AQA

GCSE
BIOLOGY

Higher Tier   Paper 1H

H

Specimen 2018

Time allowed: 1 hour 45 minutes

Materials
For this paper you must have:
- a ruler
- a calculator.

Instructions
- Answer all questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- There are 100 marks available on this paper.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- When answering questions 02.4, 03.2, and 10 you need to make sure that your answer:
  – is clear, logical, sensibly structured
  – fully meets the requirements of the question
  – shows that each separate point or step supports the overall answer.

Advice
In all calculations, show clearly how you work out your answer.

Please write clearly, in block capitals.

Centre number Candidate number

Surname

Forename(s)

Candidate signature

There are no questions printed on this page

0 1 Plants transport water and mineral ions from the roots to the leaves.

0 1 . **1** Plants move mineral ions:

- from a low concentration in the soil

- to a high concentration in the root cells.

What process do plants use to move these minerals ions into root cells?

[1 mark]

Tick one box.

Active transport ✓ ☑

Diffusion ☐

Evaporation ☐

Osmosis ☐

0 1 . **2** Describe how water moves from roots to the leaves.

[2 marks]

by the transpiration stream / in the xylem. ✓

In-n-

Question 1 continues o the next page

Plants lose water through the stomata in the leaves.

The epidermis can be peeled from a leaf.

The stomata can be seen using a light microscope.

Table 1 shows the data a student collected from five areas on one leaf.

Table 1

Leaf area	Number of stomata	
	Upper surface	Lower surface
1	3	44
2	0	41
3	1	40
4	5	42
5	1	39
Mean	2	X

(handwritten annotations, left margin):
0. 1, 0, 3, 5
$\frac{n+1}{2}$
$\frac{5+1}{2} = 3rd$

(handwritten annotations, right margin):
44+41+40+42+39
= 206
$\frac{206}{5} = 41.2$

- 0 1 . 3   Describe how the student might have collected the data in Table 1.

[3 marks]

(handwritten answer):
Mount epidermis on slide. Count stomata in one area. Repeat is 4 more areas. Calculate mean.
+ repeat method on other side of leaf

(teacher markings in red):
Mount epidermis on slide! ✓
Repeat is 4 mean !
bag
repeat method on other side ✓

0 1 . 4 What is the median number of stomata on the upper surface of the leaf?

[1 mark]

1 1

0 1 . 5 Calculate the value of X in Table 1.

Give your answer to 2 significant figures.

[2 marks]

206 ÷ 5 = 41.2 41.2 ✓

Mean number of stomata on lower surface of leaf = 41 ✓

0 1 . 6 The plant used in this investigation has very few stomata on the upper surface of the leaf.

Explain why this is an advantage to the plant.

[2 marks]

Less water lost ! so it does not wilt!

Less water on, so it does not wilt

Turn over for the next question

0 2   Tobacco mosaic virus (TMV) is a disease affecting plants.

Figure 1 shows a leaf infected with TMV.

Figure 1

TM
c

0 2 . 1   All tools should be washed in disinfectant after using them on plants infected with TMV.

Suggest why.

[1 mark]

to kill virus.
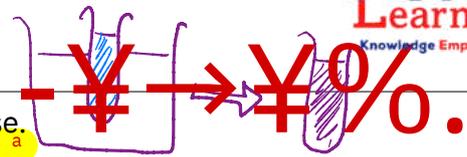To kill virus

or
or to prevent virus spreading

0 2 . 2   Scientists produced a single plant that contained a TMV-resistant gene.

Suggest how scientists can use this plant to produce many plants with the TMV-resistant gene.

[1 mark]

Take stem cells
Take stem cells from meristem
from meristem
O R   OR Tissue Culture
Tissue Culture

0 2 . 3 Some plants produce fruits which contain glucose.

Describe how you would test for the presence of glucose in fruit.

[2 marks]

Grind fruit in pestle and mortar to create a liquid
Add Benedict's reagent and heat in a water bath
If glucose is present it will turn from blue to pimpled

Student answer: Grind fruit in pestle and mortar to create a liquid. Add Benedict's reagent and heat in a water bath. If glucose is present it will turn from blue to orange.

¥8

0 2 . 4 TMV can cause plants to produce less chlorophyll.

This causes leaf discoloration.

Explain why plants with TMV have stunted growth.

[4 marks]

her photosynthes.rsocculsloro phyll required for it So less. glucose produced

blue noses used in respiration so less energy is feared for growth.

Student answer: here photosynthesis occurs since chlorophyll required for it. So less glucose is produced which is used in respiration so less energy is released for growth.

ORUS proteins. required to make produced glucose fever proteins one enential for growth.

Student answer: or Glucose is required to make proteins. Since less glucose, fewer proteins produced which are essential for growth.

Turn over for the next question

0 3 Microorganisms cause infections.

The human body has many ways of defending itself against microorganisms.

0 3 . 1 Describe two ways the body prevents the entry of microorganisms.

[2 marks]

1 Acid in stomach kills pathogens in food *pathogen good*

2 skin forms a protective barrier for *forms protective produces*
antimicrobial secretions

+ Trachea has mucus which traps pathogens *trapspathogens* breathed in
have cilia which wafts mucus to mouth to be swallowed
+ hairs in nostrils trap pathogens

| 0 | 3 | . | 2 |

In 2014 the Ebola virus killed almost 8 000 people in Africa.

Drug companies have developed a new drug to treat Ebola.

I assumed angerous → assume dangerous

Explain what testing must be done before this new drug can be used to treat people.

[6 marks]

Include:
- what we are testing for
- how to carry out such tests
- justification of this method

Carry out preclinical trials to test for efficacy, and toxicity. Then do clinical trials on healthy volunteers at low doses to monitor safety. Following this test for optimum dosage, and efficacy. Do this in the form of a double blind trial, using a placebo that contains no active drug. There should be random allocation of patients to each group, and neither patients nor doctors should know who is in which one. Completed data should be peer reviewed to help prevent false data.

