

Biology Higher Paper AQA Style (BL2H):

Model Answers

Time 60 minutes
Marks Available 60

For this paper you must have a ruler.
You may use a calculator

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer all questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 2c should be answered in continuous prose.

In this question you will be marked on your ability to:

- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

Advice

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

1 In sexual reproduction, an egg fuses with a sperm cell.

1 (a) (i) How many chromosomes do human egg and sperm cells each have? 23

1 (a) (ii) How many chromosomes will the resultant 1 cell embryo have? 46

1 (a) (iii) In which organ are the eggs produced? Ovaries

1 (a) (iv) What is the name of the type of cell division by which the embryo will grow?

Mitosis

(4 marks)

1 (b) Eggs and sperm cells both contain the structures listed in the box.

nucleus	gene	chromosome
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List the three structures from the box in size order. Begin with the smallest.

1 Gene (smallest)

2 Chromosome

3 Nucleus

4 sex cell (largest)

(2 marks)

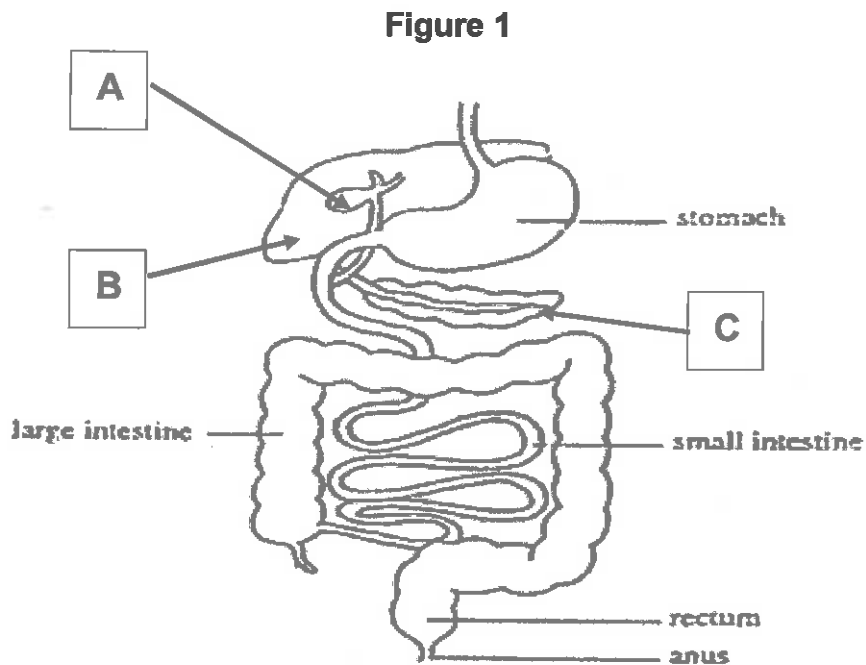
1 (c) Embryonic stem cells have the ability to divide to form any kind of body cell. How many chromosomes do embryonic stem cells contain? 46

(1 mark)

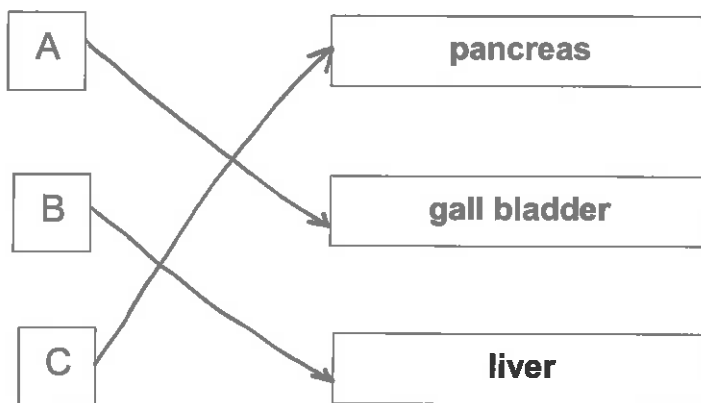
Total for question

<u>7</u>

2. Figure 1 shows a diagram of the human digestive system.



- 2 (a) Draw one line from each part of the human body to the letter representing the correct label for the diagram.



(2 marks)

- 2 (b) (i) Which part shown on the diagram is where soluble food molecules are absorbed?

