

1)

Molecules are transported into and out of cells by several mechanisms.

- (a) Read through the following passage that describes some of these mechanisms, then write on the dotted lines the most appropriate word or words to complete the passage.

(4)

Some molecules move across a cell surface membrane by passing down a concentration gradient, through the phospholipid bilayer. The movement of some polar molecules across the membrane involves carrier and channel

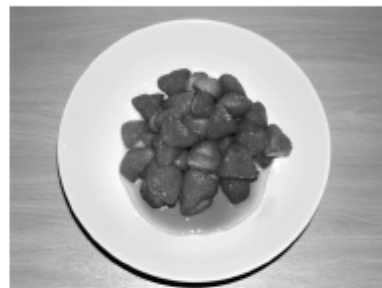
..... molecules. When this movement occurs down a concentration gradient, the process is called ..... and when it occurs against a concentration gradient the process is called .....

Energy in the form of ..... is used in the movement of molecules against a concentration gradient.

- (b) A student wanted to sweeten some strawberries, so she sprinkled some sugar on top of them, one hour before eating them. The student noticed that the sugar that she had sprinkled on them was no longer visible and that there was some juice at the bottom of the bowl.



**Appearance on adding sugar**



**Appearance one hour after adding sugar**

The student thought that the juice was the sugar dissolved in water and that the water had come from the fruit.

In order to test this hypothesis, she weighed some fresh strawberries and sprinkled them with sugar. One hour later she rinsed off the juice and reweighed the strawberries. The mass of the strawberries before adding the sugar was 77 g. The mass after rinsing off the juice was 70 g.

- (i) Calculate the percentage decrease in the mass of the strawberries.

Show your working.

(2)

- (ii) Suggest **one** possible source of error in the student's procedure that could make this value for the percentage decrease in the mass of the strawberries inaccurate.

Explain how this source of error would affect the value for the percentage decrease in the mass of the strawberries.

(3)

Source of error .....

Effect on value and explanation .....

- (iii) Using your knowledge of cell transport mechanisms and the properties of water, explain how the juice is formed from the water that came from the fruit.

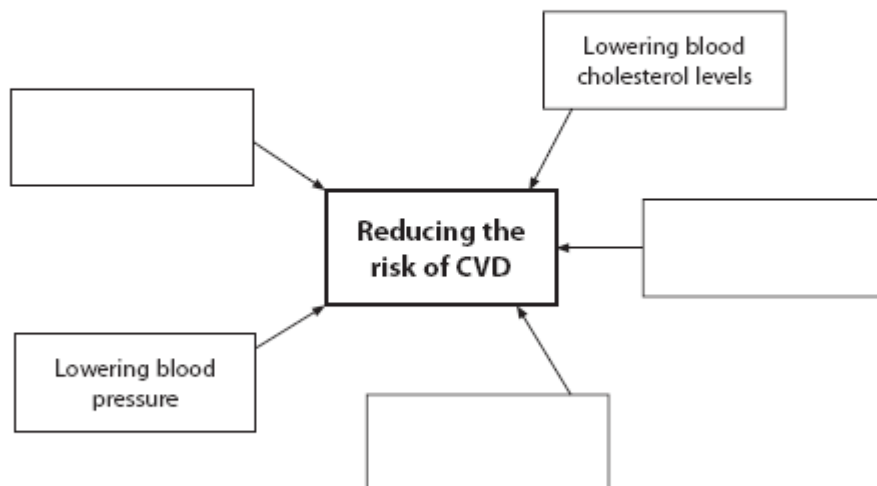
(3)

2)

The risk of developing cardiovascular disease (CVD) can be reduced in several ways. Lowering blood cholesterol levels and lowering blood pressure are two ways of reducing CVD.

- (a) (i) Complete the diagram below by giving three other ways in which the risk of CVD may be reduced. Write your answers in the empty boxes.

(3)



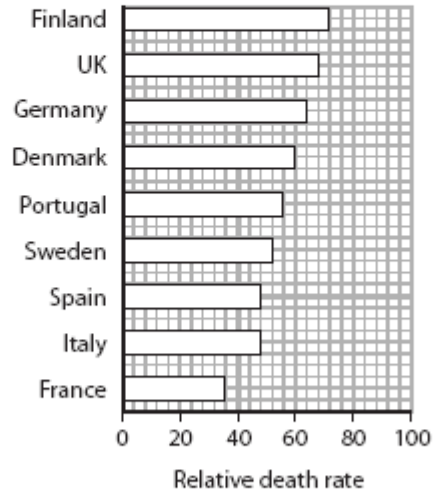
- (ii) Explain how lowering blood cholesterol levels can reduce the risk of CVD.

(2)

(b) Risk calculators can be used to estimate the probability that a person will develop CVD. Many of these calculators start by asking for the age and gender of the person using them. Explain why information about age and gender is important in estimating the risk of developing CVD.