Turn over for the next question

There are no questions printed on this page

0 4   All living cells respire.

0 4 . 1   Respiration transfers energy from glucose for muscle contraction.

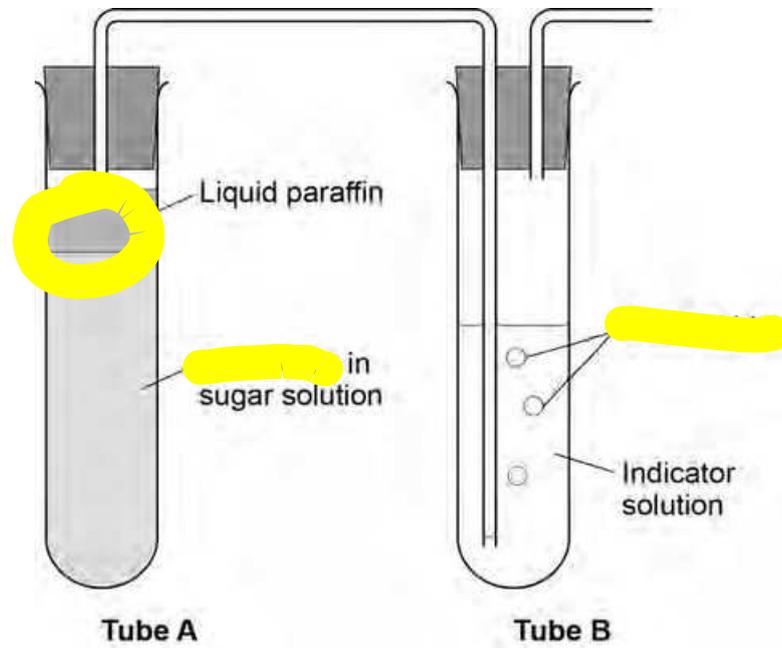Describe how glucose from the small intestine is moved to a muscle cell.

[2 marks]

Glucose moves into bloodstream by diffusion ✓. The blood then delivers glucose to muscles in capillaries ✓

[Examiner annotations: diffusion; blood then delivers glucose to mushes in capillaries ✓]

Questin 4 continues on the next page

Figure 2 shows an experiment to investigate anaerobic respiration in yeast cells.

no oxygen

Figure 2

- Liquid paraffin
- in sugar solution
- Indicator solution

Tube A   Tube B

0 4 . 2 What is the purpose of the liquid paraffin in TubeA?

[1 mark]

Tick one box.

To prevent evaporation ☐

To stop air getting in ☑

To stop the temperature going up ☐

To stop water getting in ☐

The indicator solution in Tube B shows changes in the concentration of carbon dioxide (CO2).

The indicator is:

• blue when the concentration of CO2 is very low

• green when the concentration of CO2 is low

• yellow when the concentration o

-Of CO2 is high.

| 0 4 | . | 3 | What colour would you expect the indicator to be in B during maximum rate of Tube anaerobic respiration?

[1 mark]

Tick one box.

glucose → Co +, *glucose → CO_2 + ethanol*

Blue ☐

Green ☐

Yellow ✓ ☑

| 0 4 | . | 4 | Suggest how the experiment could be changed to give a reproducible way to measure the rate of the reaction.

Incliude any apparatus you would use.

[2 marks]

collect the con with a gassyringe!Measure the volume collected in a stated time with a stopwatchit.

Collect the CO_2 with a gas syringe ✓ Measure the volume collected in a stated time with a stopwatch ✓
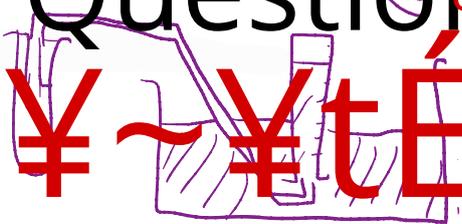
0 4 . 5 Compare anaerobic respiration in a yeast cell with anaerobic respiration in a muscle cell.

[3 marks]

Both release small amounts of energy. ✓

Yeast produces CO₂ which muscle cells do not! **not!**

Yeast produces ethanol but muscle cells produce lactic acid ✓

comparative statements.

(teacher annotations in red: "Both release small amounts of energy", "Yeast produces", "lactic acid", "comparative statements")

Turn over for the next question

0 5 A student investigated the effect of different sugar solutions on potato tissue.

Cone.
This is the method used. *of* *(cone. of solution)* *(evaporation of water)*
mention

1. Add 30 cm3 of 0.8 mol

2. Repeat step 1 with equal volumes of 0.6, 0.4 and 0.2 mol dm−3 sugar solutions.
3. Use water to give a concentration of 0.0 mol dm−3.

4. Cut five cylinders of potato of equal size using a cork borer.

5. Weigh each potato cylinder and place one in each tube.

6. Remove the potato cylinders from the solutions after 24 hours.

drying
agitps

7. Dry each potato cylinder with a paper towel.

8. Reweigh the potato cylinders. *(accuracy of balance)*
F.
o umocyugbolome

Table 2 shows the results.

Table 2

Concentration of sugar solution in mol dm−3	Starting mass in g	Final mass in g	Change of mass in g	Percentage (%) change
0.0	1.30	1.51	0.21	16.2
0.2	1.35	1.50	0.15	X
0.4	1.30	1.35	0.05	3.8
0.6	1.34	1.28	_0.06	−4.5
0.8	1.22	1.11	_0.11	−9.0

X change = *change/initial × 100* *9.7% +100*

0 5 . 1 Calculate the value of X in Table 2.

