

1. For a cell to function normally, it needs to be able to control the transport of molecules and ions across its surface membrane. Complete the following passage by writing the appropriate word(s) in each space.

(a) Molecules and ions move into cells by a variety of methods. Oxygen passes passively into cells by Hydrophilic molecules that are larger than gases pass into cells with the aid of membrane proteins in another passive process called If substances are being moved against a concentration gradient, a method called is used. This requires input of and involves proteins in the membrane. Bulk transport of materials into cells is by

(3)



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(b) Give **one** similarity and **one** difference between the following methods of transport across cell membranes:

(i) Diffusion and osmosis

Similarity

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Difference

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(ii) Endocytosis and exocytosis

Similarity

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Difference

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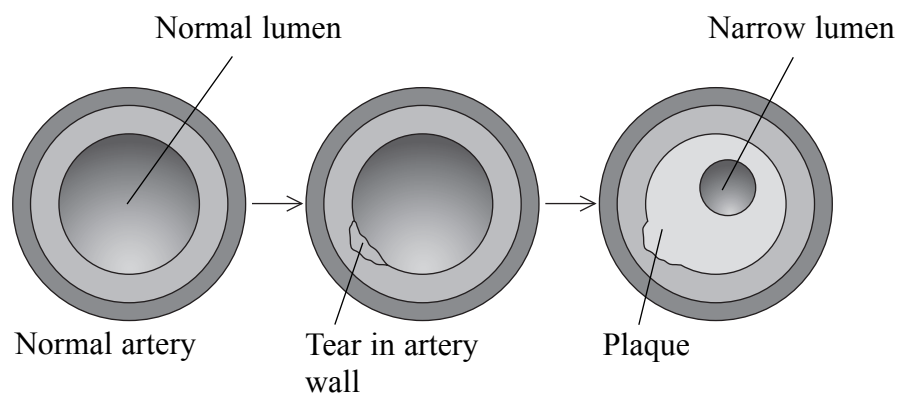
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(Total 7 marks)

Q1



2. Diseases of the cardiovascular system are a major cause of death worldwide. Most cardiovascular diseases are caused by fatty deposits called plaques. The diagrams below show stages in the development of a plaque and the narrowing of the lumen of an artery.



(a) Describe how this narrowing of the lumen can increase the risk of further damage to an **artery**.

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(2)

(b) (i) Describe the sequence of events that results in the formation of a blood clot.

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(ii) Explain how a blood clot can cause a heart attack.

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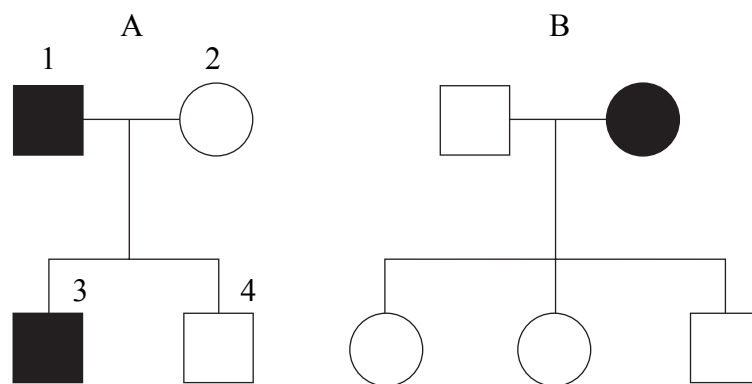
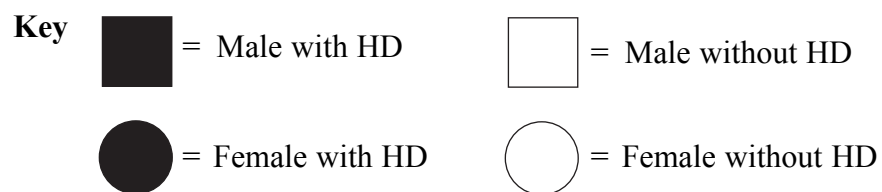
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Q2

(Total 8 marks)



3. The diagram below shows two family trees (A and B) where some of the family members have Huntington's Disease (HD). HD is caused by a dominant allele. This disease leads to degeneration of the nervous system usually when the sufferer is in their late thirties.



(a) Using H to represent the allele for Huntington's Disease and h to represent the normal allele:

(i) Give the genotype of individuals 1 and 4 in family tree A.

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4

(2)

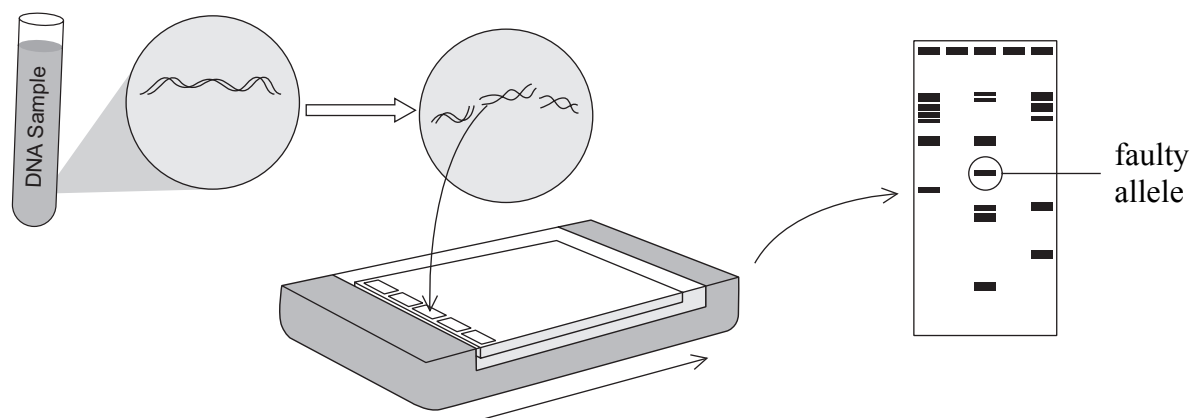
(ii) Draw a genetic diagram for family tree B to explain why none of the children will develop HD, even though one of their parents suffers from the disease.