(2)

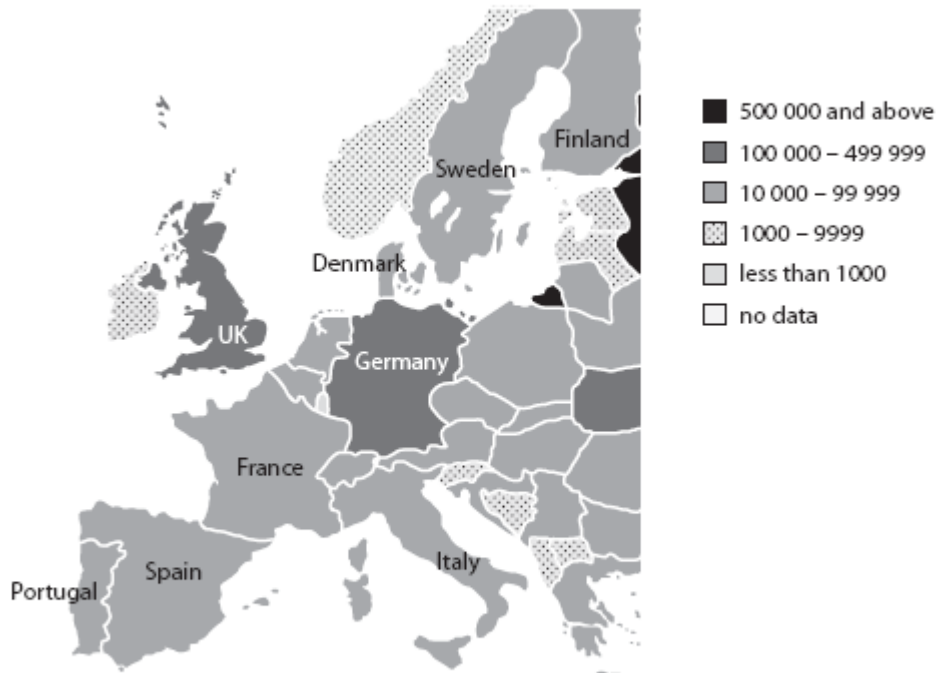
(c) The graph below shows the relative death rate from CVD in some countries in Western Europe.



(i) Compare the relative death rates from CVD in Finland, Denmark and Sweden.

(3)

- (ii) The map below shows the number of deaths from CVD in one year in Western Europe.



Describe **two** differences between the data presented in the map and the data shown in the graph.

(2)

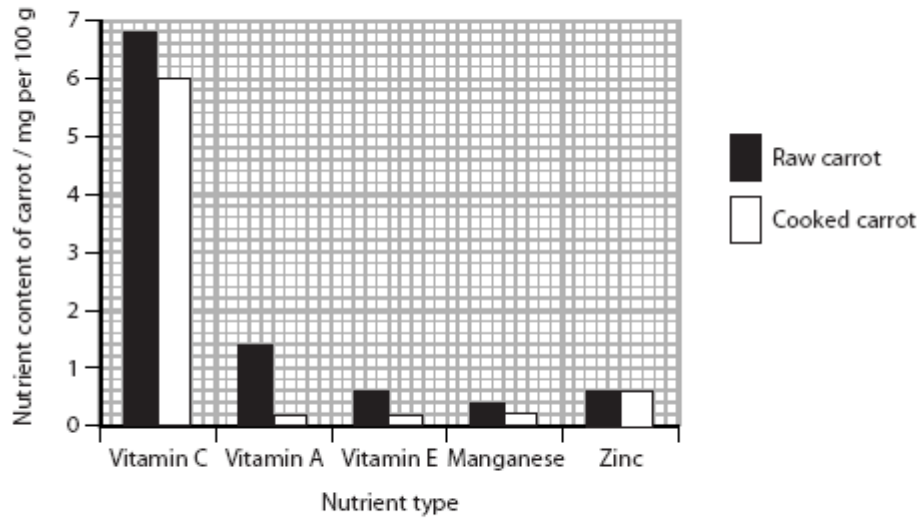
- (iii) Suggest **one** reason for the differences between the data presented in the map and the data shown in the graph.

(1)

3)

When vegetables are cooked in boiling water, they may lose some of their nutrients.

The graph below shows the effect of cooking on the content of three vitamins and two minerals found in carrots.



(a) Using the information in the graph, compare the effects of cooking on the content of vitamins and minerals found in carrots.

(3)

\*(b) It has been suggested that cooking food in a microwave oven does not reduce the nutrient content of foods by as much as cooking in boiling water.

A student wanted to test this idea on the vitamin C content of carrots.

Describe an investigation that the student could carry out to compare these two methods of cooking on the vitamin C content of carrots.

(5)

4)

In 1886, Sir Francis Galton claimed that the height of a child could be predicted by working out the mean height of its parents.

Scientists have since discovered that the inheritance of height is an example of polygenic inheritance.

(a) Explain what is meant by the term **polygenic inheritance**.