The small intestine.

(1 mark)

- 2 (b) (ii) Which part shown on the diagram produces bile?

The liver.

(1 mark)

- 2 (b) (iii) Which part shown on the diagram is responsible for producing some of the enzymes that help break down food molecules?

The pancreas or small intestine (only one needed.)

(1 mark)

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

Enzymes are also used both in products found in the home such as biological washing powders and also in industrial processes in making some foods.

Describe how enzymes work in biological washing powders and in these industrial processes and what are the benefits and drawbacks in using enzymes in this way?

You are not required to include detail of the "lock and key" hypothesis in your answer but should include information about the types of enzymes used and the products that are made using them.

washing powders: Enzymes are used in washing powders to help remove greasy stains, specifically Lipase enzymes. Proteases can also be used to remove protein rich food stains such as egg yolk. For these enzymes to work best a low temperature should be used as high temperatures (above 40°C) could denature the enzymes and therefore they will not work. There is also the possibilities that they can cause allergies.

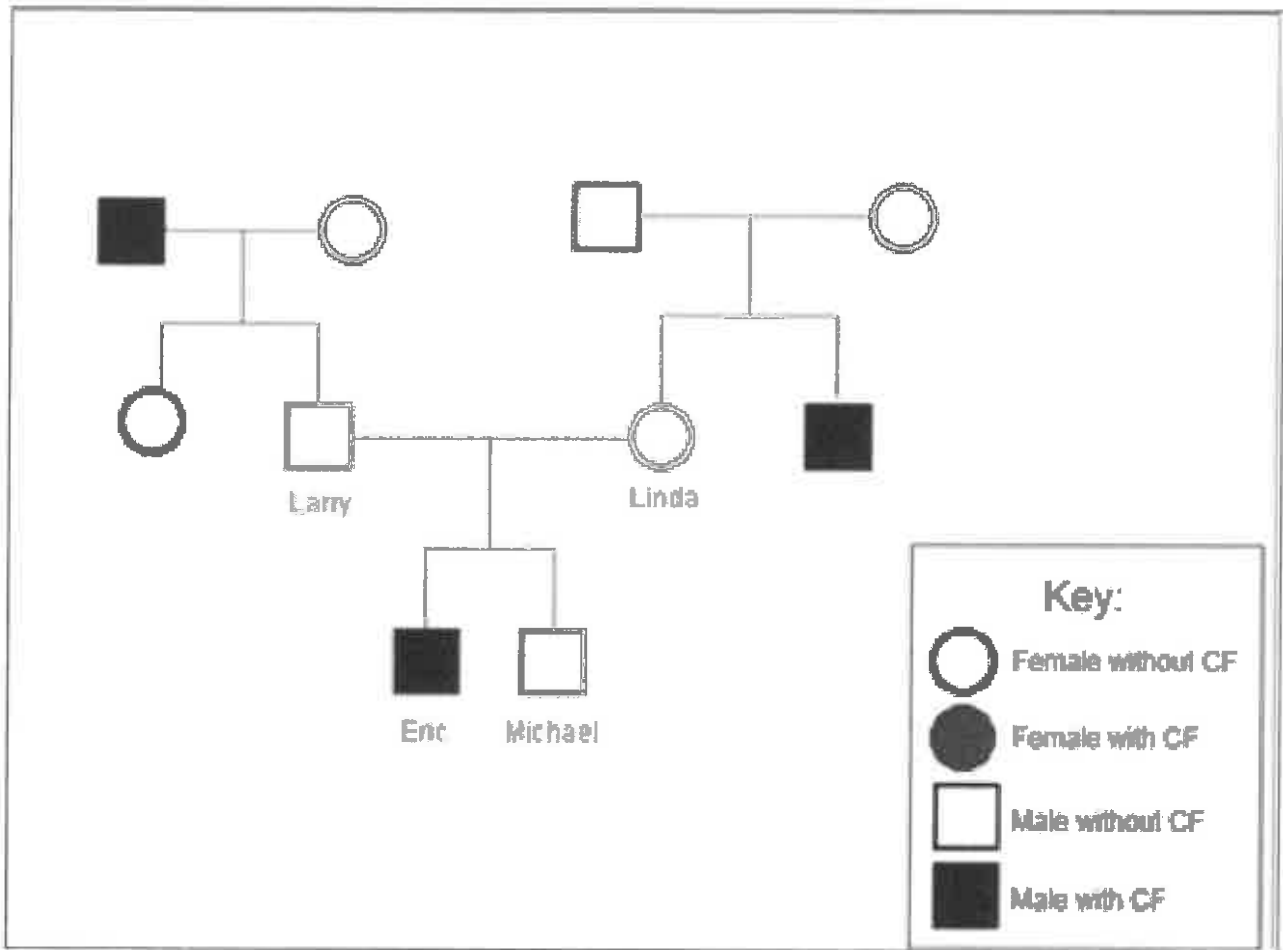
Industry: Protease enzymes are used in industry to predigest the proteins in baby food. Carbohydrases are used to convert starch into sugar syrup and isomerase is used to convert glucose syrup into fructose syrup which is sweeter - so can be used in smaller amounts for slimming products. These processes can be carried out at low temperatures to limit energy demand, and can also be reused. Enzymes can however be expensive and are sensitive to both temperature and pH.

