

Objectives

At the end of this lesson I should be able to:

- Describe how scientists measure health
- Use scientific equipment safely to collect my health measurements
- Explain how my genes could affect my health
- Describe some of the research being carried out at the University and the Hospital
- Design a health pledge to improve my own long term health

Start of lesson			End of lesson		
Confident	OK	Not so sure	Confident	OK	Not so sure
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Complete this section at the end of the lesson

What new things have you learnt today?

What skills have you used today?

What skills did you find difficult today?

How have you decided to 'Level Up Your Life'? What health pledge did you make?

How confident are you that you can achieve it, on a scale of 1-5?

Blood pressure tells us how hard the heart is having to work to pump blood round the body, and how much resistance the blood vessels have to the blood pumping.

Imagine your blood vessels are like a garden hose. If you put your fingers over the hose to make the opening narrow, the water will come spurting out really fast and strong. This is high pressure. If you take your fingers away the water will come out gently. This is low pressure.



1 in 3 adults in England and Scotland have High Blood Pressure. This puts them at increased risk of having a Heart Attack or Stroke.

There are 2 figures:

Systolic - The highest level your blood pressure reaches when your heart contracts and pumps blood into your arteries.

Diastolic - The lowest level your blood pressure reaches as your heart relaxes between beats.

1. What is your **blood pressure**?

_____ Systolic _____ Diastolic



Chris's blood pressure

_____ Systolic _____ Diastolic



Using the chart, how do you compare?



Evidence shows us that the **strength of your grip** can give an indication of how strong all your muscles are.

2. What is your **grip strength**?

	1st attempt (kg)	2nd attempt (kg)	3rd attempt (kg)	Your maximum (kg)	Chris's Maximum (kg)
Right hand					
Left hand					



Using the graph, how do you compare?





Flexibility and Jump height. Measuring the **flexibility** of your lower back and hamstrings can give a good indication of how flexible your arteries are. People with less flexible arteries have been shown to be at a greater risk of cardiovascular disease.

Measuring **jump height** can help us to understand how powerful the hamstring tendons are. If your leg muscles are powerful, research suggests that your heart muscle should also be healthy and strong.

3. How **flexible** are your hamstrings?

_____ cm

Chris's flexibility

_____ cm



4. How high can you **jump**?

_____ cm

Chris's jump height

_____ cm



Blood Glucose Testing

Blood glucose levels are taken to test for **Type 2 Diabetes**.

The blood test has to be taken when the patient has been **fasting** (not eating or drinking anything other than water) for 8 hours.

When a person fasts, their body is stimulated to produce **glucose**. In a person who does not have diabetes, the body produces enough **insulin** to lower the glucose back to normal. The blood test will only contain a small amount of glucose.

In a patient with **Type 2 Diabetes**, the body does not respond properly to insulin, so the glucose level in the blood is **high**.

5. Testing **Blood Glucose**

Sample	Glucose Level (mmol/l)	Diagnosis
Aunt Gemma		
Chris		





What is your mass adjusted for your height?

This measurement is called your BMI and can **indicate** a healthy mass for a particular height.

$$\text{BMI Calculation} \quad \frac{\text{Mass in kg}}{(\text{Height in m})^2} = \frac{\text{Mass in kg}}{\text{height} \times \text{height}}$$

6. What is your **BMI**?



	Mass (kg)	Height (m)	Height (m ²)	BMI
Me				
Aunt Gemma	100.7	1.65		
Chris				



Using the chart, how do you compare?

Who is in the healthy range?

For men and women aged over 18



Your BMI is a useful number to know but you should also measure your waist. This is because people who carry too much weight around their middle have a greater risk of developing coronary heart disease, high blood pressure and diabetes.

