WJEC Level 3 Certi cate in

MEDICAL SCIENCE

SAMPLE ASSESSMENT MATERIALS - External

Teaching from 2016

CONTENTS

WJEC LEVEL 3

Diploma in Medical Science *I*

Certificate in Medical Science

Resource Folder (Pre-release Article)

*For use with **unit 1 Human health and disease** examination*

Specimen

The following article is adapted from content found on the diabetes.org.uk website.

What is Diabetes?

Diabetes is a common life-long condition. There are 3.2 million people diagnosed with diabetes in the UK and an estimated 630 000 people who have diabetes, but don't know it.

Diabetes is a condition where the concentration of glucose in the blood is too high because the body cannot process it properly. There are two main types of diabetes: Type 1 diabetes and Type 2 diabetes.

What is type 1 diabetes?

Type 1 diabetes develops when the insulin-producing cells in the body have been destroyed and the body is unable to produce any insulin.

Type 1 diabetes accounts for about 10% of all adults with diabetes and is treated by daily insulin doses – taken either by injections or via insulin pump. It is also recommended to follow a healthy diet and take regular physical activity. Type 1 diabetes can develop at any age but usually appears before the age of 40, and especially in childhood. It is the most common type of diabetes found in childhood.

As a result of the diabetes the body can't use glucose to provide energy and tries to get it from elsewhere and starts to break down stores of fat and protein instead. This can cause weight loss. Because the body doesn't use the glucose it ends up passing into the urine.

Nobody knows for sure why these insulin-producing cells have been destroyed, but the most likely cause is the body having an abnormal reaction to the cells. This may be triggered by a virus or other infection.

What is type 2 diabetes?

Type 2 diabetes develops when the insulin-producing cells in the body are unable to produce enough insulin, or when the insulin that is produced does not work properly.

Type 2 diabetes usually appears in people over the age of 40, though in some ethnic groups, who are at greater risk, it often appears from the age of 25. It is also increasingly becoming more common in children, adolescents and young people of all ethnicities. Type 2 diabetes accounts for between 85 and 95 per cent of all people with diabetes and is treated with a healthy diet and increased physical activity.

In addition to this, medication and/or insulin are often required.

Prevalence

In 2013, the prevalence of diabetes in the adult population across the UK was as follows:

Country	Prevalence	Number of people
England	6.0%	2 703 044
Northern Ireland	5.3%	79 072
Scotland	5.2%	252 599
Wales	6.7%	173 299

Distribution of diabetes by age group in England and Wales, and Scotland is given below:

Age	Prevalence (England and Wales)	Prevalence (Scotland)
0 – 9	0.22%	0.26%
10 – 19	0.99%	1.23%
20 – 29	1.69%	2.09%
30 – 39	3.83%	3.55%
40 – 49	10.69%	9.69%
50 – 59	18.95%	18.97%
60 – 69	26.05%	26.46%
70 – 79	24.14%	24.67%
80+	13.42%	13.07%

Financial Costs

It is currently estimated that about £10 billion per year is spent by the NHS on diabetes. 10 per cent of the NHS budget is spent on diabetes.

Diabetes risk factors

About 90 % of people with diabetes have Type 2 diabetes. It can come on slowly, usually over the age of 40. The signs may not be obvious, or there may be no signs at all, therefore it might be up to 10 years before some patients learn that they have it.

Risk factors include:

- being overweight or having a high Body Mass Index
- being from an African-Caribbean, Black African, Chinese or South Asian background and over 25
- being from another ethnic background and over 40
- having a parent, brother or sister with diabetes
- ever had high blood pressure, a heart attack or a stroke
- a history of polycystic ovaries or gestational diabetes
- suffering from schizophrenia, bipolar illness or depression, or taking anti-psychotic medication

Testing

There are a range of tests which will need to be done to monitor health and diabetes. Some of these, such as blood glucose levels, can be done by the patient themselves. Others will be done by healthcare professionals. Tests include:

- blood glucose levels
- urine testing
- HbA1c (glycated haemoglobin) and fructosamine
- blood pressure
- blood lipids
-

Blood glucose levels

As part of the day-to-day routine, testing blood glucose concentration can help with necessary lifestyle and treatment choices as well as help to monitor for symptoms of hypo- or hyperglycaemia. Home blood glucose testing gives an accurate picture of blood glucose level at the time of the test. It involves pricking the side of the finger and putting a drop of blood on a testing strip.

Blood glucose targets

Children with Type 1 diabetes
- Before meals: 4–8mmol/l
- Two hours after meals: less than 10mmol/l

Adults with Type 1 diabetes
- Before meals: 4–7mmol/l
- Two hours after meals: less than 9mmol/l

Type 2 diabetes
- Before meals: 4–7mmol/l
- Two hours after meals: less than 8.5mmol/l

How to test blood glucose levels
The finger is pricked at the side and blood transferred to a test strip. Blood glucose levels should then be logged daily.

Urine testing
Urine testing involves holding a test strip under a stream of urine for a few seconds and comparing the colour change on the strip, after a set amount of time, with the chart on the strip container. Patients that have been advised to test their urine for glucose should test in the morning before breakfast. Tests done at this time should be negative.

HbA1c (Glycated haemoglobin) and fructosamine
At least once a year, the doctor should check a patient's long-term diabetes control by taking a blood sample from the arm.

The most common test is the HbA1c test, which indicates blood glucose levels for the previous two to three months. The HbA1c measures the amount of glucose that is being carried by the red blood cells in the body. For most adults with diabetes, the HbA1c target is below 48 mmol/mol, since evidence shows that this can reduce the risk of developing complications, such as nerve damage, eye disease, kidney disease and heart disease.

Fructosamine test

If the red blood cells are affected by, for example, anaemia, sickle cell anaemia or thalassaemia (all of which involve a lack of or abnormal type of haemoglobin) then a doctor may carry out a blood test for fructosamine. Fructosamine gives an average result for the previous 14 to 21 days.

