Unit 3 Biology

Revision Booklet 8

Topics

Data Analysis

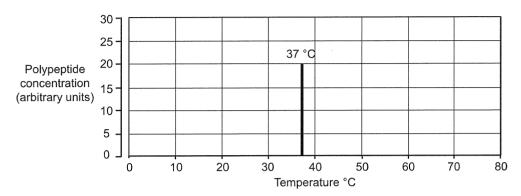
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Experimental Design

Name:

Question 5 (QOQ)

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		
100		

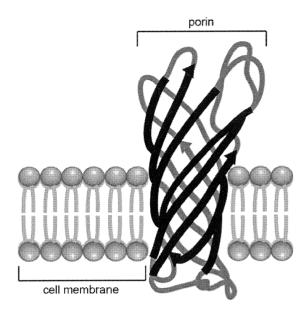
80 °C	

2 marks

Question 2 (SO(C)

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

It has been suggested that less energy is retained when hard food is the major part of an animal's diet compared with the energy retained when soft food is eaten. The difference in energy retained would be indicated by the weight of an animal.

A pet food company has made two different types of food pellets, one hard and the other soft. Each kind of pellet has the same energy content. The company intends to test the pellets on a group of adult mice. Each mouse is genetically identical and of the same weight.

You are provided with

- many adult mice. Each mouse is genetically identical and of the same weight
- two types of pellets, one hard and one soft. Each kind of pellet has the same energy content.
- b. Outline an experiment that would allow you to determine if the hardness of the food pellets affects the balance between energy intake and energy expenditure.

In your answer you should

- state the hypothesis that you are testing
- outline the experimental procedure

describe the results that would support or negate your hypothesis.			

3 marks

Total 5 marks

Question	4	200	9

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.

	i.	entists have suggested that these odours attract wasps to the caterpillar-affected plants. Outline an experiment you would carry out to test this hypothesis.		
	10	Summe an experiment you would early out to test and hypothesis.		
ii.				
	i.	Describe the results that would support the hypothesis.		
		3 + 1 = 4 mark		
		lain why it could be an advantage to the plant to produce jasmonic acid when its leaves are being eater aterpillars.		
_	, ,			

SECTION B – continued

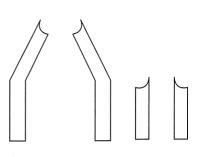
1 mark

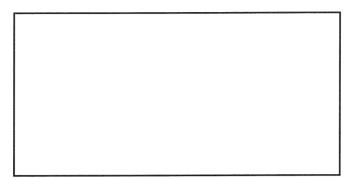
Total 5 marks

Question 6



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 autoimmun	e disease.
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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

The human hormone vitamin D is found in high levels in some immunological tissues. A scientist predicted that a deficiency of vitamin D may play a role in the development of rheumatoid arthritis and hence treatment with vitamin D tablets may reduce development of the disease. The scientist decided to test this idea by using a strain of laboratory mice that normally developed rheumatoid arthritis.

Design an experiment to test the scientist's prediction.	
In your answer you should	
• state the hypothesis that you are testing	
outline the experimental procedure that you follow	
• describe results that would support your hypothesis.	
<u> </u>	
	Manufacture Control of the Control o
	<i>C</i> 1
	5 marks

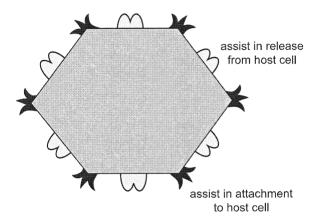
SECTION B – continued TURN OVER

Total 9 marks

Question 3 2006

a. When scientists develop drugs against infective agents the term 'rational drug design' or 'designed drug' is often used. Explain what is meant by the term 'designed drug'.

Scientists aim to develop a drug against a particular virus that infects humans. The virus has a protein coat and different parts of the coat play different roles in the infective cycle. Some sites assist in the attachment of the virus to a host cell, others are important in the release from a host cell. The structure is represented in the following diagram.



The virus reproduces by attaching itself to the surface of a host cell and injecting its DNA into the host cell. The viral DNA then uses the components of the host cell to reproduce its parts and hundreds of new viruses bud off from the host cell. Ultimately the host cell dies.

Design a drug that will be effective against this virus. In your answer, outline the important aspects y would need to consider. Outline how your drug would prevent continuation of the cycle of reproductive falls are trivially the diagrams in your answer. Space for diagrams is provided on the expression and the consecutive results are trivially the consecutive results.
of the virus particle. Use diagrams in your answer. Space for diagrams is provided on the opposite pag

1 mark

m	ar	ŀ٥	3

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.

Design an experiment,	using mice, to tes	t the effectivene	ess of the drug y	ou have designed	1.
					ASSESSED A SECULIAR A
			132.000		

3 marks

Total 7 marks

SECTION B – continued TURN OVER

2006

Question	4	200	5
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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	
Gro	Group 1: 10 pots with 2 alfalfa plants only	
Gro	up 2: 10 pots with 2 alfalfa plants and the root parasite <i>Odontites rubra</i>	927 gm
Gro	up 3: 10 pots with 2 alfalfa plants and the root parasite Rhinanthus serotinus	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

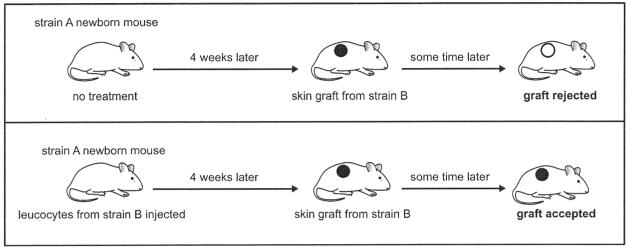
A scientist carried out a number of immunity experiments with mice.

First experiment

a.

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.



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.

	strain A newborn mouse
	4 weeks later some time later ????????
	leucocytes from strain B injected skin graft from strain B and skin graft from strain C
b.	Explain what you would expect to happen to the skin graft from strain C.
	l mark
А с г.	Themical carcinogen was used to induce a cancerous growth (called a tumour) in a mouse. 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.

21











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

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.







student Y



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

1 mark

Total 9 marks