7. What is your **waist measurement**?

_____ cm

Chris's waist

_____ cm



8. What is your **body fat %**?

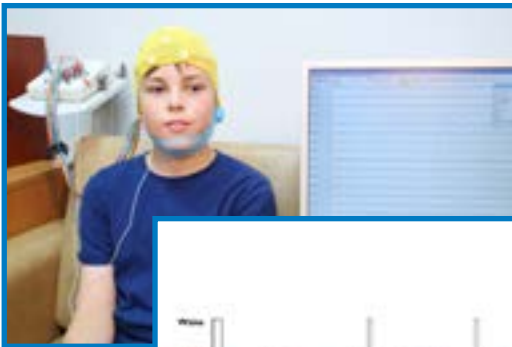
_____ %

Chris's body fat

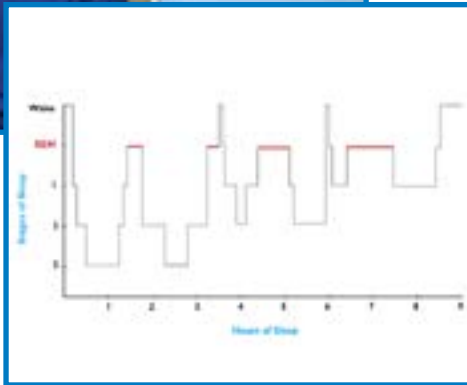
_____ %



Using the charts, how do you compare?



During **sleep studies**, scientists record the electrical activity in the brain and muscles, and heart rhythms using electrodes placed on the body. This is called **polysomnography**.



A **hypnogram** can then be produced using the data showing the different phases of sleep

Sleep is really important for our bodies. Studies have found that sleep can affect your health by:

- Releasing growth hormone which helps you grow
- Repairing cells damaged from injury
- Boosting mental well being
- Helping prevent type 2 diabetes and heart disease
- Boosting immunity, memory and performance
- Helping keep you slim

The Sleep Council provides helpful advice and tips for getting a good night's sleep to improve your health and wellbeing
www.sleepcouncil.org.uk



Teenagers are recommended to get a minimum of 9 hours of good sleep on school nights.

Scientists can use timed tasks, e.g, the Tower of Hanoi to measure cognitive ability. This is a measure of how quickly your brain is able to process information to carry out problem solving exercises. This can be affected by how much sleep you get.

9. How well did you do on the **Tower of Hanoi**?



Number of discs: _____ Time to complete the tower: _____

How many hours sleep did you have last night? _____

How do you think your school work and concentration levels are affected by your sleep?

Chris's result:

Number of Discs: _____ Time: _____

Hours of Sleep (from the graph) _____



Wellbeing (feeling good and functioning well) is really important for everyone. Developing an awareness of how to look after your wellbeing is a key part of everyday life, can help you perform well at school, be happy and stay healthier.



12. How are you feeling?



Here is a picture of five faces. The left one is the worst possible day for you and the right one is the best possible day for you. Where on this scale do you feel you are at this moment? Shade in the face that best matches how you're feeling today:



It's important to remember that it is normal for your emotional wellbeing to have ups and downs. Part of looking after your wellbeing is knowing how to bounce back from setbacks, and how to lift your mood again when things are difficult. Concerns arise when someone's mood continues to drop over a long period of time, or several challenging events occur close together.

13. How can you improve your mental wellbeing?



Evidence suggests there are five steps we can all take to help improve our mental wellbeing. If you give them a try, you may feel happier, more positive and able to get the most from life. **What could you do for each one?**

The Five Ways to Wellbeing

Connect – connecting with others

Give – giving, looking outward as well as inward

Be Active – doing something active

Take Notice – taking notice of the world around you

Keep Learning – learning new things



The MeeTwo app provides a safe and secure forum for teenagers wanting to discuss any issue affecting their lives.



Cardiopulmonary resuscitation (CPR) is a first aid technique that can be used if someone is not breathing properly and there are no other signs of life.

Chest compression CPR keeps blood and oxygen circulating in the body.

At the moment, less than 10 per cent of the 30,000 people in the UK who have a cardiac arrest out of hospital each year survive long enough to leave hospital alive. If someone carries out early CPR, it may double a casualty's chances of survival.



15. How to perform **Hands-only CPR**



If someone is not breathing normally and not responding to you, shout for help and call 999 for an ambulance then start chest compression CPR straight away.

