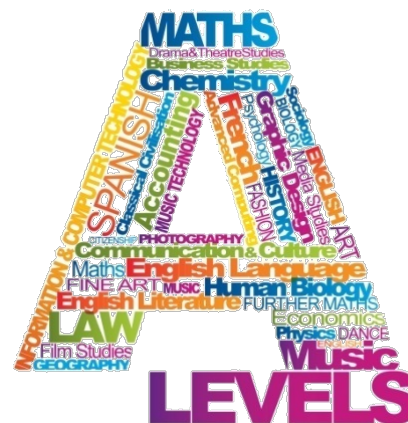


GCSE to A LEVEL Transition Project



Name:

Subject: A Level Medical Science Year 1

The purpose of this A Level Transition project is to introduce you to studying this subject at A Level standard. You will need to complete 10 hours of study on each subject every week, 4½ in class with your teacher and the rest as independent learning. Therefore, it is important that you enjoy this subject and that you start to practice your study skills as early as possible. Some subjects have significant maths content (for example business, psychology, economics); others require strong essay writing skills (for example history, English). Think about the study skills and underpinning knowledge you will require in this subject - not just the title.

If after completing this project you think this may not be your ideal choice, you can ask to transfer to another subject at the start of term, as long as you have the entry requirements and it fits alongside your other choices on the A Level Matrix (timetable). If you do decide to change subject, you will be required to complete the transition project for your new choice too.

This is also your first taste of Flipped Learning and elements will be used within your first week of lessons.

Please ensure your name, student number and subject are clearly noted on each page and bring it with you to hand in at Enrolment.

We hope you enjoy this project as you start your A Level journey.

Have a good summer and we look forward to seeing you in September.



Welcome to WJEC level 3 Diploma/Certificate in Medical Science

To EVERY lesson, you are expected to bring:

- an A4 ring-binder folder,
- lined paper
- pens, pencils, ruler and scientific calculator
- any current workbooks/worksheets
- In addition you will be expected to purchase a lab coat and lab book (these can be purchased through the college when you start the course)

Text book: There is no dedicated text book for this course. Any A Level Biology book will be useful for some aspects of this course but there is no need to purchase a text book before you start.

You will be provided with some workbooks and worksheets throughout the course, but you will be expected to print off some key material e.g. exam questions and flipped learning pre-work.

The transition work below will help you to understand the level of material we will cover in your first year. Read the attached article first, then answer **all** the questions. For some questions, you will be able to pull information from the article (though it must be written in your own words and not copied) which will demonstrate understanding. For other questions you will need to carry out additional research using either an A level/level 3 biology book or, if using the Internet, a good A Level revision site. e.g. <https://www.s-cool.co.uk/a-level/biology>

Throughout your study on this course, completing additional work to a good standard will help you gain a higher final grade.

Please submit your completed transition work in paper form at Enrolment. Make sure it has your name and subject on each page.

Name: _____

1: State 3 risk factors for diabetes

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2: Explain the difference between type 1 and type 2 diabetes

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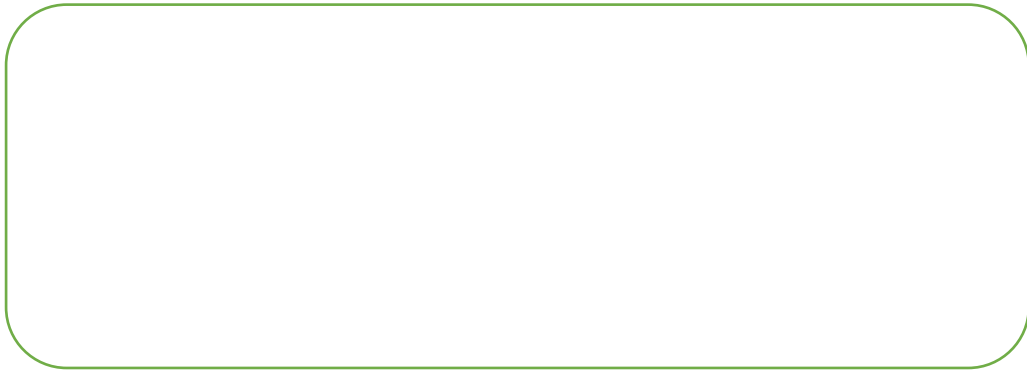
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3: Insulin is an important molecule in the normal regulation of glucose blood levels in the body. Choose the correct words in the statements below to describe Insulin.

