



**Week 1 Learning Check  
Biology Higher**

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

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

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

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Time: **30 minutes**

Marks: **30 marks**

Comments:

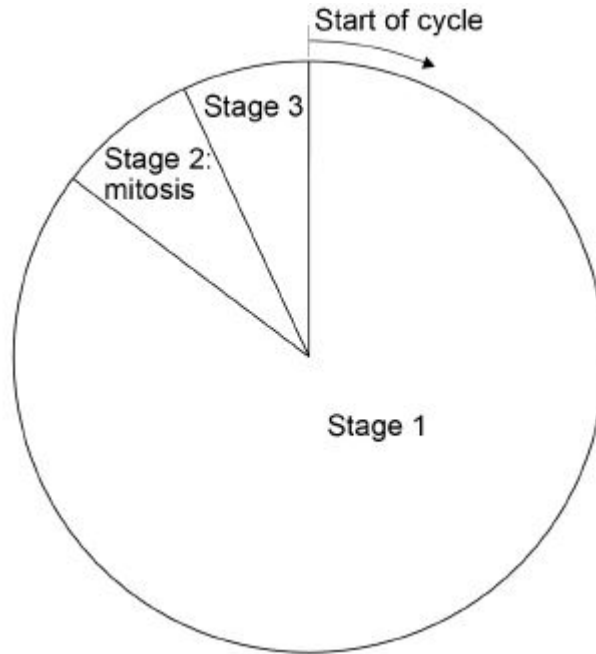
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**Q1.**

Cells divide in a series of stages called the cell cycle.

Stage 2 of the cycle is mitosis.

The diagram below shows a simplified cell cycle for a human body cell.



(a) Draw **one** line from each stage in the cell cycle to what happens during that stage.

Stage in the cell cycle	What happens during that stage
Stage 1	Nucleus divides
Stage 2	Cell divides into two
Stage 3	Copies of the DNA are made

(2)

(b) The mass of DNA in a human body cell at the start of the cell cycle is 6 picograms.

What mass of DNA will be in each of the new cells produced by this cell division?

Tick **one** box.

3 picograms

- 6 picograms
- 9 picograms
- 12 picograms

(1)

(c) Stem cells are undifferentiated cells.

Which statement about stem cells is correct?

Tick **one** box.

- Animal stem cells are found in meristems
- Animal stem cells divide by meiosis
- Meristem cells in plants can differentiate throughout the life of the plant
- Meristem cells in plants can only differentiate into one type of cell

(1)

Stem cells from human embryos can differentiate into most types of human cell.

Research is being done into the use of embryonic stem cells in medical treatments.

The long-term effects of using embryonic stem cells in patients are not well understood.

In therapeutic cloning, human embryos are produced using a donated human egg cell and a cell from the patient.

- The embryo produced contains the same genetic information as the patient.
- Stem cells are taken from the embryo and stimulated to divide to form cells the patient needs.
- The embryo is then destroyed.

(d) Suggest **two** advantages of therapeutic cloning.

1. \_\_\_\_\_  
\_\_\_\_\_
2. \_\_\_\_\_  
\_\_\_\_\_

(2)

(e) Suggest **two** disadvantages of therapeutic cloning.

1. \_\_\_\_\_  
\_\_\_\_\_
2. \_\_\_\_\_  
\_\_\_\_\_

(2)  
(Total 8 marks)

**Q2.**

This question is about digestion.

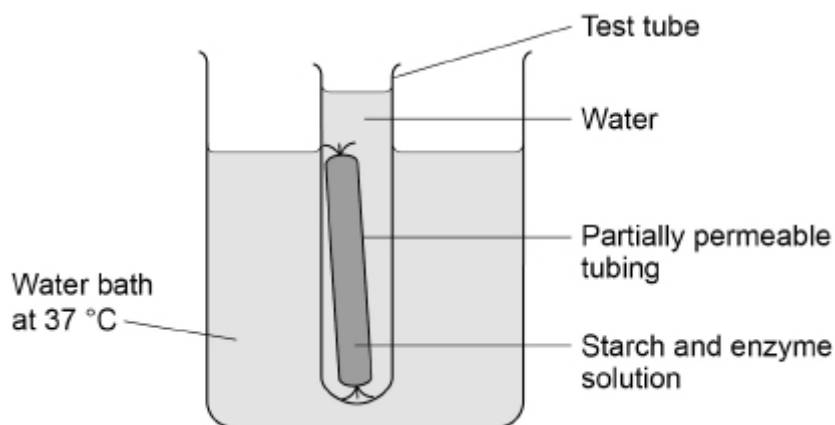
(a) Name the enzyme that digests starch in the human digestive system.