To carry out a chest compression:

1. Place the heel of your hand on the breastbone at the centre of the person's chest. Place your other hand on top of your first hand and interlock your fingers.
2. Position yourself with your shoulders above your hands.
3. Using your body weight (not just your arms), press straight down by 5–6cm on their chest, then raise them again.
4. Try to perform **approximately 2 chest compressions every second**.
5. Continue this until the ambulance arrives.



Record your % CPR score here:

_____ %

In an emergency remember **Dr ABC:**

Danger - Check its safe to treat the casualty

Response - Check for a response. Shake the casualty gently and shout loudly

Airway - Check the casualty's airway is open and unblocked, tilt the head back and lift their chin

Breathing - Check they are breathing. Look, listen and feel for breaths. **If not breathing call 999**

Circulation - Start hands only CPR, hard and fast until help arrives

Research shows that young people are good at identifying what is good for their health. However, the problem facing young people is how to put their knowledge of healthy lifestyle choices into action.

We have worked with game designers to develop an interactive app for young people to use on smartphones to support them making healthy choices.

Avatar

What is your avatar going to look like?



Activity Quest

How could you challenge yourself and your friends to get more active?



Food Challenges

How can you make a fun, healthy breakfast?



Gutsy

What do you need to feed Gutsy to make Gutsy feel good?



Tick the box when you have successfully downloaded the LifeLab app

Scientist 1



Which scientist did you listen to?

Give 2 interesting facts you found out:

•

•

Scientist 2



Which scientist did you listen to?

Give 2 interesting facts you found out:

•

•

Having now met a scientist, what three words would you now use to describe scientists?



Why is research important? What are the possible real world applications?

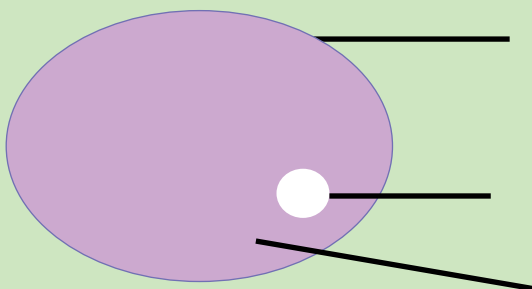
Why do you think people choose to become scientists?

Would you consider a **STEM** (Science, Technology, Engineering, Maths) career?



Label the diagram of the cell.

Where is the DNA found?



Extracting DNA

What is the lysis buffer made of?

What does the lysis buffer do?

Why is ethanol used?

What affect does temperature have?



DNA facts:

- **DNA** stands for Deoxyribonucleic Acid
- **DNA** is the molecule which contains the instructions to make living organisms.
- The structure of a **DNA** molecule is a double-stranded helix.
- There is about 2 metres of **DNA** found in the nucleus of every cell
- To fit all this **DNA** into the nucleus, it is coiled up into structures called chromosomes
- Our chromosomes are arranged in pairs. We inherit one copy of the pair from our mum and one from our dad
- If you could type 60 words per minute, eight hours a day, it would take approximately 50 years to type out the instructions to make a human.
- Sections of **DNA** form genes. Individual genes can control specific characteristics (e.g. eye colour) or functions, or work together to control other characteristics (e.g. height)
- You have 99.5% of your **DNA** in common with your parents, 98% in common with a chimpanzee and 40% in common with a cabbage!



What is epigenetics?

The name **epi** (from Greek: over, outside of, around) **genetics** (from Ancient Greek: origin).



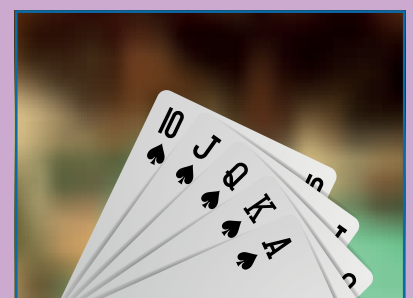
What is epigenetics?