(0.15−11.35)×100 = 1111

Percentage change in mass = _____ *11.1* %

0 5 . 2 Why did the student calculate the percentage change in mass as well as the change in grams?

[1 mark]

Allows results to be compared
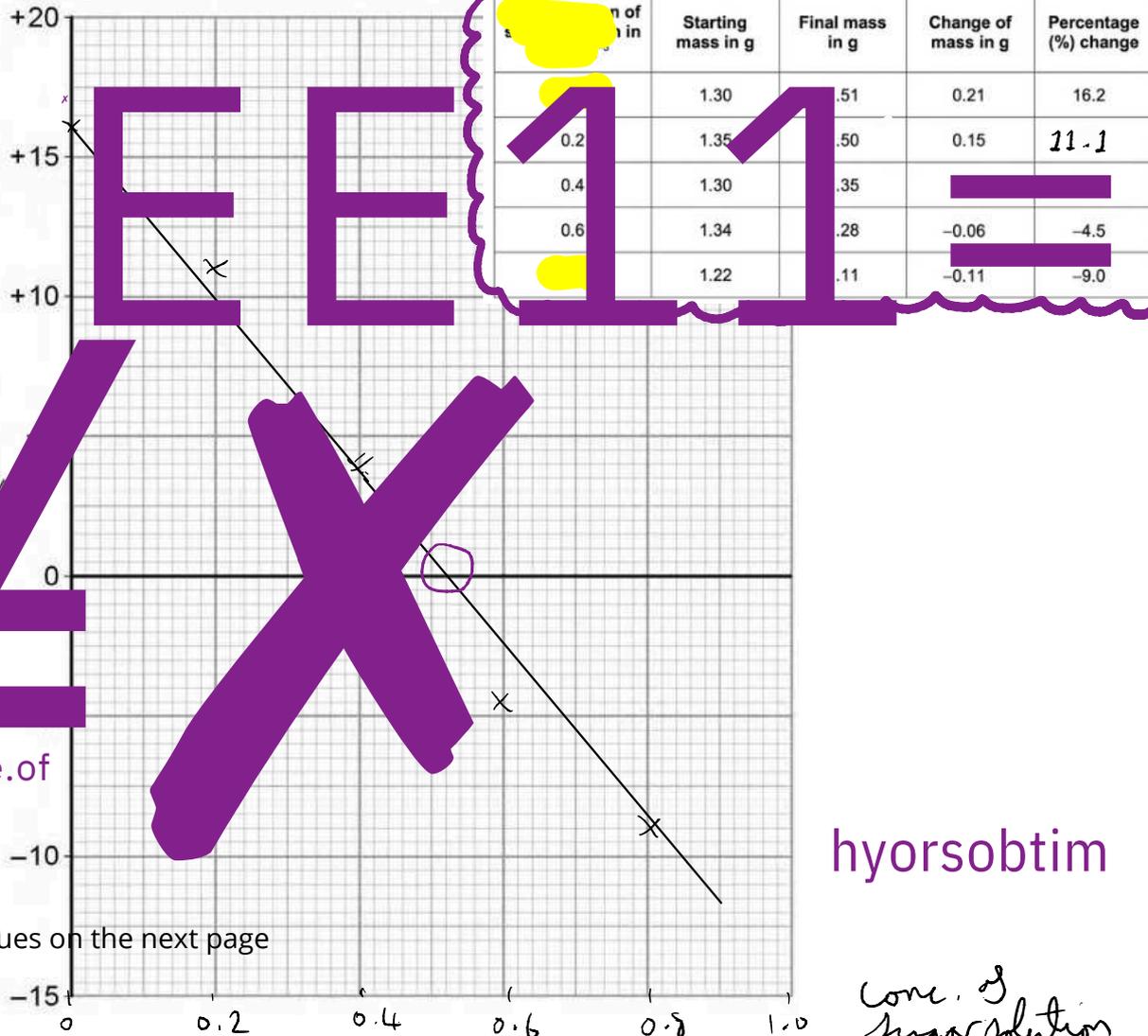*OR because starting mass was different.*

0 5 . 3 Complete Figure 3 using data from Table 2.
• Choose a suitable scale and label for the x axis
• Plot the percentage (%) change in mass.
• Draw a line of best fit.
[4 marks]

Figure 3

	Starting mass in g	Final mass in g	Change of mass in g	Percentage (%) change
	1.30	.51	0.21	16.2
0.2	1.35	.50	0.15	11.1
0.4	1.30	.35		
0.6	1.34	.28	−0.06	−4.5
	1.22	.11	−0.11	−9.0

Percentage (%) change in mass

Question 5 continues on the next page

0 5 . 4 Use your graph in Figure 3 to estimate the concentration of the solution inside the potato cells.

[1 mark]

in mass   (% change in mass)

Concentration = ___0.52___ mol dm−3

(0.45-0.55)

0 5 . 5 The results in Table 2 show the percentage change in mass of the potato cylinders.

Explain why the percentage change results are positive and negative.

[3 marks]

Between a concentration of 0 –0.52 mol/dm³, water moves into cells. Between 0.52-0.8 mol/dm³, water moves out of cells. In both cases, water moves by osmosis.

0 5 . 6 Suggest two possible sources of error in the method given on page 16.

[2 marks]

1 Cementation of solutions

2 Accuracy of balance.

0 6   Figure 4   shows the human digestive system.

