutions / ref to error in blotting / balance not zeroed / error in weighing

allow some lugworms died

allow error in calculation

1

(d) (i) 2.9 to 3.0 / correct for candidate's graph ± 0.1

1

value of no change in mass / worms in equilibrium with soln / described

allow small(est) mass change

1

(ii) water loss

1

by osmosis / diffusion

1

from dilute region in the worm to more concentrated solution outside

allow correct description in terms of high to low <u>water</u> concentration / high to low water potential

salt solution is hypertonic

concentration unqualified = salt concentration

1

[19]

Q3.

(a) motor

allow efferent / postsynaptic

*allow **another** relay (neurone)*

1

(b) release of chemical (from relay neurone)

allow ecf for 'motor' neurone from (a)

allow release of neurotransmitter / named example

1

chemical crosses gap / junction / synapse

allow diffuses across

allow chemical moves to X

1

chemical attaches to X / motor / next neurone (causing impulse)

1

(c) (curare) decrease / no contraction

accept (muscle) relaxes

1

(strychnine) increase / more contraction

*if no other mark awarded allow 1 mark for (curare) decrease / no response **and** (strychnine) increase / more response*

1

[6]

Q4.

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

1

B = cytoplasm

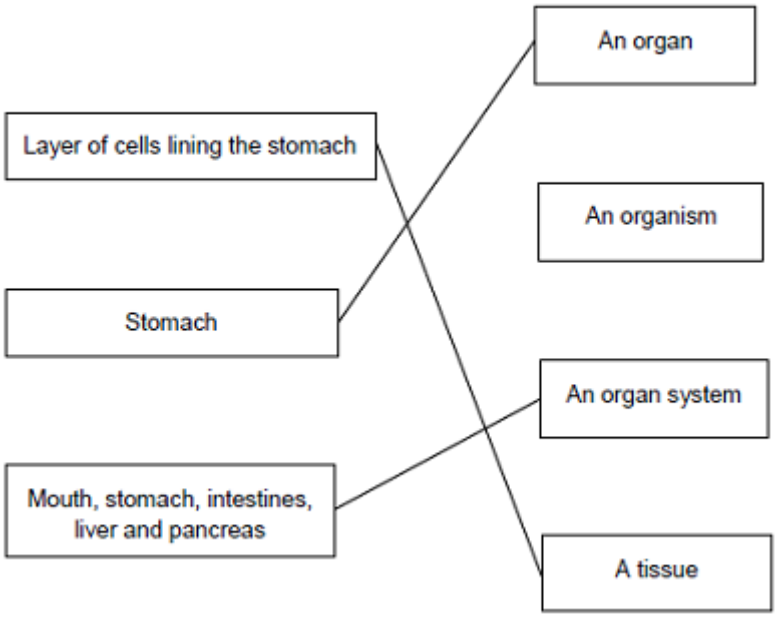
*do **not** accept cytoplast*

1

(ii) To control the activities of the cell

1

(b)



extra lines cancel

3

[6]

Q5.

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also apply a 'best-fit' approach to the marking.

0 marks
No relevant content.

Level 1 (1 – 2 marks)
An example is given of a named substance
or
a process
or
there is an idea of why diffusion is important eg definition.

Level 2 (3 – 4 marks)
At least one example of a substance is given
and
correctly linked to a process in either animals or plants.

Level 3 (5 – 6 marks)
There is a description of a process occurring in either animals or plants that is correctly linked to a substance
and
a process occurring in the other type of organism that is correctly linked to a substance.

examples of points made in the response

Importance of diffusion:

- to take in substances for use in cell processes
- products from cell processes removed

Examples of processes and substances:

- for gas exchange / respiration: O_2 in / CO_2 out
- for gas exchange / photosynthesis: CO_2 in / O_2 out
- food molecules absorbed: glucose, amino acids, etc
- water absorption in the large intestine
- water lost from leaves / transpiration
- water absorption by roots
- mineral ions absorbed by roots

extra information

Description of processes might include:

- *movement of particles / molecules / ions*
- *through a partially permeable membrane*
- *(movement of substance) down a concentration gradient*
- *osmosis: turgor / support / stomatal movements*

[6]

Q6.

(a) osmosis

1

partially permeable

1

(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

2

(ii) any **one** from:

- water will move / diffuse in
- (cells) will swell
- (cells) will burst

ignore turgid

1

(c) villi give the small intestines a large surface area

1

villi have many blood capillaries

1

[7]