

Unit 3 Biology

Revision Booklet 8

Topics

Data Analysis

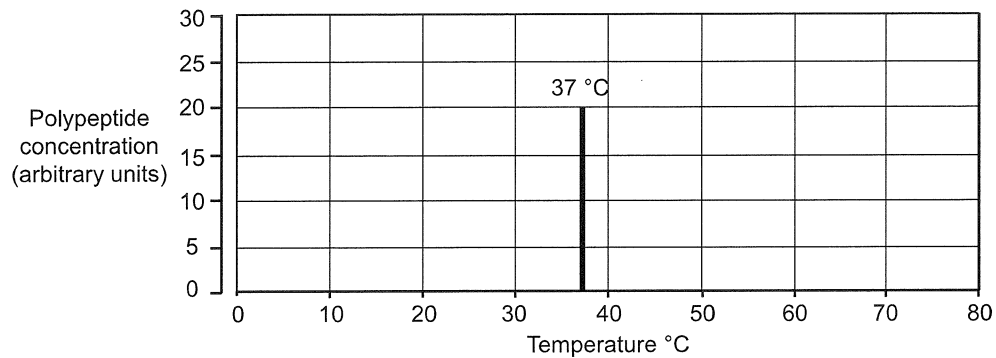
&

Experimental Design

Name:

Question 5 (2012)

Half an hour after an adult person completed eating a protein-rich meal, a sample was taken of the contents of their stomach. This sample was divided into three equal parts in separate tubes. Each tube was incubated at a different temperature for 10 hours. After that time, each tube's contents was tested to determine its polypeptide concentration. The result for the sample incubated at 37 °C is shown on the graph below.



- a. On the graph above, draw the results you would expect for the samples incubated at 10 °C and 80 °C.

2 marks

- b. Explain your predicted results for the polypeptide concentrations at temperatures of 10 °C and 80 °C.

10 °C _____

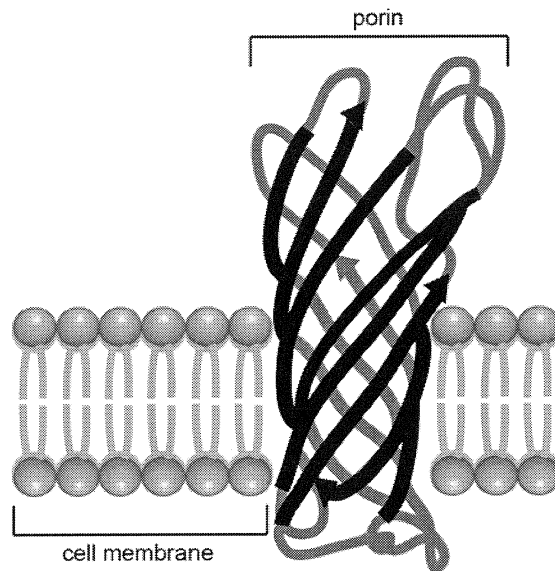
80 °C _____

2 marks

Question 2 (2010)

Some bacterial cell membranes contain proteins called porins. A porin is a pipe-like structure made of a single amino acid chain that embeds itself into the membrane.

The image below shows a portion of a cell membrane containing a porin.



In the diagram above, two structures are labelled.

- a. Outline one function of each structure.

Cell membrane _____

Porin _____

2 marks

Question 4 2009

The beet caterpillar is an insect pest of the tomato plant. When a beet caterpillar starts to eat a tomato plant, the plant responds by producing a chemical known as jasmonic acid. Jasmonic acid and its derivatives have a variety of odours.

Some scientists have suggested that these odours attract wasps to the caterpillar-affected plants.

- a. i. Outline an experiment you would carry out to test this hypothesis.

- ii. Describe the results that would support the hypothesis.

3 + 1 = 4 marks

- b. Explain why it could be an advantage to the plant to produce jasmonic acid when its leaves are being eaten by caterpillars.