Figure 4
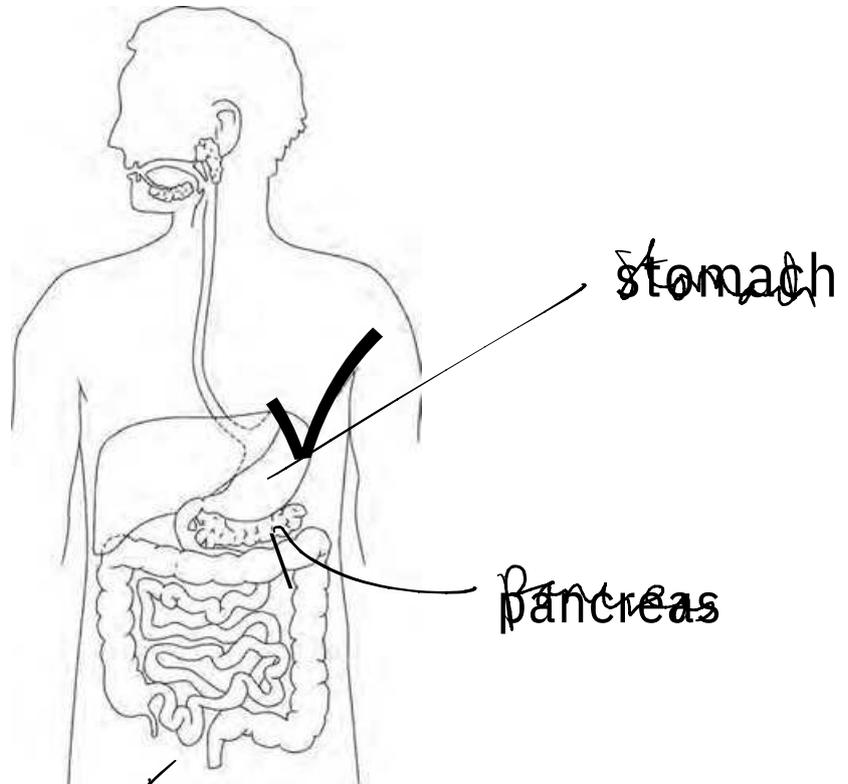
stomach

pancreas

0 6 . 1   Label the stomach and pancreas on Figure 4.

[1 mark]

Question 6 continues on the next page

Many people suffer from stomach ulcers caused by a species of bacteria called *Helicobacter pylori*.

The stomach is lined with a protective lining of mucus.

Helicobacter pylori are acid-tolerant bacteria which can damage this mucus lining.

0 6 . 2 Suggest how an infection with *Helicobacter pylori* might result in a stomach ulcer developing.

[2 marks]

Bacteria not killed by HiL and so they damage the mucus lining Therefore HCl causes an ulcer.

(teacher annotations: "causesan" / "for HCl damages stomach tissue)" / "damage the" / "damages")

0 6 . 3 *Helicobacter pylori* can also cause stomach cancer.

Describe how a person infected with *Helicobacter pylori* could also develop liver cancer.

[3 marks]

The cancer is malignant, cancer cells travels to other organs. They move via the blood forming a secondary tumour.

(teacher annotations: "Malignant", "Benign", "it as mar cells malignant", "They spread to others", "the orgablood", "secondary", ".gg#ooyo.Tg", ",√gommya")

0 6 . 4 Gluten is a form of protein found in some grains.

Describe the test you would use to find out if protein is present in food.

[2 marks]
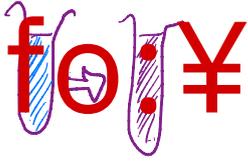
Add Biuret solution to food sample ✓
Purple colour shows protein present. ✓

0 6 . 5 Coeliac disease is a disease of the digestive system.

It damages the lining of the small intestine when foods that contain gluten are eaten.

When people with coeliac disease eat foods that contain gluten:

1. their immune system forms antibodies to gluten

2. these antibodies attack the lining of the small intestine

3. this causes inflammation in the intestines and damages the ① villi. *High SA*

Symptoms of coeliac disease include poor growth.

Suggest why a person with coeliac disease might have this symptom.

[4 marks]

Damaged villi reduce surface area for absorption.
Therefore, fewer amino acids and glucose absorbed. With less glucose, transfer of energy is reduced. With fewer amino acids, less are available to build new proteins.

0 7   A gardener is looking at the plants in his greenhouse.
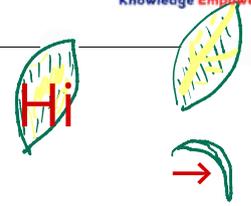
0 7 . 1   Some of the plants have a disease.

Give two ways the gardener could identify the pathogen infecting the plants.

[2 marks]

1 ~~Compare pitures~~ Compare pitures on a gardening website _(or gardening magazine book)_ ✓

2 ~~Send to a labb for analysis~~ Send to a lab for analysis ✓

0 7 . 2   Plants can become unhealthy if they do not have essential mineral ions.

Describe the appearance of plants with:

• nitrate deficiency
• magnesium deficiency.

[2 marks]

Nitrate deficiency   ~~Stunted growth~~ Stunted growth

Magnesium deficiency   ~~Yellowing of leaves~~ Yellowing of leaves ✓

Magnesium → chlorophyll.

nitrate → amino acid → fukin
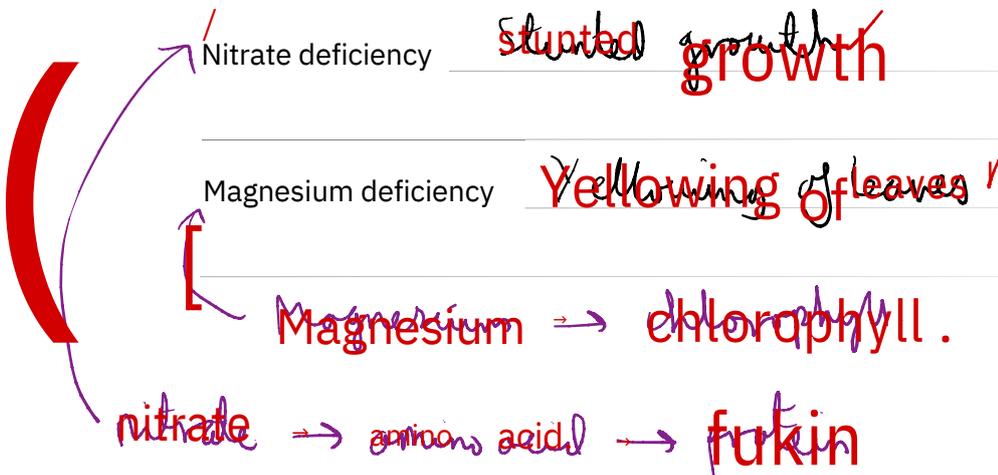
0 7 . 3 Plants need other mineral ions.