(6 marks)

Total for question

- 3 Figure 1 shows part of a family tree where some of the individuals carry and inherit cystic fibrosis (CF).

Figure 1



- 3 (a) Larry and Linda are both carriers of CF. What is meant by the term "carrier"?
Has one copy of the recessive allele and therefore does not suffer from the disease.

(1 mark)

- 3 (b) (i) CF is caused by a recessive allele. What can we conclude about the alleles that Eric has inherited? They are both the CF allele - he has two copies.

(1 mark)

- 3 (b) (ii) If Eric were to have children with a woman who did not carry the CF allele what is the probability that their children would be sufferers? Explain your answer.

Zero chance. It would be impossible for the offspring to inherit two copies of the allele.

(2 marks)

- 3 (c) What is the probability that any further children that Larry and Linda have are normal? Construct a genetic diagram to show how you arrived at your answer if you wish. Show the Normal (dominant) allele as N and the (recessive) allele for CF as n.

		Larry	
		N	n
Linda	N	NN normal.	Nn
	n	Nn	nn

The probability of Larry and Linda having a Normal child is: 1 in 4 or 25%
(4 marks)

- 3 (d) (i) Doctors tell Larry and Linda that it is possible that they can undergo a process during IVF that determines whether any future embryos will inherit the CF allele. What do we call this process?

Embryo Screening.

(1 mark)

- 3 (d) (ii) What does IVF stand for?

In vitro fertilisation.

(1 mark)

- 3 (d) (iii) During IVF the fertilised egg divides to form an embryo by cell division. Name this type of cell division.

Mitosis.

(1 mark)

Total for question

11

- 4 Scientists investigated how exercise affects blood flow to different organs in the body.

The scientists made measurements of blood flow to different organs of:

- a person resting in a room at 20°C

- the same person, in the same room, doing vigorous exercise at constant speed on an exercise cycle.

The table shows the scientists' results.

Organ	Blood flow in cm ³ /minute whilst:	
	Resting	Exercising vigorously
Brain	750	750
Heart	250	1100
Muscles	1200	22200
Skin	500	650
Other	3100	300

- 4 (a) The scientists decided that it was better to carry out the experiments inside a laboratory on an exercise bicycle rather than outside on the road.

Suggest two reasons why. Do not include safety as either of your answers.

Constant effort, Constant speed, Constant temperature,
No wind (weather), outside there are hills, different
terrain, traffic conditions, pollutants.

You only need two!

(2 marks)

- 4 (b) Calculate the change in cm³/minute in blood flow to the muscles during exercise?

$$22200 - 1200 = 21000 \text{ cm}^3/\text{min}$$

Answer 21000 cm³/min

(2 marks)

- 4 (c) Give two changes to the action of the heart that the scientists might observe in the subject during exercise.

Increased heart rate and stroke volume.

This is the volume of blood pumped from the heart with each beat.

(2 marks)

- 4 (d) The scientists conclude that there is an increase in aerobic respiration in the subject's muscles during the period of exercise.

Give the word equation that summarises aerobic respiration in the space below:



(2 marks)

- 4 (e) (i) The scientists noticed that the subject continued to have an increased blood supply to her muscles for some time after exercise was ceased. They concluded that this was to remove waste materials produced during exercise.