Blood pressure
For someone without diabetes the blood pressure should be no higher than 140/85 but for a diabetic blood pressure should be no higher than 130/80.

Blood cholesterol and triglycerides
Some cholesterol in the blood, HDL (high density lipoprotein), can actually protect against heart disease. Low levels of this protective HDL cholesterol increase the risk of cardiovascular disease (CVD). However, LDL (low density lipoprotein) cholesterol is the bad form of cholesterol in the blood. It is high levels of this type that is linked with an increased risk of heart disease. Triglycerides are another type of fat in the blood. Raised LDL and raised triglycerides give an increased risk of CVD. For diabetes patients:

- total cholesterol level should be below 4.0 mmol/l
- LDL levels should be less than 2.0 mmol/l
- HDL levels should be 1.0mmol/l or above in men and 1.2mmol/l or above in women
- triglyceride levels should be 1.7mmol/l or less

Diabetes complications
People living with diabetes may have to deal with short-term or long-term complications as a result of their condition.

Short-term complications include hypoglycaemia, diabetic ketoacidosis (DKA), and hyperosmolar hyperglycaemic state (HHS).

Long-term complications include how diabetes affects the eyes (retinopathy), heart (cardiovascular disease), kidneys (nephropathy), and nerves and feet (neuropathy).

Hypoglycaemia (hypo)
Hypoglycaemia means ‘low blood glucose levels’ – less than 4 mmol/l. This is too low to provide enough energy for the body’s activities.

Symptoms
Hypos can come on quickly and everyone has different symptoms, but common ones are: feeling shaky, sweating, hunger, tiredness, blurred vision, lack of concentration, headaches, feeling tearful, stroppy or moody, going pale.

There’s no rule as to why they happen, but some things make it more likely: excess insulin, delayed or missed meal or snack, not enough carbohydrate, unplanned physical activity, and drinking large quantities of alcohol or alcohol without food. Sometimes there just is no obvious cause.

Hyperglycaemia (hyper)

At the other end of the scale is hyperglycaemia or hypers. This happens when blood glucose levels are too high – usually above 7mmol/l before a meal and above 8.5mmol/l two hours after a meal.

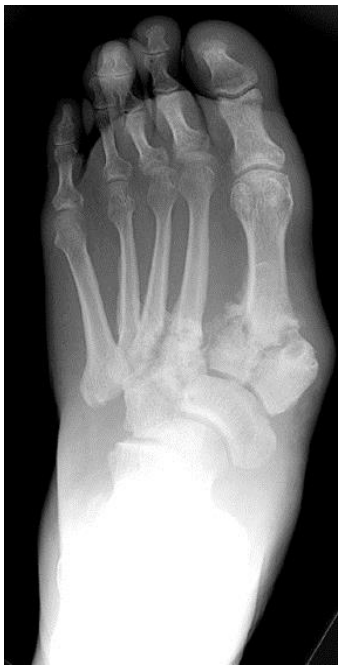
A patient may have missed a dose of medication, eaten more carbohydrate than the body and/or medication can cope with, be stressed, be unwell from an infection, over-treated a hypo.

Feet

People with diabetes are at much greater risk of developing problems with their feet, due to the damage raised blood sugars can cause to sensation and circulation. If left untreated, these problems can cause foot ulcers and infections and, at worst, may lead to amputations. However, most foot problems are preventable with good, regular foot care.

The high blood sugar levels associated with diabetes can affect the circulation and damage the sensory, motor or autonomic nerves in the body. Nerve damage is known as neuropathy, and the feet are often the first part of the body to be affected.

Sensory neuropathy



This affects the nerves that carry messages from the skin, bones and muscles to the brain and affects how we feel temperature, pain and other sensations. It is the most common form of neuropathy, mainly occurring in nerves in the feet and legs, and can lead to a loss of feeling and a failure to sense pain. This could mean that patients might develop a blister or minor burn without realising it, which, if not treated properly, could become infected or develop into an ulcer.

Charcot joint is a rare complication of people with diabetes who have severe neuropathy. It happens when an injury to the foot causes a broken bone, which may go unnoticed because of the existing neuropathy. The bone then heals abnormally, causing the foot to become deformed and misshapen. Treatment includes immobilizing the foot in a plaster cast and in some cases surgery.

Motor neuropathy

This affects the nerves responsible for sending messages to the muscles about movements, such as walking. Damage to these nerves leads to weakness and wasting of the muscles that receive messages from the affected nerves. If the nerves supplying the feet are affected it could cause the feet to alter shape. The toes may become clawed (curled) as the arch/instep becomes more pronounced or the arch may ‘fall’ causing flat feet. This can cause the bones in the foot to fracture (break) when stressed.

Autonomic neuropathy

Autonomic neuropathy affects nerves that carry information to organs and glands. They help to control some functions without consciously directing them, such as stomach emptying, bowel control, heart beating and sexual organs working. Damage to these nerves may affect the sweat glands, reducing secretions and making the skin dry and inelastic. If not looked after the skin may crack and become sore and prone to infection.

Other problems associated with autonomic neuropathy include gastroparesis, loss of bladder control, leading to incontinence, irregular heart beat and impotence.

Poor circulation

Diabetes may also affect the circulation by causing atherosclerosis. This can affect all the major blood vessels, especially those supplying the feet. Without a good blood supply, patients may have problems with cuts and sores, as the feet will be less able to heal well. Patients may also suffer from cramp and pain in the legs and/or feet as a result of poor circulation. High blood pressure, a high fat content in the diet and, in particular, smoking, all increase the risk of poor circulation.

Cardiovascular disease

People with diabetes have a higher chance of developing cardiovascular disease.
Blood vessels are damaged by high blood glucose levels, high blood pressure, smoking or high levels of cholesterol. So, it is important for people with diabetes to manage these levels by making lifestyle changes such as eating a healthy diet, taking part in regular activity, weight loss if overweight and stopping smoking.