- Potassium ions are needed for healthy root growth.

- Phosphate ions are needed for healthy flowers and fruits.

The gardener makes his own garden compost.

The percentage (%) of minerals in his compost was compared with two fertilisers he could buy.

The data are shown in.

Table 3

Table 3
Percentage (%) min

	Nitrate ions	Phosphate ions	Potassium ions	Cost in £/kg
Garden compost	0.5	0.3	0.8	0.00
Fertiliser S	5.0	1.3	6.6	4.99
Fertiliser T	3.0	12.0	6.0	9.99

The gardener buys Fertiliser.

Explain why he chose Fertiliser S.

[4 marks]

S has the higher nitrate ion concentration so promotes the best growth. S also has the highest potassium ion content so will produce the stronger roots. It is cheaper than fertiliser T. However, it does not have the highest phosphate iron content but perhaps gardener is not interested in growing flowers.

(teacher annotations: forgive xeral content; for flowers; for roots; good growth; 5 has the higher nitrate ion concentration; so promotes the growth; potassium; highest; stronger roots; cheaper; produce the; than; perhaps; fertiliser T; phosphate; gardener; growing; have the highest; flowers; the)
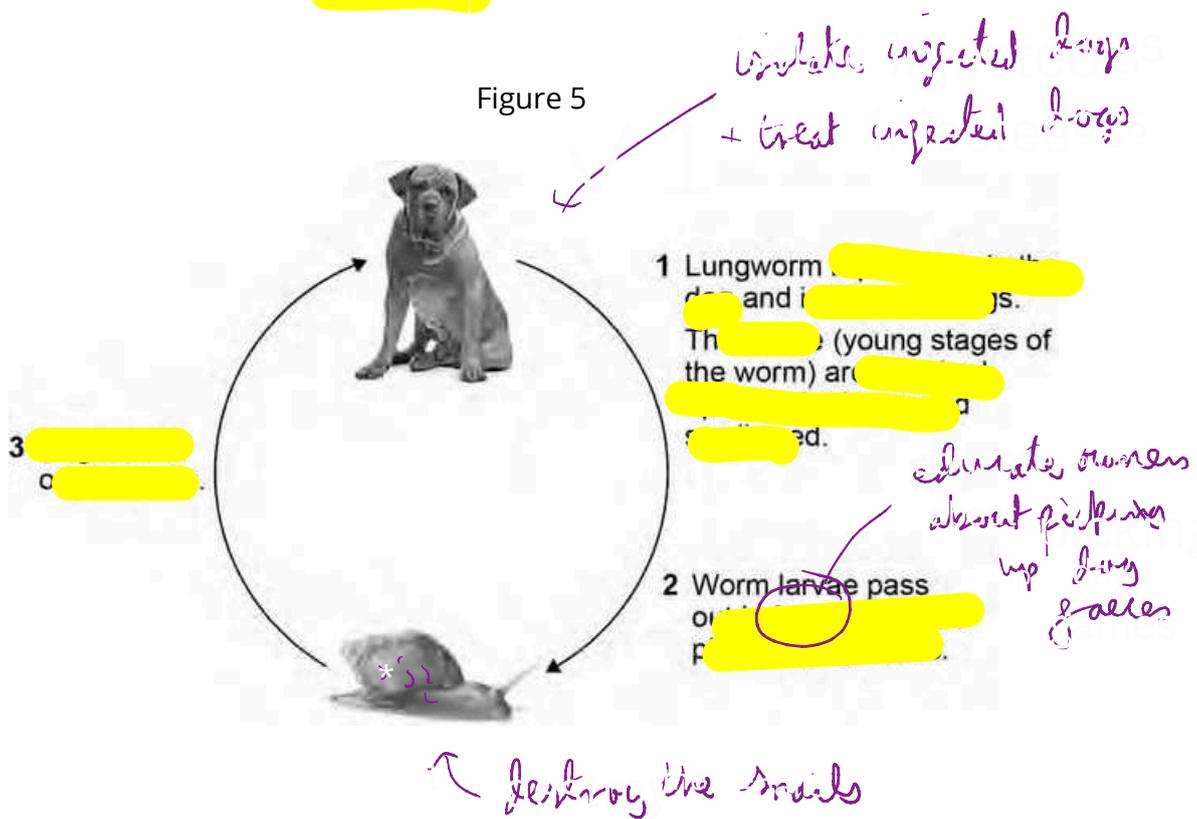
0 8

Lungworm is an infection.

Lungworm can kill dogs.

It is caused by a small worm.

Figure 5 shows the lifecycle of the lungworm.

Figure 5

[handwritten: isolate infected dogs + treat infected dogs]

[handwritten: educate owners about picking up dog faeces]

1 Lungworm ... the dog and i... ...gs. Th... (young stages of the worm) are ... ...ed.

2 Worm larvae pass o... ... ...

3 ...

[handwritten: destroy the snails]

0 8 . 1 What type of organism is represented by the snail in the lifecycle of the lungworm?

[1 mark]

Tick one box.

[handwritten: microorganism]

Fungus ☐

Parasite ☐

Protist ☐

[handwritten: the lungworm]

Vector ☑

[handwritten: a microorganism e.g. malaria]

0 8 . 2 Suggest how the spread of the lungworm disease can be prevented.