\_\_\_\_\_

(1)

A student set up a model to represent the digestion and absorption of food molecules in the digestive system.

The diagram shows the student's model.



This is the method used.

1. Fill a test tube with water at 37 °C
2. Test the water for starch and for sugar.
3. Mix together starch and enzyme solution and immediately test it for starch and for sugar.
4. Fill some partially permeable tubing with the starch and enzyme mixture.
5. Seal the tubing and place it in the test tube of water.
6. Place the test tube in a water bath at 37 °C
7. After 30 minutes, test the mixture inside the partially permeable tubing and test the water in the test tube for starch and for sugar.

(b) Suggest which parts of the body the partially permeable tubing and the water in the test tube represent.

Partially permeable tubing \_\_\_\_\_

Water in the test tube \_\_\_\_\_

(2)

The table below shows the results.

Test	Description of liquid	Result of starch test	Result of sugar test
1	Mixture inside tubing at start	✓	X
2	Water in the test tube at start	X	X
3	Mixture inside tubing after 30 minutes	✓	✓
4	Water in the test tube after 30 minutes	X	✓

**Key**

✓ = Present

X = Not present

(c) Name the reagents used to test for starch and for sugar.

Starch \_\_\_\_\_

Sugar \_\_\_\_\_

(2)

(d) Why was there no sugar present in test 1?

\_\_\_\_\_  
\_\_\_\_\_

(1)

(e) Explain the results for test 3.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

(2)

(f) Explain the results for test 4.

\_\_\_\_\_  
\_\_\_\_\_

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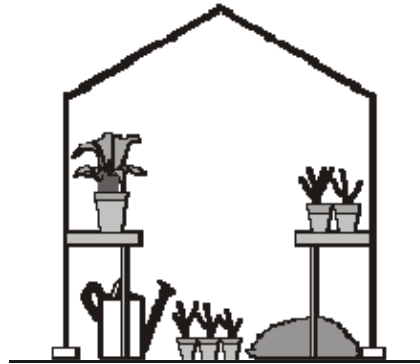
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(2)  
(Total 10 marks)

**Q3.**

The diagram shows some plants growing in a greenhouse on a hot summer's day.



Which **one** of the following factors is most likely to limit the rate of photosynthesis at this time?

- carbon dioxide concentration
- light intensity
- temperature

Factor \_\_\_\_\_

Explain the reason for your answer.

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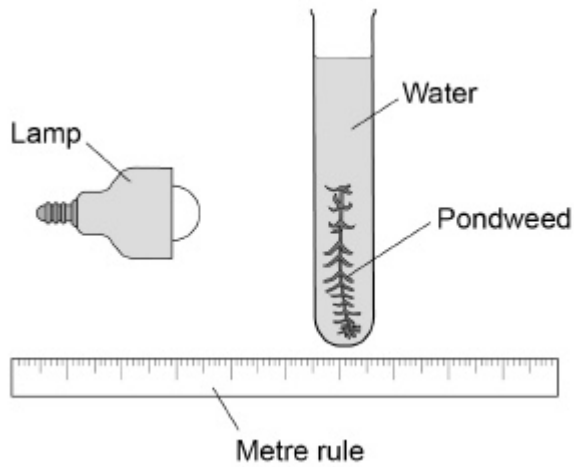
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(Total 4 marks)

**Q4.**

Students investigated the effect of light intensity on the rate of photosynthesis in pondweed.

The diagram shows the equipment the students used.



This is the method used.

1. Place the lamp 50 cm from the pondweed.
2. Count the number of bubbles of gas released in two minutes.
3. Repeat steps 1–2 with the lamp at different distances from the pondweed.

(a) The students could not make a firm conclusion because their method did not control enough variables.

Give **two** variables the students have **not** controlled that would affect the rate of photosynthesis.