- i) Insulin is a **protein/carbohydrate/nucleic acid/lipid**.
- ii) The single units that make up this type of molecule are: **glucose monomers/amino acids/nucleotides**
- iii) Insulin is a **neurotransmitter/enzyme/hormone**
- iv) Insulin is produced in the **liver/kidney/lungs/pancreas**

4: Glucose is present in the urine of diabetics. There are two isomers (structural forms) of glucose, alpha (α) glucose and beta (β) glucose. Draw a diagram of both and describe how they differ.



5: Why is glucose often present in the urine of Diabetics?

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6: A 56 year old woman suffers from Type 2 diabetes. Before eating a meal, her blood glucose levels were 4.5 mmol/L. Two hours after eating, her blood glucose levels were 9mmol/L. Is this a cause for concern? If yes explain why.

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7: If her blood pressure was taken and it was 180/90, why would this be a cause for concern?

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8: If this woman had her blood cholesterol levels measured and gave the results below, what would this indicated in terms of her risk of CVD and why?

- Total cholesterol levels - 3.8mmol/l
- LDL -2.5 mmol/l
- HDL-1.3 mmol/l

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9: How could she reduce her cholesterol levels to reduce her risk of CVD?

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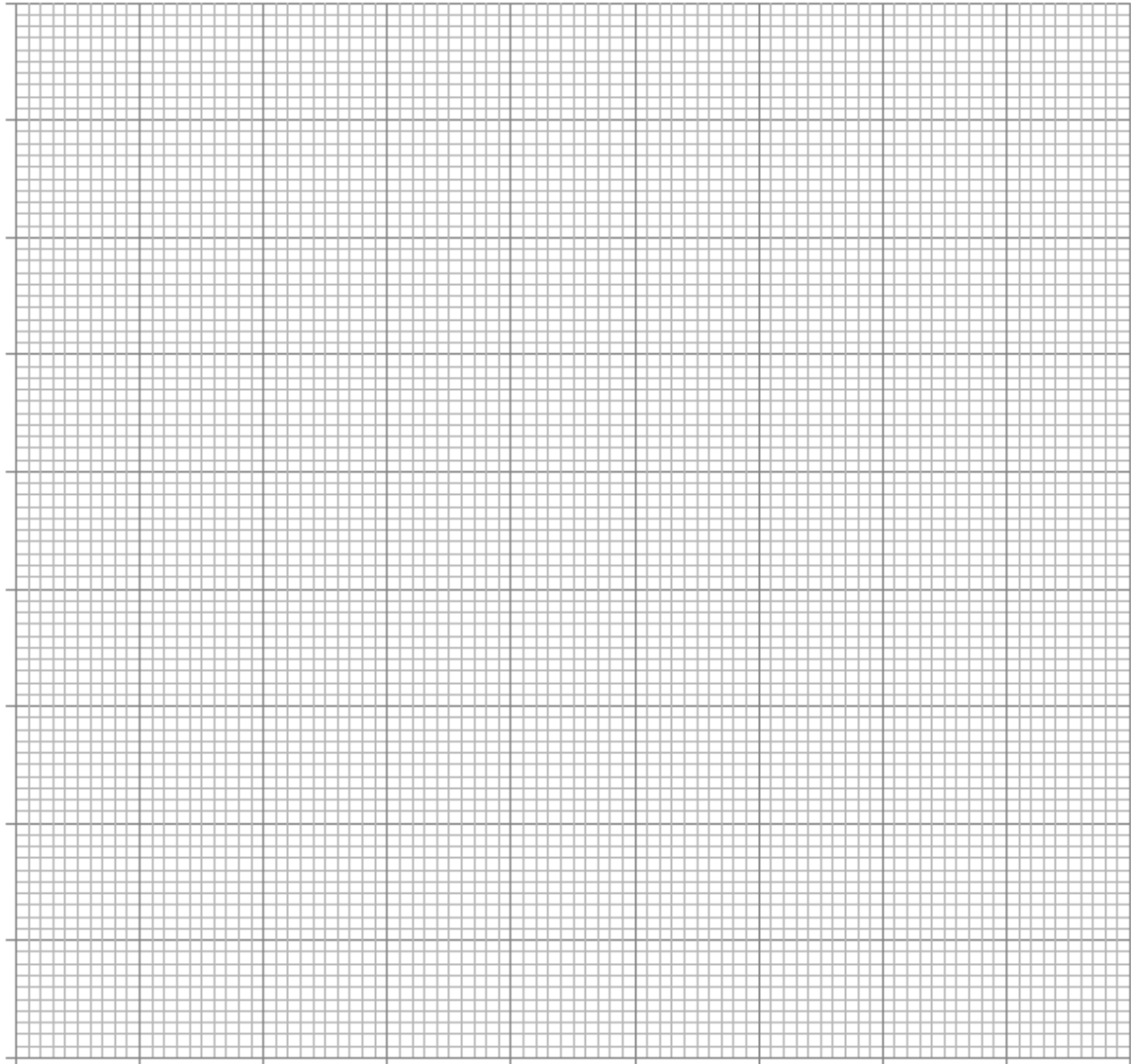
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10: If a child with Type 1 diabetes gave the same **glucose** readings at the same time, would this be a cause for concern?