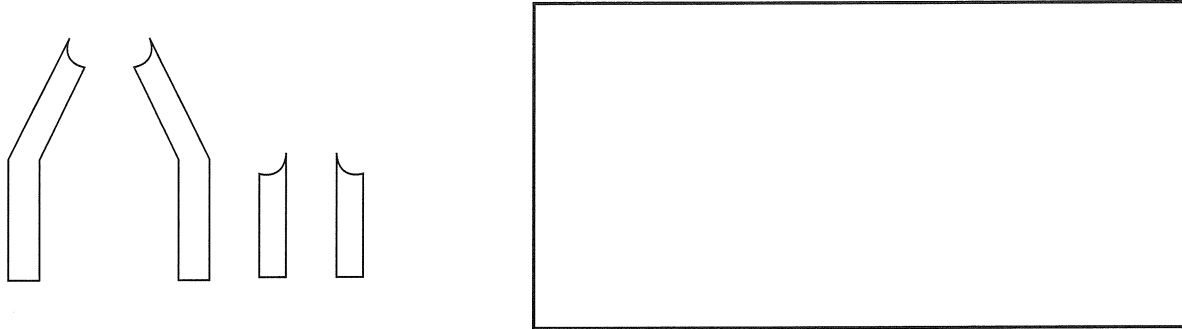
1 mark

Total 5 marks

Question 6

2008

A typical antibody molecule comprises four polypeptide chains that are linked together. The following diagram shows the four fragments of a particular antibody molecule.



- a. i. Redraw these fragments in the box above to show the typical representation of an antibody.
 ii. On your answer to part i. in the box above, draw two arrows to indicate the two positions at which antigen would bind to the antibody.

1 + 1 = 2 marks

Rheumatoid arthritis is an 'autoimmune disease' that can occur in humans and laboratory mice.

- b. Outline the general characteristics of an **autoimmune disease**.

1 mark

Hormones are found in all multicellular organisms.

A hormone is sometimes defined as 'a chemical that is produced in one organ and transported by the blood to other cells where it causes a specific change'.

We now understand that this definition fails to account for all hormones found in multicellular organisms.

- c. Write a new definition for a hormone, covering the majority of situations in which we know hormones are involved.

1 mark

d. Design an experiment to test the scientist's prediction.

- state the hypothesis that you are testing
- outline the experimental procedure that you follow
- describe results that would support your hypothesis.

Total 9 marks

3 marks

Before a drug is used for human treatment it is usually tested on animals. This is because results for animals often give some indication of how effective a drug may be in humans. In this case the virus under investigation also infects mice.

- c. Design an experiment, using mice, to test the effectiveness of the drug you have designed.

3 marks

Total 7 marks

2006

SECTION B – continued
TURN OVER

Question 4 2005

To determine the effect of a plant parasite on the plant's growth, an experiment was carried out with alfalfa plants. Two alfalfa seeds were planted into each of 30 pots. Into 10 of these pots the root parasite, *Odontites rubra*, was also introduced. Into another 10 pots a different root parasite, *Rhinanthus serotinus*, was introduced.

When the plants were mature the total dry weight of the twenty plants in each group was measured.

The results were

Group 1: 10 pots with 2 alfalfa plants only	1483 gm
Group 2: 10 pots with 2 alfalfa plants and the root parasite <i>Odontites rubra</i>	927 gm
Group 3: 10 pots with 2 alfalfa plants and the root parasite <i>Rhinanthus serotinus</i>	968 gm

- a. Why was the dry weight of the plants measured?

1 mark

- b. Suggest what the root parasites were obtaining from the plant.

1 mark

- c. Given the data above, state one conclusion about the effect of the parasites on the alfalfa.

1 mark

Total 3 marks

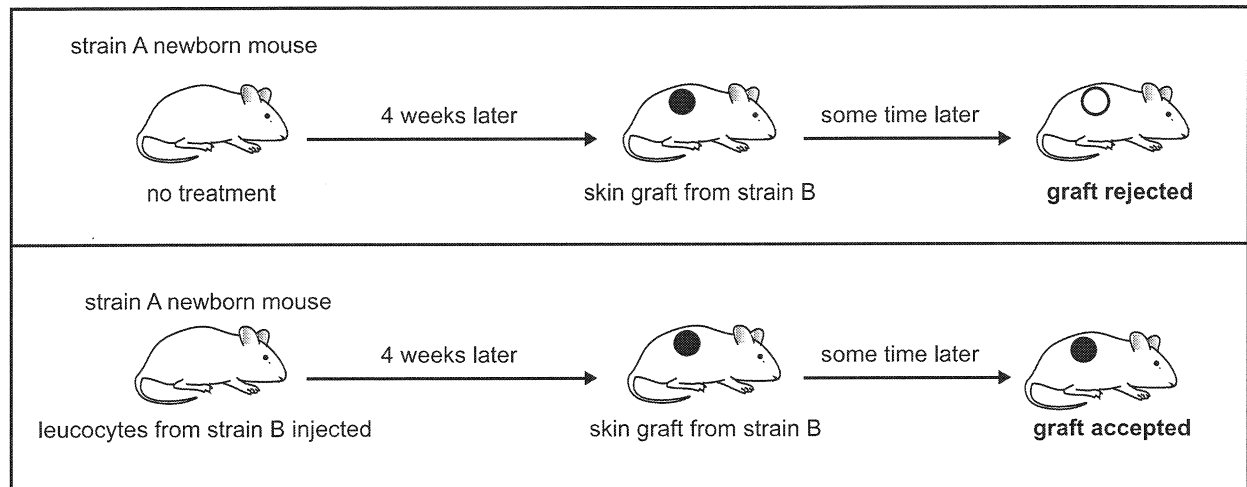
Question 5 2005

A scientist carried out a number of immunity experiments with mice.