Eyes (retinopathy)

Diabetic retinopathy is damage to the retina and is a complication that can affect people with diabetes. It is the most common cause of blindness among people of working age in the UK. The delicate network of blood vessels that supply the retina with blood are damaged by high blood glucose and high blood pressure. When those blood vessels become blocked, leaky or grow haphazardly, the retina becomes damaged and is unable to work properly.

Kidneys (nephropathy)

Kidney disease (nephropathy) is when the kidneys start to fail. Kidney disease is much more common in people with diabetes or high blood pressure, and is most common in people who have had diabetes for over 20 years. About one in three people with diabetes might go on to develop kidney disease, although, as treatments improve, fewer people are affected.
The kidneys regulate the amount of fluid and various salts in the body, helping to control blood pressure. They also release several hormones.

As kidney disease progresses, the kidneys become less efficient and the person can become very ill. This happens as a result of the build-up of waste products in the blood, which the body cannot get rid of.

Kidney disease is caused by damage to small blood vessels, making the kidneys work less efficiently. Keeping blood glucose levels as near normal as possible can greatly reduce the risk of kidney disease developing as well as other diabetes complications. It is also very important to keep blood pressure controlled.

As part of the annual health care review patients should have a blood and urine test. The urine will be checked for tiny particles of protein, called 'microalbumin'. These appear during the first stages of kidney disease, as the kidneys become 'leaky' and lose protein. At this stage, kidney disease can often be treated successfully, so this test is very important. The blood test will measure urea, creatine, and estimated glomerular function (eGFR) showing how well the kidneys are working.

Diabetic ketoacidosis (DKA)

Consistently high blood glucose levels can lead to a condition called diabetic ketoacidosis (DKA). This happens when a severe lack of insulin means the body cannot use glucose for energy, and the body starts to break down other body tissue as an alternative energy source. Ketones are the by-product of this process. Ketones are poisonous chemicals which build up and, if left unchecked, will cause the body to become acidic – hence the name 'acidosis'.

Hyperosmolar Hyperglycaemic State (HHS)

Hyperosmolar Hyperglycaemic State (HHS) occurs in people with Type 2 diabetes who experience very high blood glucose levels (often over 40mmol/l). It can develop over a course of weeks through a combination of illness (e.g. infection) and dehydration.

Stopping diabetes medication during illness (e.g. because of swallowing difficulties or nausea) can contribute, but blood glucose often rises despite the usual diabetes medication due to the effect of other hormones the body produces during illness.

HHS is a potentially life-threatening emergency. It does not usually lead to the presence of ketones in the urine, as occurs in diabetic ketoacidosis (DKA). Ketones develop when the blood glucose level is high due to lack of insulin which is needed to allow glucose to enter the cells for energy. Because people with Type 2 diabetes may still be producing some insulin, ketones may not be created.

Candidate Name	Centre Number	Candidate Number

WJEC Level 3 Certificate in Medical Science

Specimen External Assessment

AM/PM xxxday xx June 20xx

Unit 1: Human Health and Disease (2 hours)

	For Examiner's use only	
Question	**Maximum Mark**	**Mark Awarded**
1-6	**25**	
7	**16**	
8	**6**	
9	**9**	
10	**12**	
11	**7**	
12	**8**	
13	**7**	
Total	**90**	

Instructions to candidates

Answer all questions.

Write your answers in the spaces provided in this booklet.

Information for candidates

The total mark for the paper is **90** marks.

You are reminded of the necessity of good English and orderly presentation of your answers.

The number of marks is given in brackets at the end of each question or part question.

Questions in section A are based on the pre-release article.

You will need the resource folder that contains the pre-release article.

You will need a calculator and ruler for this exam.

You should show your working to calculations.

Section A

1. State **three** risk factors for diabetes. [1]

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2. Explain the difference between type 1 and type 2 diabetes. [2]

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3. *(a)* Describe the role of the pancreas in regulating blood glucose in a healthy person. [2]

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(b) Describe the role of the liver in regulating blood glucose in a healthy person. [4]

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4. Glucose is present in the urine of Diabetics. There are two isomers of glucose, alpha (α) glucose and beta (β) glucose. Describe how the two isomers of glucose differ from each other. *(Any diagrams must be fully annotated.* [2]

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5. In diabetics, blood pressure should not be above 130/80.

(a) Describe what is meant by the term '130/80' [2]

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(b) Describe how a GP would measure a patient's blood pressure [3]

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(c) Kidney disease is a complication of diabetes that occurs due to high blood pressure. Suggest why high blood pressure is particularly damaging to the kidneys. [2]