1. \_\_\_\_\_
2. \_\_\_\_\_

(2)

The table shows the students' results.

Distance of lamp from the pondweed in cm	Number of bubbles released in two minutes				
	1	2	3	4	Mean
50	5	8	6	5	6
40	10	8	9	4	9
30	12	12	15	17	14
20	25	17	23	24	24
10	22	34	31	31	X

- (b) Calculate the mean rate of bubbles produced per minute when the lamp was 10 cm from the pondweed.

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Mean rate = \_\_\_\_\_ bubbles per minute

(3)

- (c) The mean number of bubbles released when the lamp was 30 cm away from the plant was greater than when the lamp was 50 cm away.

How many times greater?

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Number of times greater = \_\_\_\_\_

(1)

- (d) The students wanted to find out if different wavelengths of light affect the number of bubbles released.

Describe how the method could be adapted to find the effect of different wavelengths of light.

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(2)

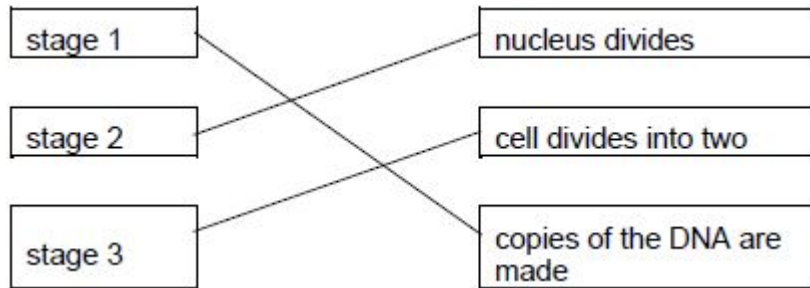
(Total 8 marks)



Mark schemes

**Q1.**

(a)



*allow 1 mark for 1 or 2 correct  
credit can be given where students have  
matched the boxes correctly, for example  
numbering the boxes*

2

(b) 6 picograms

1

(c) meristem cells in plants can differentiate throughout the life of the plant

1

(d) any **two** from:

- may cure / treat diseases  
**or**  
cure medical conditions  
**or**  
produce replacement cells / tissues / organs  
*allow example e.g. diabetes / paralysis  
allow cells can be stored for future use  
ignore used in medical treatments  
ignore patient makes / grows cells / tissues /  
organs*
- cells unlikely to be **rejected** by patient)  
*ignore same genetic information*
- cells / tissues of any type can be produced  
*ignore differentiated into most types of cells*
- many cells produced
- cells produced could be used for research
- would reduce waiting time for transplants

2

*ignore references to cost  
ignore all reference to producing babies / IVF*

(e) any **two** from:

- (potential) life is killed / destroyed  
*allow embryo is killed*

*ignore embryo is destroyed*  
*ignore embryo is a life / becomes a baby*

- shortage of donors / eggs
- egg donation / collection has risks
- do not yet know risks / side effects of the procedure on the patient  
*ignore long term effects are not well understood*  
*allow may cause tumours / cancer*
- may transfer (viral) infection
- poor success rate  
*allow in terms of viable egg / embryo / cell / tissue / organ production*

2

*ignore references to cost*  
*ignore unethical unqualified*  
*Ignore reference to religion / beliefs*

[8]

## Q2.

(a) amylase

*allow phonetic spelling*  
*allow carbohydrase*  
*ignore references to source of enzyme e.g. salivary / pancreatic*  
*do **not** accept amylose*

1

(b) (partially permeable tubing) small intestine

*allow stomach*  
*ignore intestine unqualified*  
*do **not** accept large intestine*

1

(water in test tube) blood

*allow plasma*

1

(c) (Starch): Iodine (solution)

*ignore iodide unqualified*

1

(Sugar): Benedict's (solution)

*all allow phonetic spelling*

1

(d) enzyme had not started to work

**or**

none of the starch had been digested / broken down

1

- (e) (enzyme) digested / broke down starch to form sugar 1  
 (however) not all the starch was digested / broken down 1  
 (f) sugar molecules formed are small enough to pass through tubing 1  
 (but) starch molecules too large (to pass through tubing) 1  
**[10]**