[3 marks]

(handwritten answer, annotated in red)
Destroy snails ! Isolate injected dogs.
E climate
Tell dog owners about picking up dog fakes .

Red annotations: Destroy snails ! Isolate injected dogs ✓. dog owners about picking up fakes .

0 8 . 3 Malaria is a disease spread by mosquitoes.

(red annotation: vector)
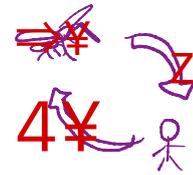
Describe two ways to control the spread of malaria.

-[2 marks]

1 Use mosquito nets so mosquitos cannot bite humans
2 Prevent mosquitos breeding.

Red annotations: mosquito nets so mosquitos cannot ✓ mosquitos breeding ✓

Turn over for the next question

0 9 Figure 6 shows photographs of some animal cells at different stages during the cell cycle.

Figure 6

A

division

chromosomes

B

nucleus
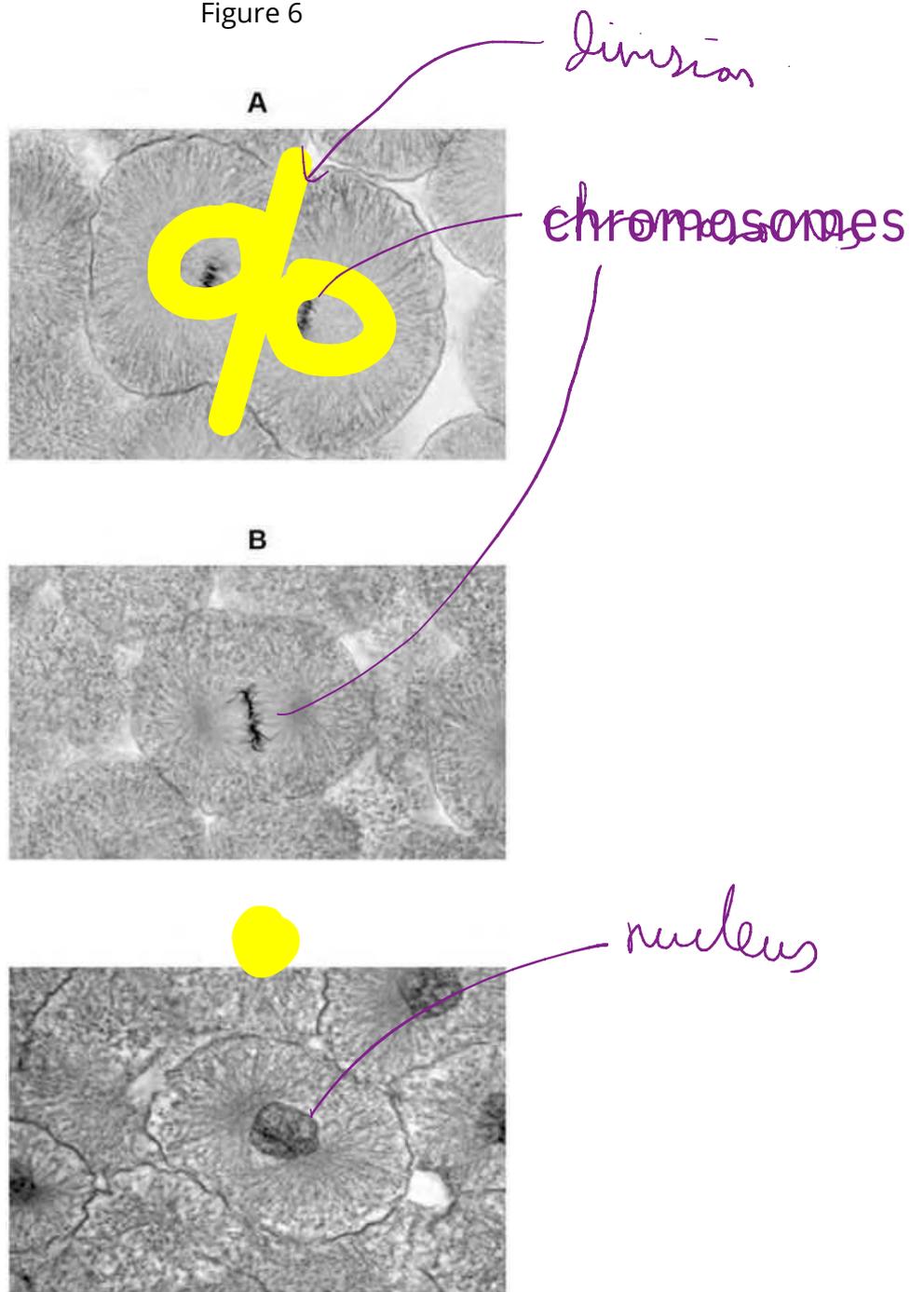
0 9 . 1   Which photograph in Figure 6 shows a cell that is <mark>not going through mitosis?</mark>

[1 mark]

Tick one box.

A B ☐   ☐ ☐   C ☑

0 9 . 2   Describe what is happening in photograph A.

[2 marks]

[handwritten answer, annotated in red:]

amon.i um2,s

Division g cell membrane and cellulplasm ✓ (OR Cytokinesis) daughter cells ✓

Cytoplwnm✓(or Ventria

To form2identical

Question 9 continues on the next page

A student wanted to find out more about the cell cycle.

The student made a slide of an onion root tip.

She counted the number of cells in each stage of the cell cycle in one field of view.

Table 4 shows the results.