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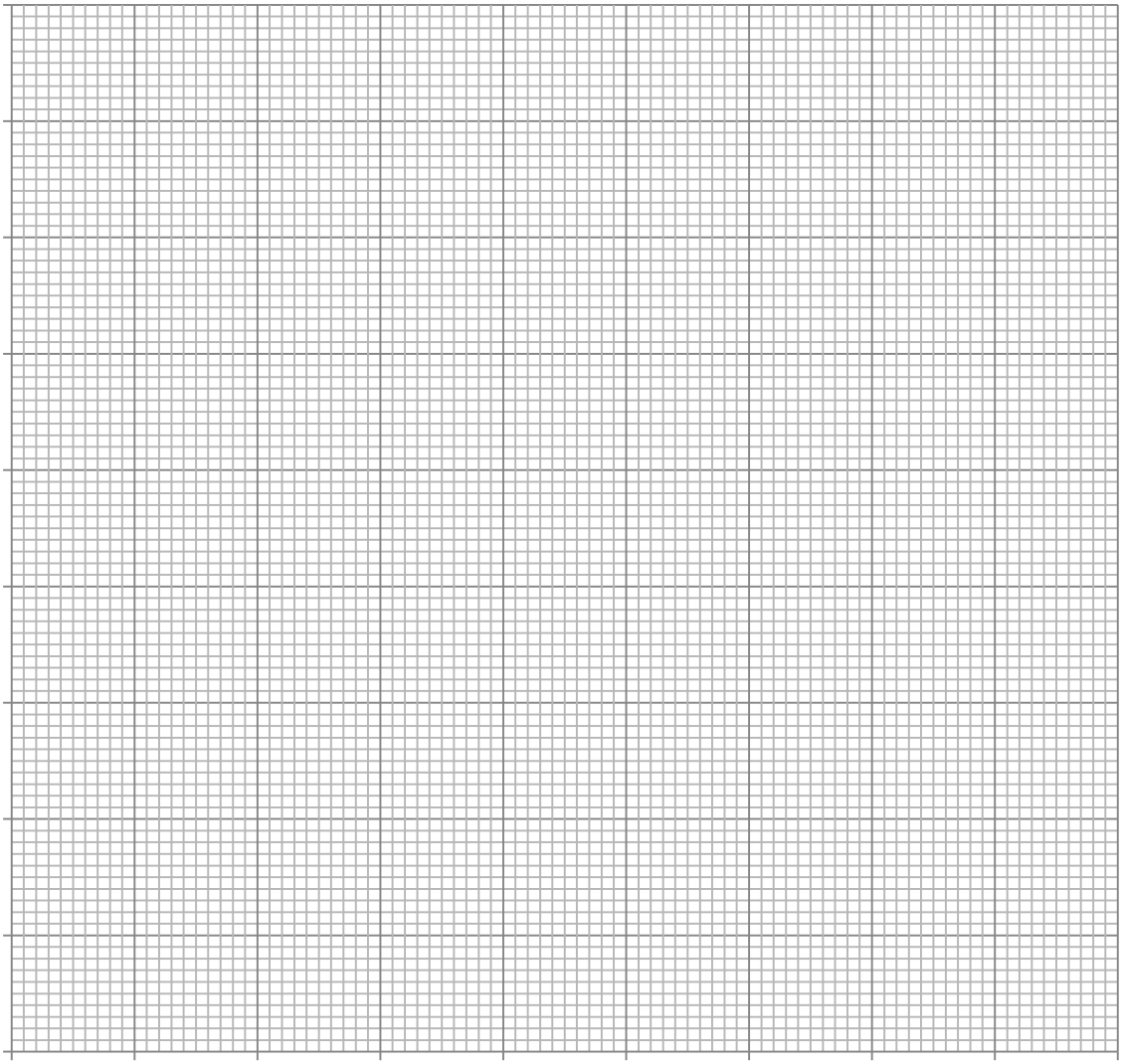
6. *(a)* Plot the data for distribution of diabetes in England and Wales by age group on the graph paper below. [4]

Age	**Prevalence (England and Wales)**	**Prevalence (Scotland)**
0 – 9	0.22%	0.26%
10 – 19	0.99%	1.23%
20 – 29	1.69%	2.09%
30 – 39	3.83%	3.55%
40 – 49	10.69%	9.69%
50 – 59	18.95%	18.97%
60 – 69	26.05%	26.46%
70 – 79	24.14%	24.67%
80+	13.42%	13.07%



(b) Calculate the percentage difference in the distribution of diabetes between 10-19 years and 40-49 years in England and Wales. [2]

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(c) Suggest why this pattern of distribution occurs. [2]

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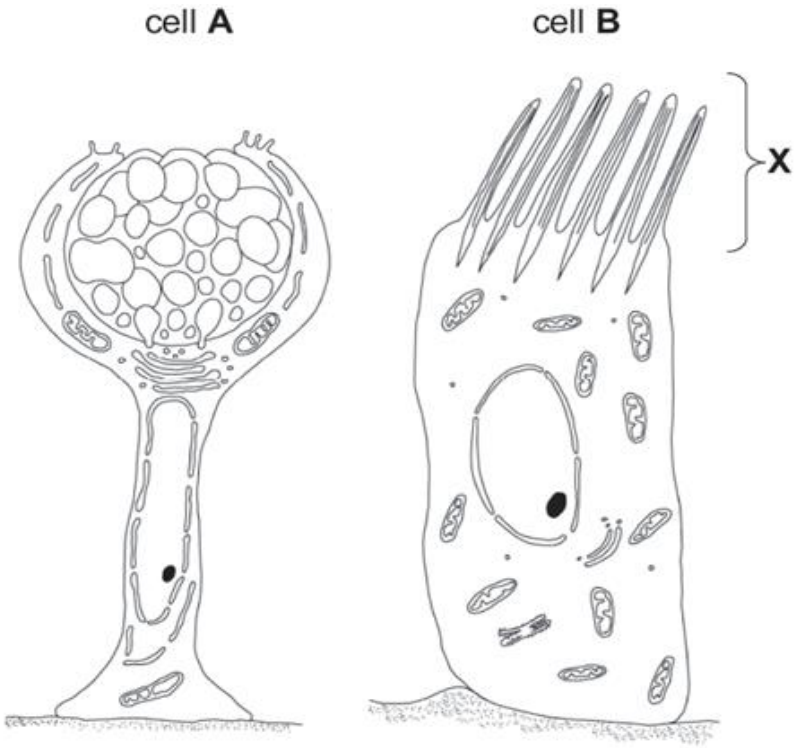
Section B

7. The diagram below shows two cells found in the human respiratory system



(a) Cell **A** produces mucus. State **two** reasons why mucus is present in the respiratory system. [2]

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(b) State in which part of the respiratory system cell **B** is found. [1]

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(c) Which cell (**A** or **B**) would be most metabolically active? Explain your answer. [2]

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(d) Suggest how the structures in cell A show that mucous contains a high concentration of glycoprotein. [1]

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(e) (i) The function of the structures in region **X** is affected by tar from cigarettes.

How will this affect the respiratory system? [1]

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(ii) State what equipment is used to monitor the lung capacity of smokers [1]

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(f) A study invited smokers to participate in a discussion into their opinions on

quitting smoking. Posters were used to invite members of the local community who smoked to participate and a snowballing approach used to support recruitment.
Face-to-face interviews revealed that smokers who self-identified as highly motivated to quit, actually expressed low motivation during discussions.