Name two waste materials that would be removed from the muscles during and after exercise.

Lactic Acid ←

Carbon Dioxide

This is the chemical waste product of anaerobic respiration - and causes your muscles to feel tired.

(2 marks)

- 4 (e) (ii) The subject also continued to breath more rapidly for some time after the exercise was completed. Explain why.

The build up of lactic acid is an aerobic process - so requires oxygen.

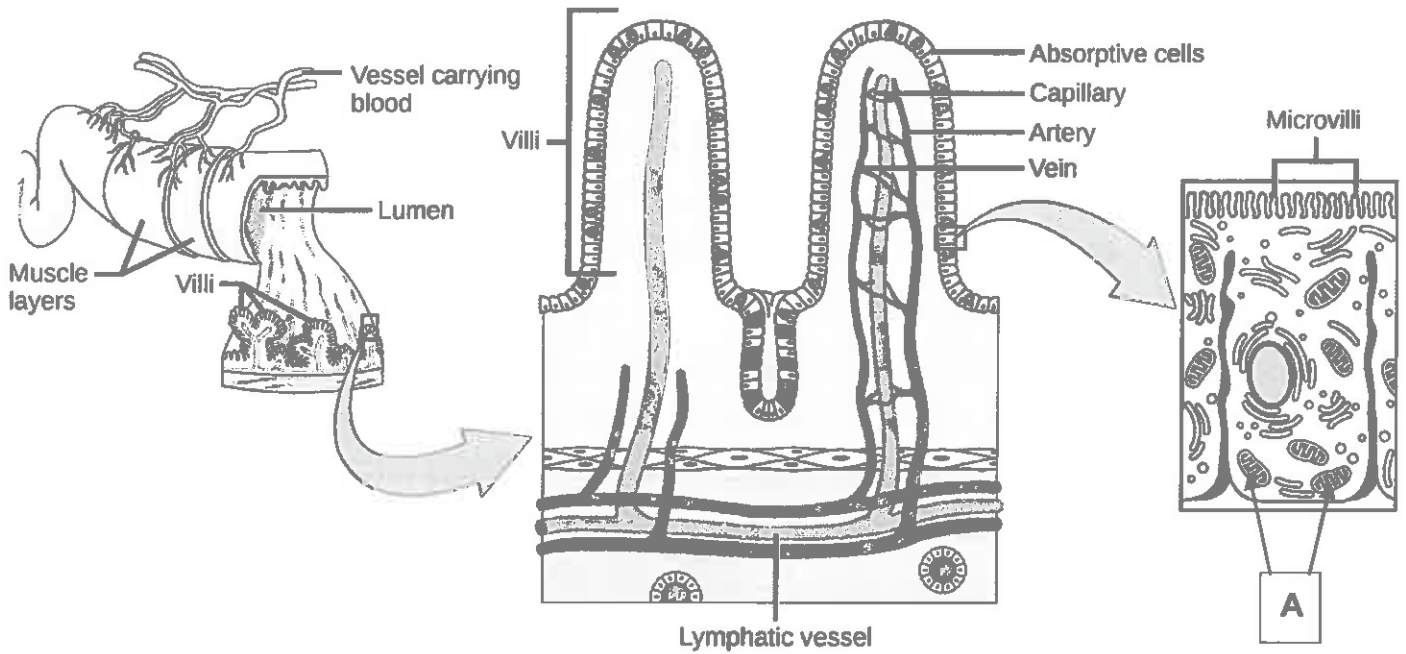
(2 marks)

Total for question

12

- 5 **Figure 1** shows a section through part of the small intestine which is then magnified to show the structure of the wall of the intestine and a villus.

Figure 1



- 5 (a) (i) The (epithelial) cells that line the small intestine have on their surface microvilli as shown in the diagram. What is their purpose?

To increase surface area.

(1 mark)

- 5 (a) (ii) The epithelial cells also contain lots of the cell structures labelled A in the diagram. What is the name given to structure A?

Mitochondrion ← the plural of this is mitochondria.

(1 mark)

- 5 (b) (i) How does the oxygen required for respiration get to the epithelial cells?

Use information from the diagram to explain how.