- Epigenetics is the study of how the environment (e.g. what we eat, how much we exercise, where we live, whether we smoke etc.) can change how our genes work.
- DNA is often referred to as the blueprint or instruction manual for our bodies.
- Epigenetics tell our bodies which section of the blueprint (or which page of the instruction manual) to read at a given time.
- Epigenetic changes do not alter the letters of our DNA, but instead change its punctuation – like an exclamation mark (!), **bold**, or comma (i.e. “Let’s eat Grandad.” This phrase with an epigenetic change might be “Let’s eat, Grandad”).



Why is it important?

- These “punctuation” changes can turn genes “on” or “off” inside cells like traffic lights. This process is called gene regulation.
- Genes that are switched on tell cells what to become e.g. eye cells, brain cells or skin cells.
- They also control how our organs form, how our bodies respond to disease and infection, and much, much more.
- Gene regulation influences our health throughout our life and new research suggests that epigenetic changes may affect not only ourselves, but also our future children.
- It is important for women to eat well in pregnancy and for young children and teenagers to receive a good diet. At these important times our diet is setting the ‘traffic lights’ which can affect future health.
- Epigenetic changes can be reversible. The choices we make may undo or lessen the effects of early epigenetic marks on our DNA and prevent us passing them on to our children.
- **This is like playing a card game. Even if you are dealt a bad hand it is possible to play it well. It is also possible to mess up a good start in life with the wrong life choices.**



Gel Electrophoresis



Gel Electrophoresis



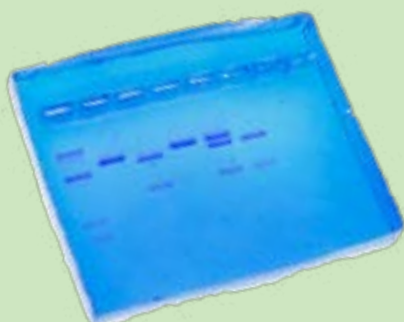
This process uses electricity to separate DNA fragments by size as they move through a gel.

Why would scientists investigate DNA?



How might they use the information they have discovered?