(i) Describe the difference in the type of data collected by qualitative and quantitative methods. Explain which type of method was used to collect data in this case. [4]

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(ii) Explain what is meant by a 'snowballing approach'. What are the limitations of this method? [4]

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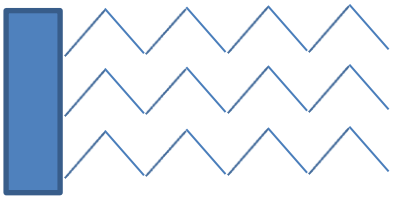
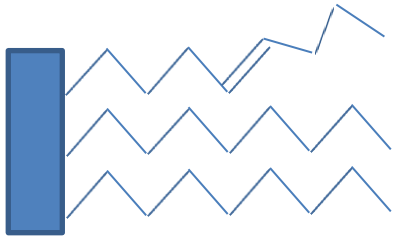
8. The diagram below shows the structure of four lipid and lipid-based molecules in the human body.

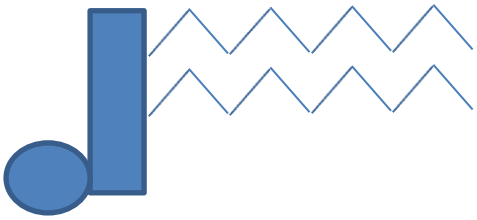
A



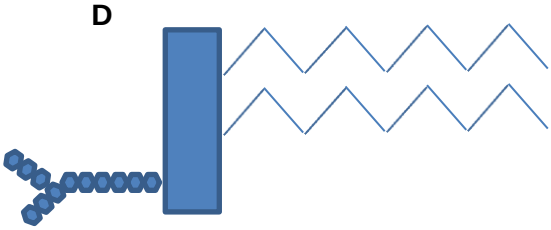
B



C



D



(a) Identify molecules **A**, **B**, **C** and **D** [2]

A ……..

B ……..

C ……..

D ……..

(b) Explain how the structural differences in **A** and **B** contribute to their different physical properties. [1]

……

……

(c) State a function of **C** and **D** in the human body. [2]

C……

D..……

(d) Suggest why we are encouraged to decrease our consumption of **A** compared to **B**. [1]

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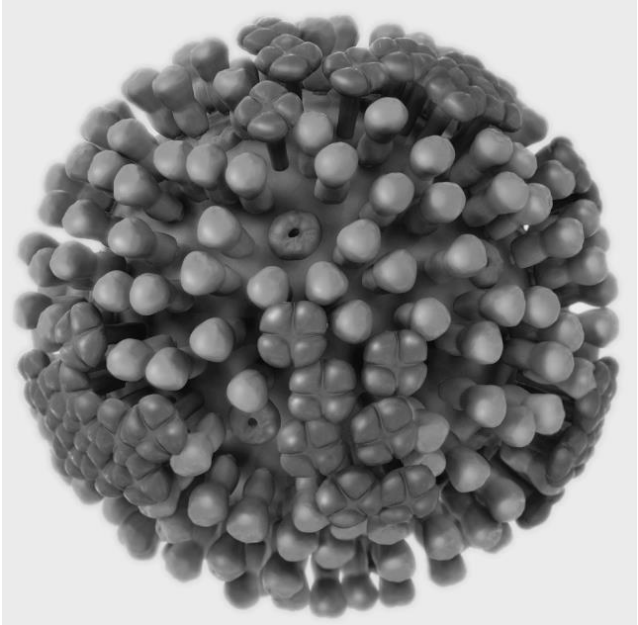
9. The diagram below shows the structure of the influenza virus.



(a) Describe how viruses such as influenza replicate. [4]

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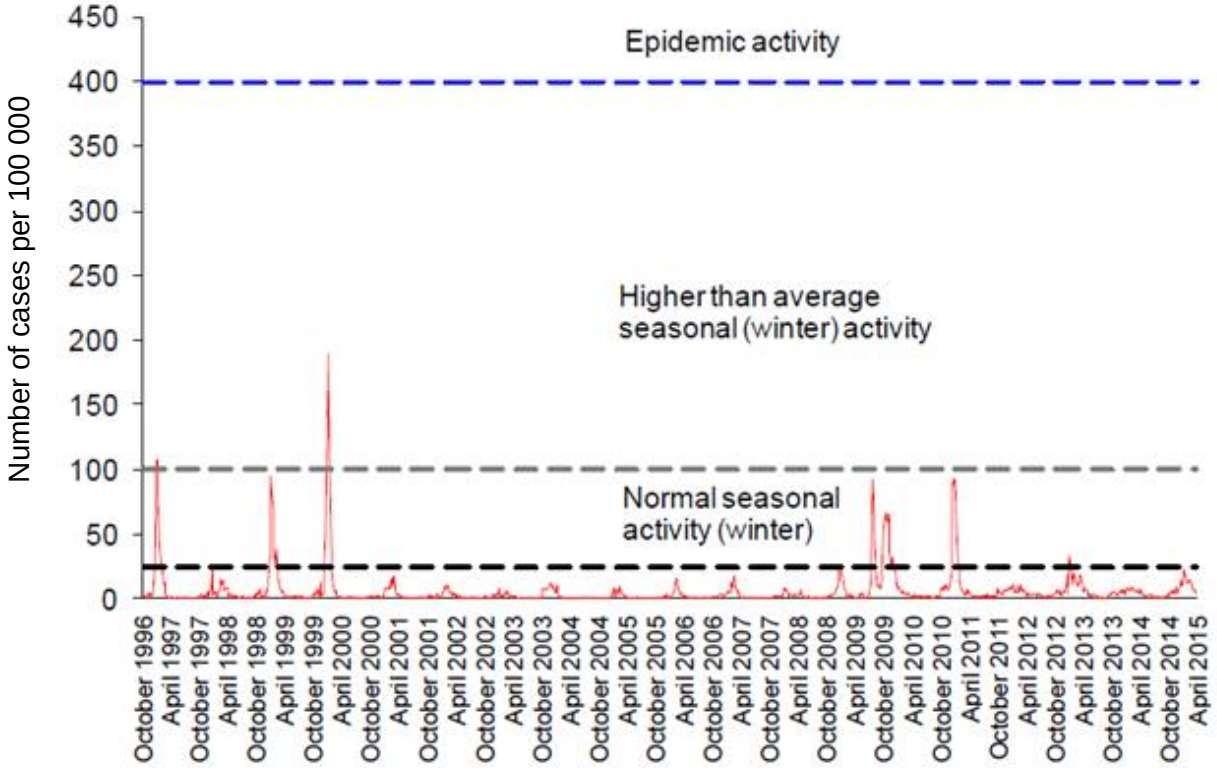
The chart below shows the number of influenza cases in Wales between October 1996 and April 2015.