(3)



(b) The children in family B have had some of their cells genetically screened to find out whether the allele for HD was present.

The diagrams below show some of the main steps involved in testing the DNA from cells. The DNA is separated into fragments so that a faulty allele can be identified using a gene probe.



Describe the techniques involved in the steps shown on the diagram, which allow the DNA to be separated and identified using a gene probe.

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(Total 10 marks)

Q3

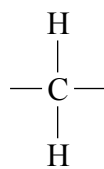
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4. Proteins have a wide range of functions in living organisms. The function of a protein is related to its precise three dimensional shape, which is determined by its specific sequence of amino acids. The diagram below shows a model of a typical protein molecule.



- (a) (i) Complete the diagram below to give the structure of the amino acid glycine.



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(ii) Explain how a specific sequence of amino acids can form the precise three dimensional shape of a protein molecule.

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(3)

(b) The following DNA base sequence codes for part of a protein molecule.

TACGGTATGCCAACCTTC

(i) State the number of amino acids coded by this section of DNA.

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(1)

(ii) Name the process involved in converting a base sequence of DNA into a base sequence of messenger RNA (mRNA).

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(1)

(iii) Give the complementary mRNA sequence to the DNA sequence above.

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(2)

(Total 9 marks)

Q4



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5. (a) The following table contains some statements about the properties of polysaccharides, lipids and proteins. Complete the table by placing a ✓ if a statement is correct and a ✗ if it is incorrect.

	Polysaccharides	Lipids	Proteins
Are polymers			
Have ester bonds			
Contain carbon, hydrogen, oxygen and nitrogen			
Form components making up the structure of cell membranes			

(6)

- (b) Give **one** difference between the following pairs of molecules:

- (i) Saturated and unsaturated lipids

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- (ii) Glycogen and starch

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(2)

Q5

(Total 8 marks)



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6. Lowering the level of blood cholesterol in an individual by 1% can decrease the risk of coronary heart disease by 2–3%. A low cholesterol diet can help to lower the level of blood cholesterol.

(a) (i) Suggest a specific change in diet that could help to lower the level of blood cholesterol.

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(1)

(ii) Suggest and explain why a low cholesterol diet might **not** result in a lower blood cholesterol level.

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(2)

(b) Statins are drugs currently in use to help lower blood cholesterol levels. The table below gives the results of some trials carried out to determine if statins reduce the risk of heart disease in men and women.

Drug used	Number of subjects involved		% of subjects who had heart attacks		% reduction in heart attacks
	Control group	Statin group	Control group	Statin group	
Statin A	4502	4512	15.9	12.3	22.6
Statin B	2223	2221	15.0	8.7	42.0
Statin C	3301	3304	14.8	8.9	

(i) Use the figures shown in the table to calculate the % reduction in heart attacks after taking Statin C. Show your working.

Answer

(2)



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(ii) State which statin was the most effective.

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(iii) Suggest a reason for:

The number of subjects involved

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The control group

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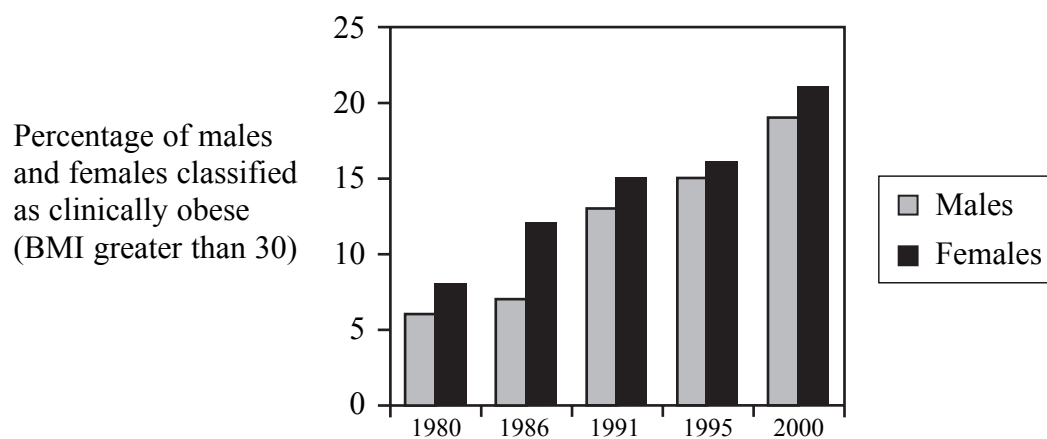
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Q6

(Total 8 marks)



7. The graph below shows the percentage of males and females that were classified as clinically obese in a population between 1980 and 2000.



(a) (i) Describe the trends shown on the graph.

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(ii) Suggest reasons for these trends.

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(b) One way of defining obesity is to use the body mass index (BMI).

Calculate the BMI for an individual who weighs 76 kg and whose height is 1.70 metres and state if this individual would be described as obese.

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(c) Explain the links between obesity and health problems.

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(Total 10 marks)

Q7

TOTAL FOR PAPER: 60 MARKS

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