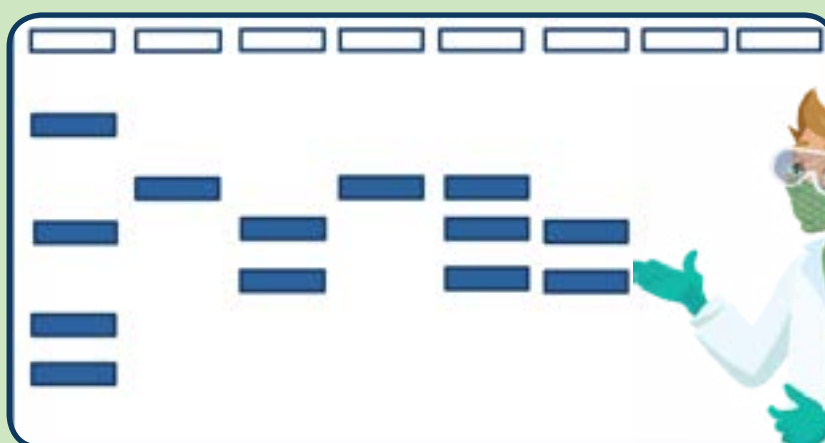
Looking at gels



DNA ladder to measure bands

Person with the 'normal' gene

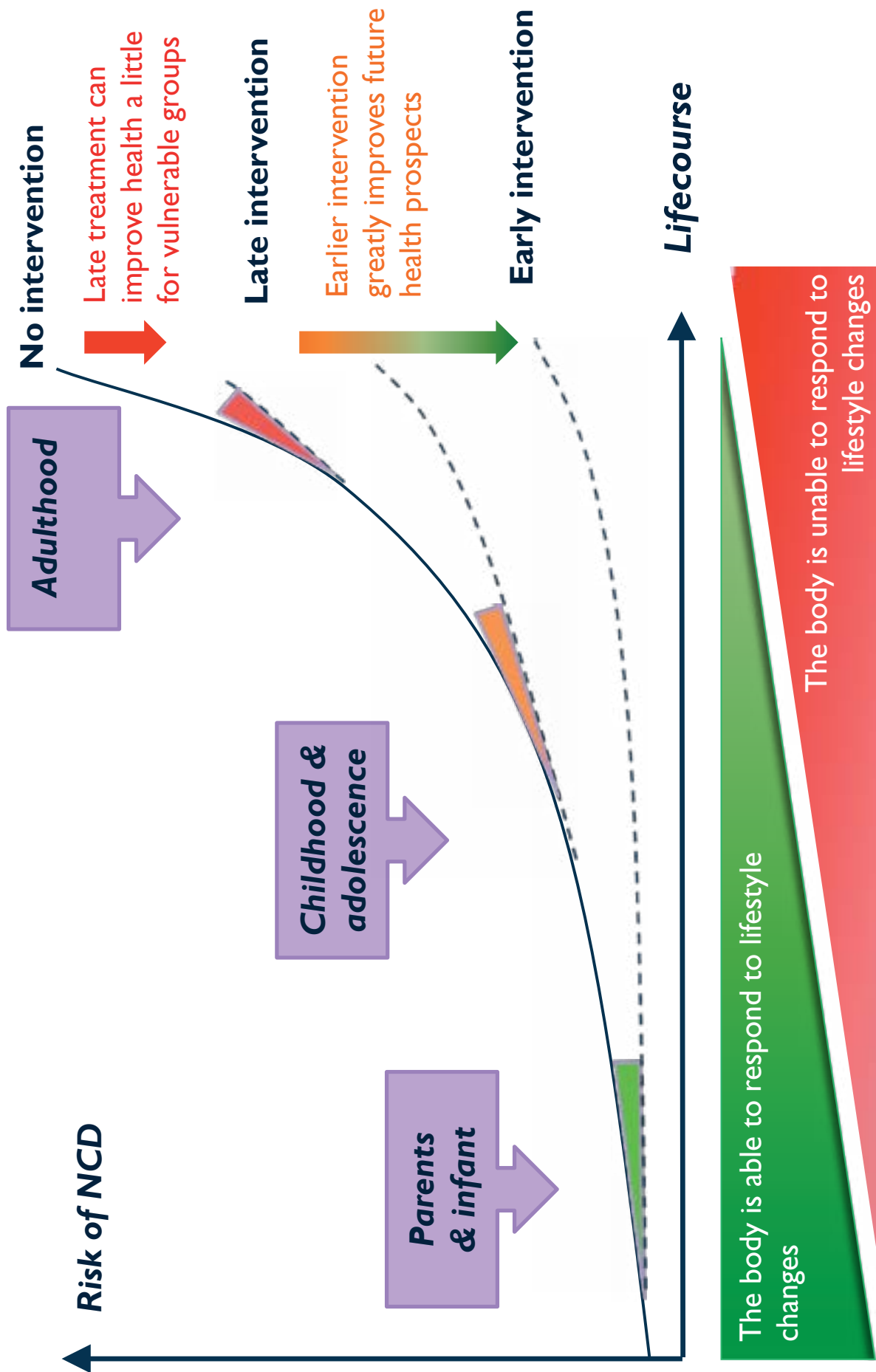
Person with high cholesterol



What conclusions can you draw from these results?



Risk of NCD over the lifecourse



Level Up Your Life



Discuss with a partner the following questions.....

1. What area of your lifestyle could you change to improve your health?

2. How important is this for you?

3. What are the possible changes you could make to improve this area of your life?



4. What would be the best change to fit in with your lifestyle?

5. What difference will this change make to your life?

6. How confident are you that you can do this on a scale of 1-5 ?



After your discussion fill in the boxes below:

1. My health pledge is to.....

Large empty rounded rectangular box for writing the health pledge.




2. What is the first step you will **take** to start this pledge?



3. How will you make it **measurable**?
e.g. When will you start? How often? Which days?
How many? How long?

Back at school - 7. How **successful** was your pledge?



1 2 3 4 5
Not very successful Very successful

What will be your next steps?

6. How **long** will it take you to achieve this pledge?
What will be the **positive impact** on your health?

4. What might make it **difficult** for you to achieve your pledge?

5. How could you get over these difficulties?
Who might **support** you with this pledge?

Level Up Your Life