(b) (i) Describe the pattern shown in the chart. [2]

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(ii) Suggest why the number of cases of influenza appears to be unchanged despite the availability of a vaccine. [1]

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(iii) During the winter of 2010, there was a public campaign to promote awareness of the importance of good hygiene to prevent the spread of a particularly severe form of influenza known as 'swine flu'. Use the evidence in the chart to evaluate whether this campaign was successful. [2]

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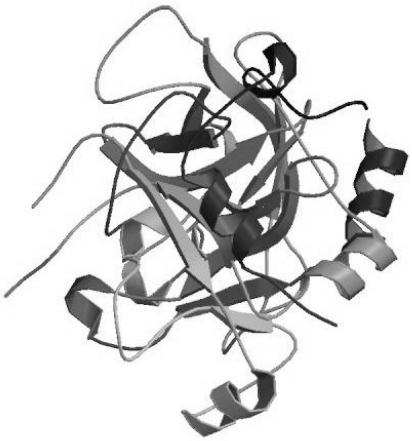
10. The enzyme, thrombin is important in blood plasma. It catalyses the conversion of fibrinogen to fibrin during the blood clotting process.



(a) Describe the structure of thrombin. [4]

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(b) Explain how the structure of the enzyme thrombin allows it to catalyse the conversion of fibrinogen to fibrin. [3]

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(c) (i) Heparin is a drug which prevents blood clotting. Suggest how heparin brings about its effect. [1]

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(ii) In an experiment, the effect of heparin concentration on clotting time as investigated. On the axes below, sketch the expected result of this investigation [2]

(iii) Protamine sulfate can reverse the effects of heparin by binding to the heparin molecule so that it no longer has its effect. Suggest how protamine sulfate reverses the effect of heparin. [2]

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11. Haemophilia is caused by a sex linked gene**.**

(a) What is meant by the term *'sex linkage'*? [1]

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(b) Complete the following genetic diagram to show how parents who did not suffer from haemophilia, could have a son with haemophilia but also other children who did not suffer from haemophilia. Use the symbols $\mathbf{X^H}$ for the normal allele and $\mathbf{X^h}$ for the allele which causes haemophilia. [4]

Phenotype of parents	Normal male	Normal female
Genotype of parents	……	……
Genotype of gametes	…… ……	…… ……

Genotype of offspring	……	……	……	……
Phenotype of offspring	……	……	……	……

(c) What is the probability of the couple having a daughter with haemophilia? [1]

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(d) What is the probability of the couple having another son with haemophilia? [1]

……

12. Catrin was studying the electrical activity of the heart as part of her Medical Science course. She learnt that the heart muscle was myogenic and that the electrical excitation spread in a particular route, to ensure that the chambers contract in the correct sequence.

(a) State what is meant by the term *myogenic*. [1]

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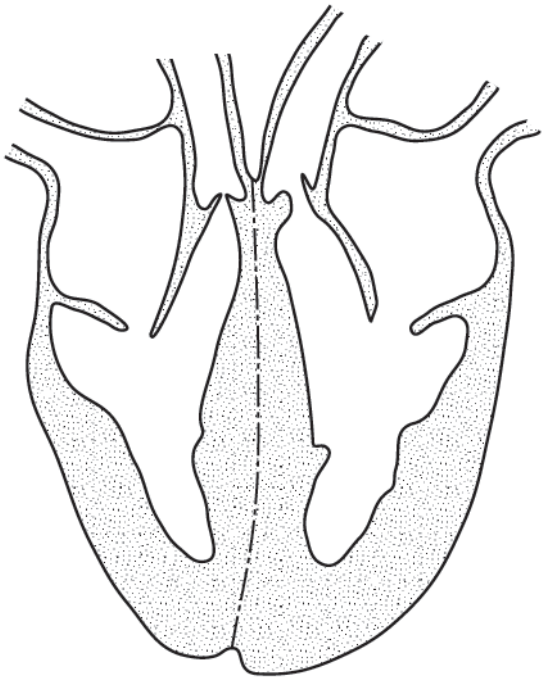
(b) (i) Catrin studied the role of the Atrio-Ventricular Node, Purkinje (Purkyne) tissue and Sino-Atrial Node. On the diagram below, show the position of these **three** structures. [3]



(c) The atrio-ventricular septum is a thin layer of tissue between the outer walls of the atria and ventricles. Explain the role of the atrio-ventricular septum. [1]

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(d) Name the equipment used to determine the electrical activity of the heart. [1]

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(e) In Britain, about 10 000 people a year are fitted with an artificial pacemaker to treat an abnormally slow heartbeat.