**Q3.**

- carbon dioxide concentration 1  
 since atmospheric concentration very low / value give e.g. 0.03%  
*allow carbon dioxide used up* 1  
 temperature high  
*allow if light chosen as a factor* 1  
 light intensity high  
*allow if temperature chosen as a factor* 1  
**[4]**

**Q4.**

- (a) temperature 1  
 carbon dioxide concentration  
*allow type of pondweed*  
*allow mass of pondweed* 1  
 (b) 
$$\frac{(34 + 31 + 31 =) 96}{3}$$
  
*allow 1 mark for*  

$$\frac{22 + 34 + 31 + 31 =) 118}{4} = 29.5$$
 2  

$$\frac{32}{2(\text{min})}$$
  
 = 16(.0) (bubbles per minute)  
*allow ecf from incorrect mean* 1  
 (c) 2.3(333)

1

(d) place different coloured filters over the lamp bulb

**or**

use different coloured light bulbs

1

keep the lamp the same distance from the pondweed each time

1

**[8]**

## Examiner reports

### Q1.

- (a) 33% of students achieved both marks for knowing the sequence of events in the cell cycle. 51% of students achieved one mark, which was usually for realising that in the final stage the cell divides into two.
- (b) The majority of students thought the mass of DNA in the new cells produced by mitosis would be half of that in the cell at the start of the cell cycle. 30% of students said the mass would be the same.
- (c) The majority of students incorrectly thought that animal stem cells divide by meiosis. 31% of students correctly said that meristem cells in plants can differentiate throughout the life of the plant.
- (d) The majority of students copied sentences from the information given in the question. There had to be some added value in order to be awarded marks. A fifth of students scored 1 mark. This was often for saying therapeutic cloning would produce replacement cells or could treat some diseases. Very few gained 2 marks. A lot of students confused therapeutic cloning with IVF treatment.
- (e) The majority of students copied the sentence about the embryo being destroyed, which had no added value, and so it was ignored. Those who rephrased this to say a life is killed or destroyed were awarded a mark. Another common correct response was that the procedure may not work.

### Q2.

- (a) Almost a quarter of students correctly named amylase or carbohydrase as the enzyme that digests starch. Phonetic spellings were allowed.
- (b) The question informed students that the figure was a model to represent the digestion and absorption of food molecules in the digestive system. Students should know that digestion and absorption occur in the small intestine. Named parts of the small intestine, including villi and microvilli, were all allowed. The stomach was also allowed.

Just saying the gut or intestines was insufficient. Reference to the large intestine was incorrect. Other incorrect responses included organs such as the pancreas or lungs. Some students gave partially permeable membrane as their answer, but this was labelled on the diagram.

The second marking point, for stating that the water represented the blood or bloodstream was the mark most commonly scored. Many of those who gave the stomach, thought the water in the test tube was stomach acid, so only gained the first marking point. There were quite a lot of unusual suggestions such as body temperature, saliva, enzymes or another organ.

- (c) About 17% of students gained both marks. About 23% of students did not attempt the question. A few students gave the names of other food test reagents, for example Sudan III and Biuret reagent, whilst others gave bromine for Benedict's solution.
- (d) Around 17% of students gained the mark. Quite a few students said that no sugar had been put in at the start, which was ignored. Misconceptions included that the

sugar had dissolved, or that the mixture hadn't been heated. Some wrote confused statements about the sugar not being broken down.

- (e) Very few students could explain why both starch and sugar were inside the tubing after 30 minutes. Some students described the test results, saying that starch and sugar were both present, which didn't gain credit as an explanation was required.
- (f) Very few students on the Foundation tier scored any marks for this question. A fifth of students did not attempt the question. Some students described the results, saying that sugar was present in the tube, but not starch. Most attempts at an explanation either referred to the starch being fully digested to sugar, or confused references to diffusion, osmosis or active transport were given.

### **Q3.**

The concept of limiting factor not well understood, even by the more able candidates. The candidates who correctly identified the percentage of CO<sub>2</sub>, usually limited their explanation to carbon dioxide in the greenhouse 'running out'. They generally failed to point out that there would be a high light intensity and a high temperature on a hot summer's day. Many candidates chose temperature and gave explanations in terms of wilting and stomatal closure. These are indirect effects of temperature rather than limiting effects on the process of photosynthesis.