Table 4

	Non-dividing cells	Stages in the cell cycle				Total
		Stage 1	Stage 2	Stage 3	Stage 4	
Number of cells	20 9 4			2	1	36
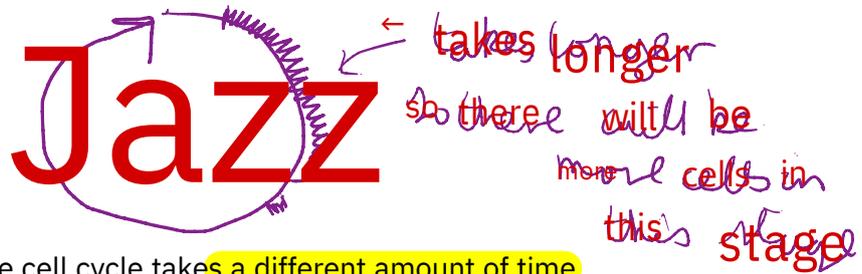
0 9 . 3 Each stage of the cell cycle takes a different amount of time.

Which stage in Table 4 is the fastest in the cell cycle?

Give a reason for your answer.

[2 marks]

Stage _____

Reason _____

0	9	.	4

The cell cycle in an onion root tip cell takes 16 hours.

Calculate the length of time Stage 2 lasts in a typical cell.

Give your answer to 2 significant figures.

[3 marks]

Time in Stage 2 = _____ 110 minutes

zQuestiona 9 contiunes on the nyext page

Bacteria such as *Escherichia coli* undergo cell division similar to mitosis.

Figure 7 shows a growth curve for *E. coli* grown in a 0 nutrient broth.

Figure 7
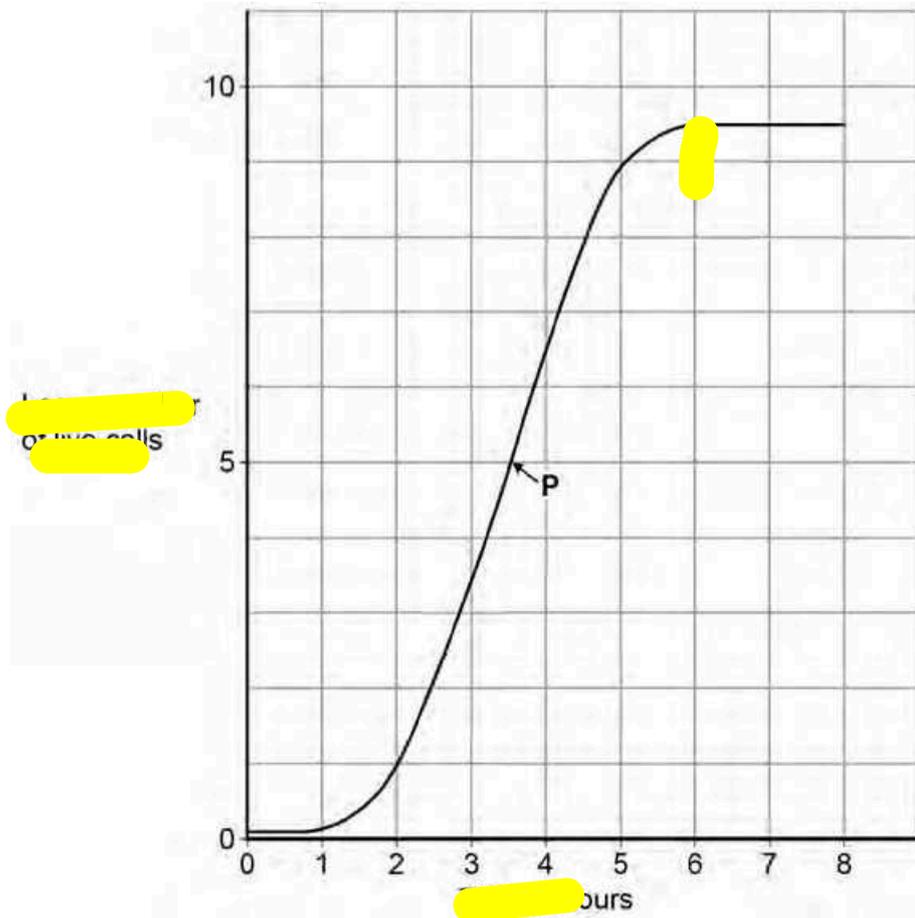
0 9 . 5 What type of cell division causes the change in number of *E. coli* cells at P?

[1 mark]

!. Binary Fission /

| 0 | 9 | . | 6 | Suggest why the number of cells levels out at Q.

[2 marks]

There is a shortage of nutrients ✓
So, cells die ✓
OR rate of cell growth is the same as
the rate of cell death .

Turn ov   er for the next qu estion

| 1 | 0 |

Explain how the human circulatory system is adapted to:

- supply oxygen to the tissues "
- remove waste products from tissues.

level 3
'detailed and coherent'

[6 marks]

LUNGS
HEART
[TISSUE]
TISSUE

low pressure

high pressure

gross stunted

high goes to

"Nhk'dd^

Has a double circulatory system which allows higher blood pressure and greater flow of blood and so oxygen to tissues. The pulmonary artery carries deoxygenated blood to the lungs which absorbs oxygen then it carried back to the heart before being pumped to tissues by the heart through the aorta. Oxygen is carried by red blood cells which contain no nucleus so contain more haemoglobin for oxygen transport. Capillaries carry blood cells to tissues. They have thin walls to allow diffusion of oxygen out and waste products in.