By diffusion, when you breathe in oxygen diffuses into the capillaries (in the lungs) and flows around the body. When it reaches the epithelial cells (in this example) it will diffuse across the cell membrane as there is a concentration gradient (low concentration in the cell, high in the capillary).

(3 marks)

- 5 (b) (ii) The wall of the small intestine is well suited to diffusion.

Use information from the diagram and your own knowledge to help you explain how and why the structures shown help diffusion happen quickly across the wall of the small intestine.

The walls of the small intestine have villi which provides a large surface area. As well as the villi, they also contain microvilli which increases the surface area again. The muscles are also contracting keeping the contents of the small intestine moving which can help maintain the concentration gradient.

The walls are very thin (one cell thick) which allows for easy diffusion. The lacteal (Lymph) helps carry away the absorbed products of digestion maintaining the concentration gradient, as do the capillaries.

for 6 marks you need to explain at least three structural adaptations.

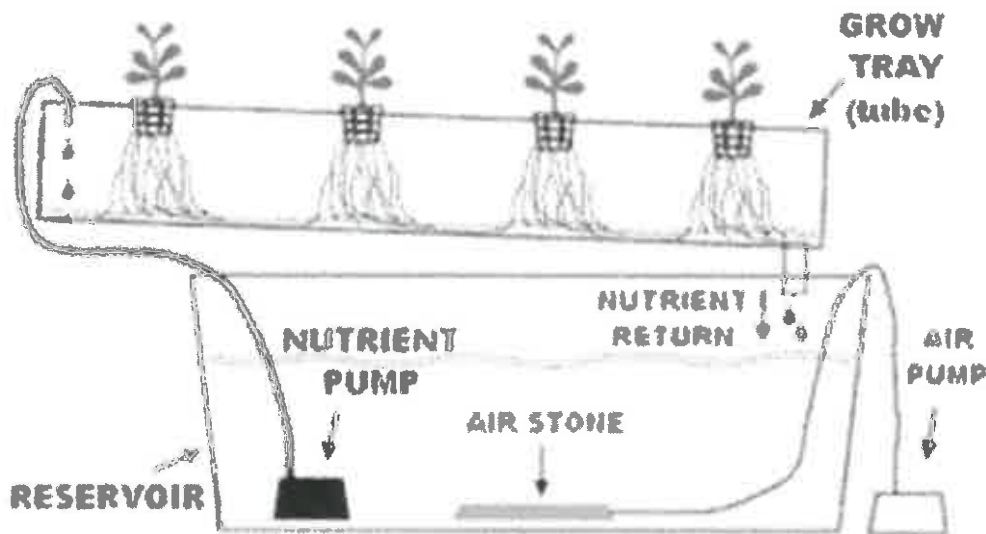
(6 marks)

Total for question

11

- 6 Figure 1 shows the hydroponic system a grower is using for tomatoes in his commercial greenhouse.

Figure 1



- This system allows the plants to grow without the use of soil.
- The nutrient pump sends water and ions to the plant roots.
- The solution slowly bathes the roots and returns to the reservoir.
- The concentration of ions in the solution and its pH are controlled.

6 (a) (i) Give one advantage to the grower of using this system rather than growing the plants in soil.

Easier to control the conditions, easier to replace or maintain the nutrient levels, to keep the fruit dirt free.

(1 mark)

6 (a) (ii) The air pump and air stone introduce bubbles of air into the solution of ions. Oxygen from the air dissolves in the solution.

Explain why the plants need the oxygen.

Oxygen is needed for aerobic respiration. This is then used for making proteins, cellulose etc. Also used for active transport of ions.

Only aerobic respiration statement and one other needed.

(2 marks)

6 (b) Besides what is shown in the diagram, give two other conditions the grower would need to control in the greenhouse?

Temperature, amount of light, carbon dioxide levels.

(2 marks)

6 (c) (i) The tomato plants produce glucose from photosynthesis. Some of this glucose is used to make proteins.

Give one other use that is made of the glucose by the plant.

Store as starch, to make proteins, to make cellulose etc.

(1 mark)

6 (c) (ii) As well as the glucose, what other element do the plants need in order to make proteins and in what form do they get it?

Nitrogen for Nitrates.

(2 marks)

Total for question

8

END OF QUESTIONS