First experiment

The scientist took several newborn mice of the same strain A. Half of the mice received no treatment. The rest of the mice each received an injection of leucocytes from a strain B adult mouse. Four weeks later several pieces of skin were taken from strain B mice. A single piece was grafted onto each of the strain A mice. Some time later, the grafts were examined.

The experiment and the results are outlined in the table below.



- a. What are two conclusions you can make, with regard to the mouse immune system, from this experiment? Outline the evidence you have for each conclusion.

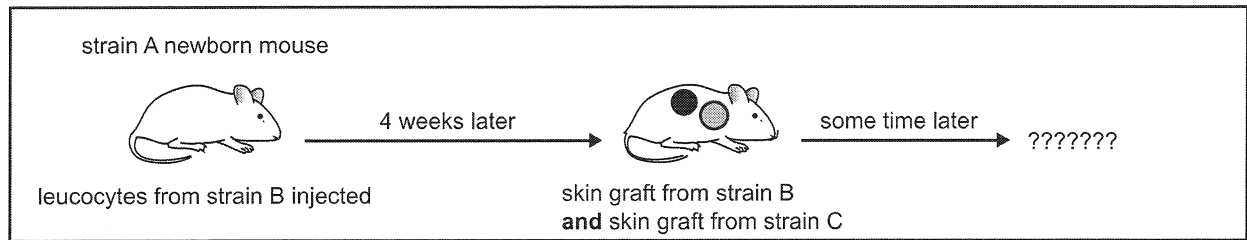
Conclusion 1 and evidence _____

Conclusion 2 and evidence _____

2 marks

Second experiment

Newborn mice of strain A were each injected with leucocytes from strain B mice. Several weeks later, each mouse was given skin grafts from both a strain B mouse and a strain C mouse.



- b.** Explain what you would expect to happen to the skin graft from strain C.

1 mark

A chemical carcinogen was used to induce a cancerous growth (called a tumour) in a mouse.

- c.** In what way is apoptosis significant in the formation of a tumour?

1 mark

- d.** It was suggested that tumour cells from one mouse could be used to vaccinate another mouse against developing the same type of tumour.

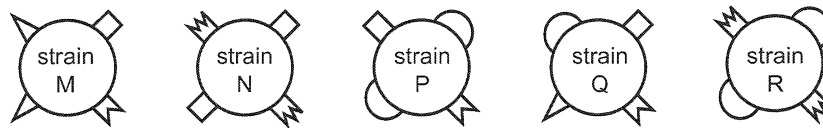
Living tumour cells were removed from an affected mouse. Some of the cells were killed and some were kept alive for several weeks for later use.

Outline an experiment you would perform to test the idea that vaccination against a specific kind of tumour is possible.

2 marks

Antigens exist on cell surfaces.

The following diagrams show the different forms of antigens, and their relative distribution, found on the surfaces of different strains of *Staphylococcus* bacteria.



You wish to make a single vaccine that will be effective against as many strains as possible of the *Staphylococcus* bacteria shown.

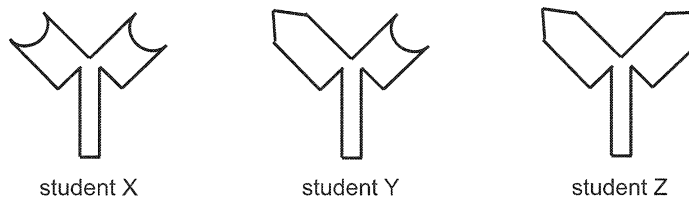
- e. Which strain would you use to make the vaccine?

_____ 1 mark

- f. Against which of the strains would your vaccine be effective?

_____ 1 mark

Students were asked to draw an antibody that would be most effective against strain **P**. The following diagrams were presented by three different students.



- g. Explain which student has drawn an antibody that would be most effective against strain **P** *Staphylococcus* shown above.

1 mark

Total 9 marks