higher surface area of capillaries for optimum diffusion

blood goes back to heart in veins with valves to prevent backflow

dftjuhins

higher blood pressure and greater
oxygen Ltissues The pulmonary
deoxygenated hhmdbthe alveoli pulmonary
before being pumped to tissues by the
oxygen is carried by red blood.   haemoglobin
oxygen transport. Capillaries carry my blood
they have thin walls to allow
diffusion of oxygen out and waste
blood back bheart in veins with rakes
surface away capillaries
for preven back flow
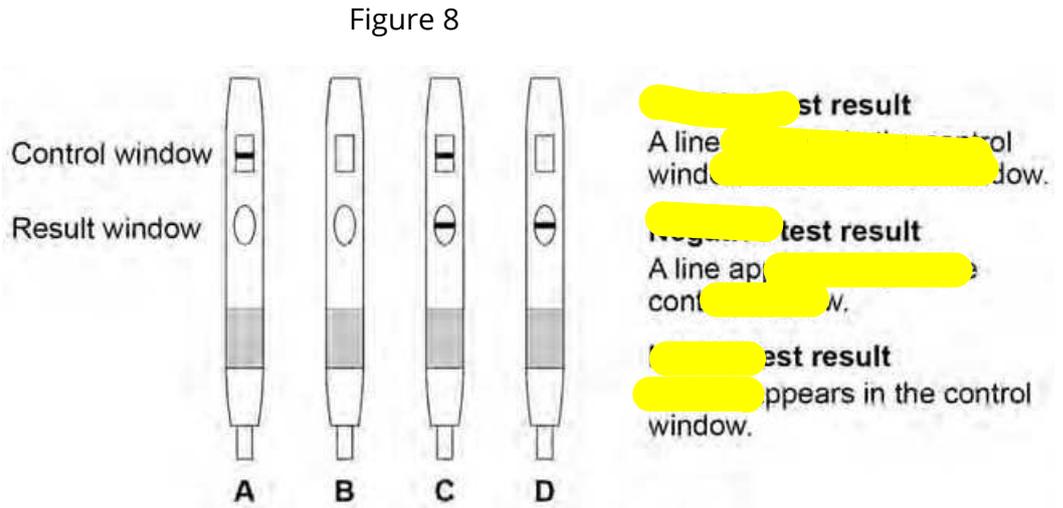printouts
optimum

Turn over for the next question

1 1 Monoclonal antibodies are used to measure the levels of hormones in the blood.

Pregnant women produce the hormone HCG.

HCG is excreted in urine.

Figure 8 shows four pregnancy test strips.

Figure 8

Which test strip shows a negative test result?

[1 mark]

Tick one box.

A ✓ B ✗ C D

1 1 . 2 Monoclonal antibodies are used for pregnancy testing.
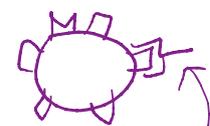
Give one other use of monoclonal antibodies.

[1 mark]

To treat cancer

1 1 . 3   Figure 9 shows the parts of a pregnancy test strip.

Figure 9

4. Immobilised antibodies specific to the _____ from the reaction zone.

3. _____ specific to HCG here.

2. _____: There are _____ specific to HCG here. These antibodies can move and _____ m.

1. _____
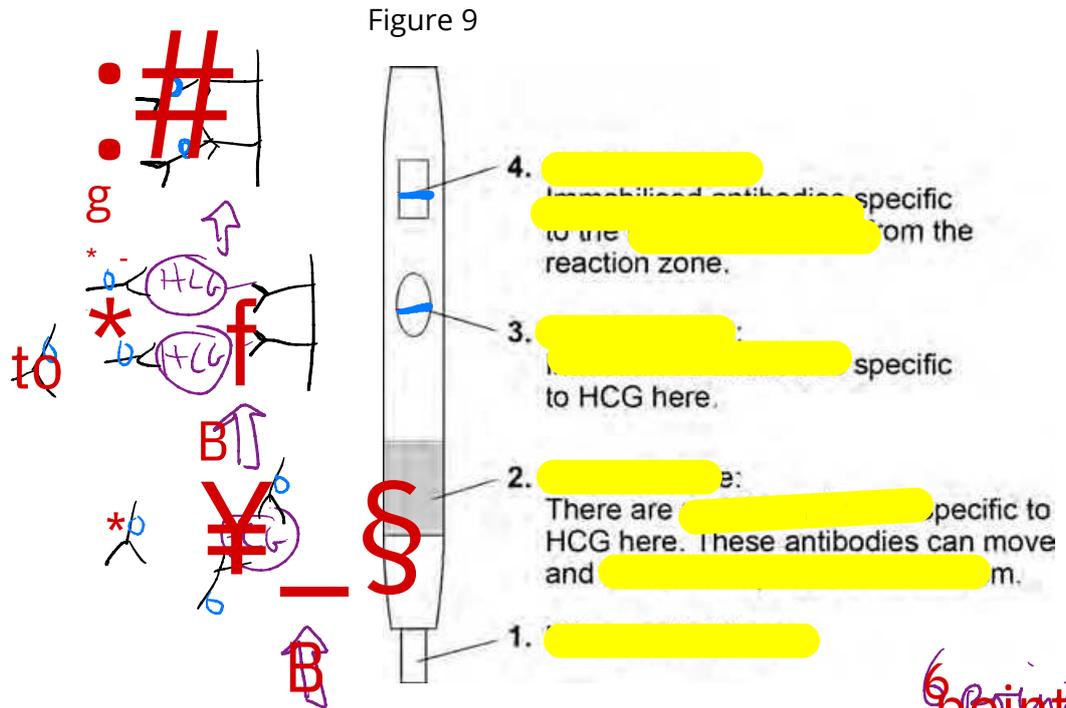
6 points

The pregnancy test strip will show a positive test result when a woman is pregnant.

Explain how the pregnancy test strip works to show a positive result.

[6 marks]

As urine passes through the reaction zone, mobile antibodies bind to HCG in urine. Continues to move up the stick and HCG binds to the specific immobile antibodies in the results zone, creating a blue line. Any antibodies that have not bound to the specific immobile antibodies here, thus a blue line up to the control window. Control window ✓ is also seen in the control window ✓

END OF QUESTIONS

There are no questions printed on this page

SPECIMEN MATERIAL