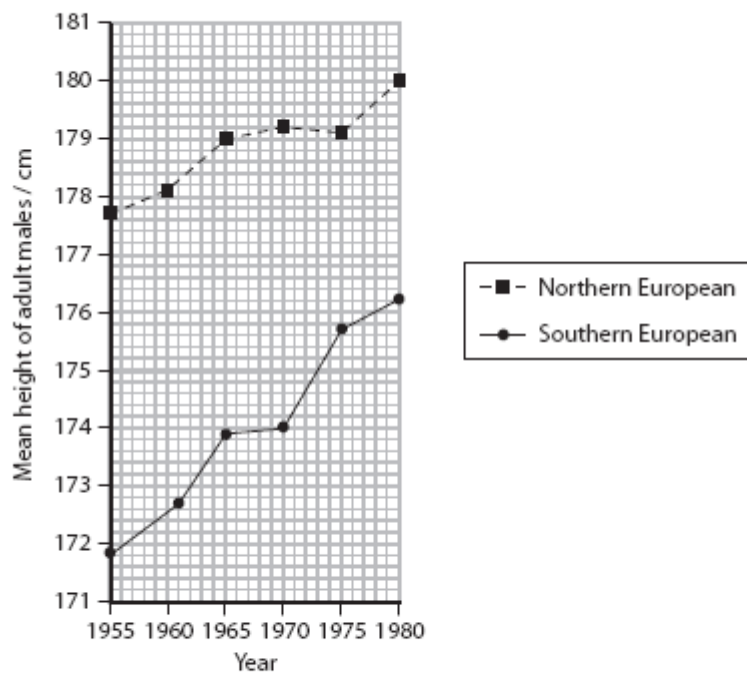
(2)

(b) Some scientists have suggested that diet may affect the growth of a child.

Explain how the height of an adult human demonstrates how environmental factors interact with genotype.

(3)

(c) The graph below shows the mean height of populations of adult males in Northern and Southern Europe from 1955 to 1980.



(i) Using the information in the graph, describe the changes in mean height for adult European males from 1955 to 1980.

(3)

(ii) Suggest an explanation for the changes in mean height of these two groups of adult males.

(2)

5)

Blood is carried around the body of many animals in different types of blood vessels. The structures of these blood vessels relate to their function.

(a) The table below refers to the structure of capillaries and veins. If the statement is correct, place a tick (✓) in the appropriate box and if the statement is incorrect, place a cross (✗) in the appropriate box.

(3)

Type of blood vessel	Valves present along the length of the vessel	Wall consists of a single layer of cells	Endothelial cells present
Capillary			
Vein			

(b) Semilunar valves and elastic fibres are found in the aorta. For each of these structures, describe its location in the aorta and explain its function.

Semilunar valves

(3)

Location .....

Function .....

Elastic fibres

(3)

Location .....

Function .....

6)

Read through the following passage on the structure of DNA, then write on the dotted lines the most appropriate word or words to complete the passage.

(8)

A DNA molecule consists of two strands of mononucleotides. Each of these strands

is twisted around the other, forming a .....

Each mononucleotide consists of a pentose sugar called .....,

a base and a ..... In each strand, the mononucleotides are

held together by ..... bonds.

The two strands are held together by complementary base pairing. Adenine bonds

with ..... and cytosine bonds with .....

The name of the bond that forms between these bases is a

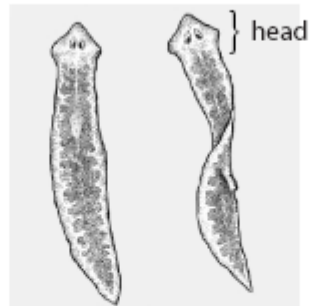
..... bond. A DNA molecule that is composed of 34% adenine

will be composed of .....% cytosine.



7)

Some species of flatworm are found in freshwater streams. Flatworms obtain oxygen from the water through the surface of their bodies. The diagram below shows the structure of flatworms.



Flatworms

Magnification  $\times 10$

(a) Using the diagram and your knowledge of gas exchange surfaces, explain how the structure of a flatworm is adapted to obtain oxygen from the water.

(2)

(b) The table below shows the relationship between the temperature of water and the solubility of oxygen in water.

Temperature of water / °C	Solubility of oxygen in water / mg dm <sup>-3</sup>
0	14.6
5	12.8
10	11.3
15	10.2
20	9.2
25	8.6
30	7.5
35	6.9
40	6.4

(i) Describe the relationship between the temperature of the water and the solubility of oxygen in water.

(2)

(ii) Using the information in the table and your knowledge of gas exchange and enzymes, suggest why flatworms are often found in water at a temperature of about 15°C.

(3)

(c) Flatworms do not have a heart or a circulatory system.

Explain why many animals need a heart and a circulatory system.

(4)

8)

The table below describes four methods by which molecules or ions can move through the cell membrane.

Description of method	Method by which molecules or ions can move through the cell membrane			
	A	B	C	D
The direction of movement is from a higher concentration to a lower concentration of the molecule	✓	✗	✓	✓
ATP required	✗	✓	✗	✗
Membrane proteins involved	✓ or ✗	✓	✓	✗
A molecule or ion transported by this method	water	sodium ions	glucose	oxygen

Identify the method of movement by placing a cross ☒ in the correct box in the table below.

(3)

Method of movement	A	B	C	D
Active transport	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Facilitated diffusion	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Osmosis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>