(i) What is the medical term given to a heart beat of less than 60 beats per minute? [1]

……

(ii) What region mentioned in part *(b)* is mimicked by an artificial Pacemaker? [1]

……

13. Phagocytes are specialised white blood cells that defend the body from bacterial pathogens such as *Mycobacterium tuberculosis.* Describe the process by which pathogens such as *Mycobacterium tuberculosis* are destroyed by phagocytes. [7]

END of PAPER

WJEC APPLIED CERTIFICATE IN MEDICAL SCIENCE

MARK SCHEME - UNIT 1 HUMAN HEALTH AND DISEASE

Question Number			Answer	Marks	LO1	LO2	LO3	LO4	Unit 2	Unit 3
1			• Overweight/high BMI • Large waist • African-Caribbean, Black African, Chinese or South Asian background and over 25 • Other ethnic background and over 40 • Parent or sibling with diabetes • Have high blood pressure • Polycystic ovaries / gestational diabetes • Schizophrenia/bipolar/depression/taking antipsychotic drugs (3 points for 1 mark)	1			1			
2			• Type 1: insulin-producing cells in the body have been destroyed • Type 2: insulin-producing cells in the body are unable to produce enough insulin / insulin that is produced does not work properly	2			2			
3	a		• Pancreas produces insulin to decrease blood glucose/when blood glucose is high • Pancreas produces glucagon to increase blood glucose/when blood glucose is low	2		2				
	b		When blood glucose levels are low: • Liver converts glycogen to glucose / glycogenolysis • Liver converts {non-carbohydrate substances/amino acids/glycerol} to glucose / gluconeogenesis When blood glucose levels are high: • Liver stores glucose as glycogen / glycogenesis • Liver converts glucose to fat • Liver uses the glucose for respiration (2 points for low, 2 points for high)	4		4				

Question Number			Answer	Marks	LO1	LO2	LO3	LO4	Unit 2	Unit 3
4			• α glucose: H on C1 above the ring, OH below • β glucose: OH on C1 above the ring, H below	2	2					
5	a		• the maximum arterial pressure (occurring during contraction of the left ventricle of the heart) is 130 mm/Hg • The minimum arterial pressure (due to relaxation of the ventricles) is 80 mmHg	2					2	
	b		• The cuff is inflated/ pumped- up around upper arm to prevent blood flow • cuff is deflated until blood flow begins - this gives systolic pressure • cuff loosened further until free blood flow - this gives diastolic pressure	3					3	
	c	i	• Damages {capillary network / small blood vessels} • {Filtration of blood/ultrafiltration} is less efficient	2		2				
6	a		Axes + scale (1) Plot (2)	3				3		
	b		difference = 10.69-0.99 = 9.7 % difference = 9.7/0.99 x 100 = 979.8 %	2				2		
	c		• Before 40 low numbers as cases due to Type 1 diabetes • After 40 High number as cases due to type 1 and type 2 diabetes	2			2			
Total Section A				25	2	8	5	5	5	0

Question Number			Answer	Marks	LO1	LO2	LO3	LO4	Unit 2	Unit 3
7	a		Lubrication Protection	2		2				
	b		Trachea	1		1				
	c		B – more mitochondria more respiration/ATP (marks for reason)	2	2					
	d		Extensive golgi apparatus / Golgi used in protein modification	1	1					
	e	i	lack of mucous clearance / infection/cough	1			1			
		ii	Spirometer / peak flow meter	1					1	
	f	i	• quantitative methods - generates measureable data / data that can be transformed into useable statistics (1) • qualitative methods – has no measurement statistics / uses words to explore meaning (1) • Qualitative method used (1) • best method to gain an understanding of underlying reasons / opinions / motivations. (1) *or* • Or qualitative methods use interviews (etc) to find underlying reasons / opinions / motivations	4						4
		ii	• Snowballing is a non-probability sampling technique (1) • where existing subjects recruit future subjects from friendships/ acquaintances (1) Limitations (2) Two of: • Danger of bias • First participants will have strong impact on sample • Not random sample so may not be representative	4						4

Question Number			Answer	Marks	LO1	LO2	LO3	LO4	Unit 2	Unit 3
8	a		A: Saturated triglyceride B: Unsaturated triglyceride C: Phospholipid D: Glycolipid (1 mark per correct pair)	2	2					
	b		A – no C=C double bonds – solid at room temp/lower mp Or B – has C=C double bonds – liquid at room temp/higher mp	1	1					
	c		C membranes D cellular recognition	2	2					
	d		A – saturated fat linked to CHD (or reverse argument)	1			1			
9	a		• Virus attaches itself to host cell • Injects genetic material into host cell • Viral DNA incorporates into host cell • Host cell replicates the viral {genome/DNA/RNA} • Newly-created viruses and released from the host cell • Cell breaks apart/dies (any 4 points in correct sequence)	4			4			
	b	i	• Number of cases low {in summer months / Apr-Oct} • Number of cases high {in winter months / Oct-Apr}	2				2		
		ii	High mutation rate of influenza virus	1			1			
		iii	Yes • Cases of flu did not reach epidemic level • Numbers decreased in spring to normal (marks for reasoning)	2				2		

Question Number			Answer	Marks	LO1	LO2	LO3	LO4	Unit 2	Unit 3
10	a		• Primary structure/sequence of amino acids • Folded into secondary structure / Alpha helix and beta pleated sheet • Held by H Bonds • Folding of secondary structure to form tertiary structure • Held by H bonds, ionic bonds, disulphide bridges • 3D structure enables formation of active site (any 4 points)	4	4					
	b		• {Substrate/fibrinogen} binds to active site / forms E-S complex • Formation of fibrin as product • {Substrate/fibrinogen} is specific / active site is complementary • Correct reference to {lock and key/induced fit model}	3	3					
	c	i	Inhibitor of thrombin (ignore ref to competitive/non-competitive)	1	1					
		ii	• Appropriate line - As conc of Heparin increases, clotting time increases • Axes correctly labelled	2				2		
		iii	(Heparin-protamine) sulfate complex is a different shape (heparin-protamine sulfate) complex is no longer complementary to (active site/allosteric site of) thrombin Substrate/fibrinogen can now bind (any 2 points)	2	2					