Yes/no

11: Plot the data for distribution of diabetes in England and Wales by age group on the graph paper below.



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

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13: Why do you think this pattern of distribution occurs?

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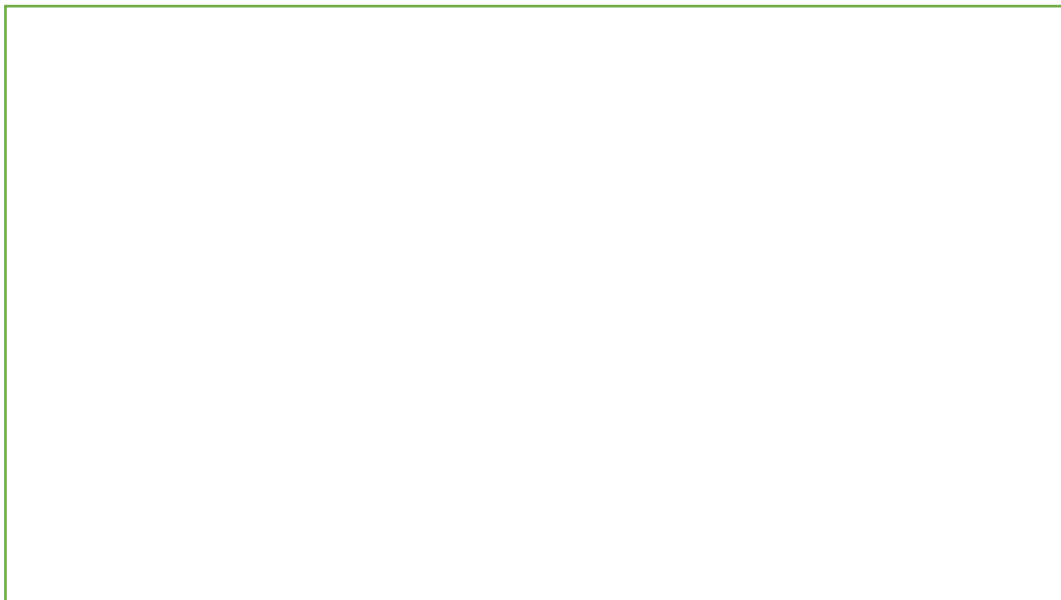
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14: The HbA1c measures the amount of glucose that is being carried by the red blood cells in the body. Draw and label the features of a red blood cell in the box below and describe how it is adapted to carry out its function.



15: State and describe two short term and two long term complication of diabetes

Short term complication _____

Descriptions

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short term complication_____

Description

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Long term complication _____

Descriptions

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Long term complication _____

Description

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Level 3 Medical Science Transition work

The following article is adapted from content found on the www.diabetes.org.uk website. Read the article first carefully then answer the attached questions. For some questions you will need to carry out additional research.

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	Prevalence
	(England and Wales)	(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 hypoor 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, stropy 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.