<table>
<tr><th colspan="3">Question Number</th><th>Answer</th><th>Marks</th><th>LO1</th><th>LO2</th><th>LO3</th><th>LO4</th><th>Unit 2</th><th>Unit 3</th></tr>
<tr><td>11</td><td>a</td><td></td><td>(Genes) on the {X/ Y} chromosomes / (genes) on sex chromosomes, not on the autosomes</td><td>1</td><td></td><td></td><td>1</td><td></td><td></td><td></td></tr>
<tr><td></td><td>b</td><td></td><td><table>
<tr><td>Parents</td><td colspan="2">X^HY</td><td colspan="2">X^HX^h</td></tr>
<tr><td>Gametes</td><td>X^H</td><td>Y</td><td>X^H</td><td>X^h</td></tr>
<tr><td>Offspring</td><td>X^HX^H</td><td>X^HX^h</td><td>X^HY</td><td>X^HY</td></tr>
<tr><td></td><td>Normal Female</td><td>Normal / Carrier Female</td><td>Normal Male</td><td>Haemophilliac / Affected Male</td></tr>
</table>1 mark per correct row</td><td>4</td><td></td><td></td><td>4</td><td></td><td></td><td></td></tr>
<tr><td></td><td>c</td><td></td><td>None</td><td>1</td><td></td><td></td><td>1</td><td></td><td></td><td></td></tr>
<tr><td></td><td>d</td><td></td><td>0.25 / 25%</td><td>1</td><td></td><td></td><td>1</td><td></td><td></td><td></td></tr>
<tr><td>12</td><td>a</td><td></td><td>Excitation produced spontaneously, without requiring stimulation from nerve cells</td><td>1</td><td></td><td>1</td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>b</td><td></td><td>SAN, AVN, Purkinje fibres labelled in correct region (Purkinje fibres across both sides)</td><td>3</td><td></td><td>3</td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>c</td><td></td><td>• Insulation
• Prevents direct transfer of wave of excitation to ventricles
• Prevents atria and ventricles from contracting at the same time
• Causes contraction of ventricles from base
(any one)</td><td>1</td><td></td><td>1</td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td>d</td><td></td><td>ECG</td><td>1</td><td></td><td></td><td></td><td></td><td>1</td><td></td></tr>
<tr><td></td><td>e</td><td>i</td><td>Bradychardia</td><td>1</td><td></td><td></td><td></td><td></td><td>1</td><td></td></tr>
<tr><td></td><td></td><td>ii</td><td>SAN</td><td>1</td><td></td><td>1</td><td></td><td></td><td></td><td></td></tr>
</table>

Question Number	Answer	Marks	LO1	LO2	LO3	LO4	Unit 2	Unit 3
13	• (Bacterial pathogens /tuberculosis) initially attach to receptors on surface of phagocyte • Pathogen is engulfed by phagocyte / surrounded by cytoplasm • By phagocytosis • Formation of {phagocytic vesicle / phagocytic vacuole / phagosome} • Lysosomes fuse with vesicle • {Enzymes/lysins/hydrogen peroxide / free radicles} are released from the lysosomes • {Digest/break down} pathogen • Into {amino acids/sugars/glucose/fatty acids/glycerol} • Break down products are absorbed by cells (any 7)	7		3	4			
Total B		65	18	12	18	6	3	8
Total (unit)		90	20	20	23	11	8	8

WJEC Level 3 Certificate in Medical Science

Unit 1 Human Health and Disease

External Assessment: documentation

Year	*specimen*
Examiner	
Reviser	

Specification link

SECTION A (pre-release section)

LO	1				2		3				4				Unit link	
AC	1.1	1.2	1.3	1.4	2.1	2.2	3.1	3.2	3.3	3.4	4.1	4.2	4.3	4.4	2	3
Question																
1								1								
2										2						
3 a						2										
b					4											
4	2															
5 a															2	
b															3	
c i						2										
6 a												3				
b												2				
c										2						
Total	2				4	4		1		4		5			5	
	2				8		5				5				5	0
														Total	25	
														Allowed range for Section A	22-25	

SECTION B

LO	1				2		3				4				Unit link	
AC / Question	1.1	1.2	1.3	1.4	2.1	2.2	3.1	3.2	3.3	3.4	4.1	4.2	4.3	4.4	2	3
7 a						2										
b					1											
c		2														
d		1														
e i										1						
e ii															1	
f i																4
f ii																4
8 a	2															
b	1															
c	2															
d							1									
9 a									4							
b i												2				
ii									1							
iii													2			
10 a	4															
b	3															
c i	1															
c ii												2				
c iii	2															
11 a										1						
b										4						
c										1						
d										1						
12 a					1											
b					3											
c						1										
d															1	
e i															1	
ii					1											
13						3			4							
Total B	15	3			6	6	1		9	8		4	2		3	8
	18				12		18				6				3	8
																65
Total A	2				4	4		1		4		5			5	
Total	20				20		23				11				8	8
Allowed range	18-23				18-23		18-23				10-15				8-13	8-13
														Total	90	

WJEC Level 3 Certificate in Medical Science
Unit 1 Human Health and Disease
Coverage

	Specimen	2017	2018	2019	All AC covered in last three years?	2020	2021	2022	All AC covered in last three years?	2023
Section A marks in range 22-25 marks	25									
LO1 marks in range 18-23	20									
LO2 marks in range 18-23	20									
LO3 marks in range 18-23	23									
LO4 marks in range 10-15	11									
Unit 2 marks in the range 8-13	8									
Unit 3 marks in the range 8-13	8									
Extended response	✓									
Principal Examiner										
Reviser										

WJEC Level 3 Certificate Medical Science

Unit 1 Human Health and Disease

Assessment criteria: annual coverage

LO	**1**				**2**		**3**				**4**				**Unit 2**	**Unit 3**	**Verified**	
AC / Year	**1.1**	**1.2**	**1.3**	**1.4**	**2.1**	**2.2**	**3.1**	**3.2**	**3.3**	**3.4**	**4.1**	**4.2**	**4.3**	**4.4**			Principal Examiner	Reviser
Specimen	17	3			10	10	1	1	9	12		9	2		8	8		
2017																		
2018																		
2019																		
2020																		
2021																		
2022																		
2023																		