Name: _____

c.1900-present. Medicine in Modern Britain

Complete the tasks in this booklet, ready to hand in to your teacher on: _____

In this topic, you will study:

c1900–present: Medicine in modern Britain	
1 Ideas about the cause of disease and illness	• Advances in understanding the causes of illness and disease: the influence of genetic and lifestyle factors on health. • Improvements in diagnosis: the impact of the availability of blood tests, scans and monitors.
2 Approaches to prevention and treatment	• The extent of change in care and treatment. The impact of the NHS and science and technology: improved access to care; advances in medicines, including magic bullets and antibiotics; high-tech medical and surgical treatment in hospitals. • New approaches to prevention: mass vaccinations and government lifestyle campaigns.
3 Case studies	• Key individuals: Fleming, Florey and Chain's development of penicillin. • The fight against lung cancer in the twenty-first century: the use of science and technology in diagnosis and treatment; government action.

Factors are a very important part of this topic. As you work through the tasks, wherever you come across one of the factors, add it to the Factors Log on P.17.

Individuals

Science & Technology

Institutions (Government)

Attitudes in Society

1. Ideas about the causes of illness and disease.

Influence of genetic factors

Task: Read the information and answer the questions that follow.

Genetic causes of illness: the discovery of DNA

Turning point 1: **Discovering DNA's structure.**

In 1800 scientists knew that DNA existed and that it somehow controlled what we are like. During the 20th century two improvements in technology allowed scientists to take the first photographs of human cells. These improvements were **electron microscopes** (which allow people to see much smaller objects in finer detail) and better X-rays, using a technique called **crystallography** which uses radiation to take a high-power X-Ray photograph.

In 1953 James **Watson** and Francis **Crick** discovered the structure of DNA – a **double helix** (see image). They proved that this DNA structure is in every cell and showed how it passes information on from parents to children. They were able to make this discovery by doing many scientific experiments and by working with a large team of scientists with a range of skills and knowledge. Rosalind **Franklin** developed a technique to photograph a single strand of DNA and was the first person to take X-Ray photographs of DNA. Watson and Crick also had the latest and best equipment, like the improved microscopes and X-Ray photography mentioned above. This was all expensive, and the government provided a lot of the funding.

Turning point 2: **Mapping the human genome.**

The complete set of genes in a living creature is called a **human genome**. In 1986 the **Human Genome Project** began to identify the exact purpose of each gene in the human body, compiling a complete map of human DNA. The task was completed in 2001. The research was so complex it needed teams of scientists in 18 countries to take part ('big science'). Once this was completed, it then became possible for scientists to use this blueprint to look for mistakes or mismatches in the DNA of people suffering with hereditary diseases (those that can be passed down from parent to child). For example, scientists have now been able to identify a gene that is

sometimes present in women who suffer from breast cancer. They can then prevent the disease with a mastectomy (removal of one or both breasts by surgery).

Task: Complete this table using the information on DNA.

Development	Why was this important?
electron microscopes	
Watson and Crick	
crystallography	
structure of DNA	
government funding	
human genome	
Any other important information:	

Influence of lifestyle factors on health

Task: Use the information in the table below to design an advice leaflet to explain threats to health.

During the 20th century, we have gained a better understanding of the impact of lifestyle choices on the body and how these are linked with diseases and illnesses.

Lifestyle choice:	*Link to disease/illness:*
Smoking	By the 1950s doctors noticed a rise in men suffering from lung cancer. Doctors now recognise that smoking is associated with a large number of diseases, including high blood pressure, a wide variety of cancers, heart disease and even gum disease and tooth decay. They are also aware of the dangers of second-hand smoke.
Diet	We now recognise that what you eat (and how much of it) has a huge impact on your health. Advice includes eating plenty of fresh fruits and vegetables, and most other things in moderation. Too much sugar can lead to type 2 diabetes. Too much fat can lead to heart disease.
Drinking too much alcohol	Can lead to liver disease and kidney problems.
Intravenous drug-taking or unprotected sex	People now recognise that sharing bodily fluids with other people can lead to the spread of diseases.
Tanning	The fashion for tanning has led to a rise in the number of skin cancer cases worldwide.

MY HEALTH ADVICE LEAFLET

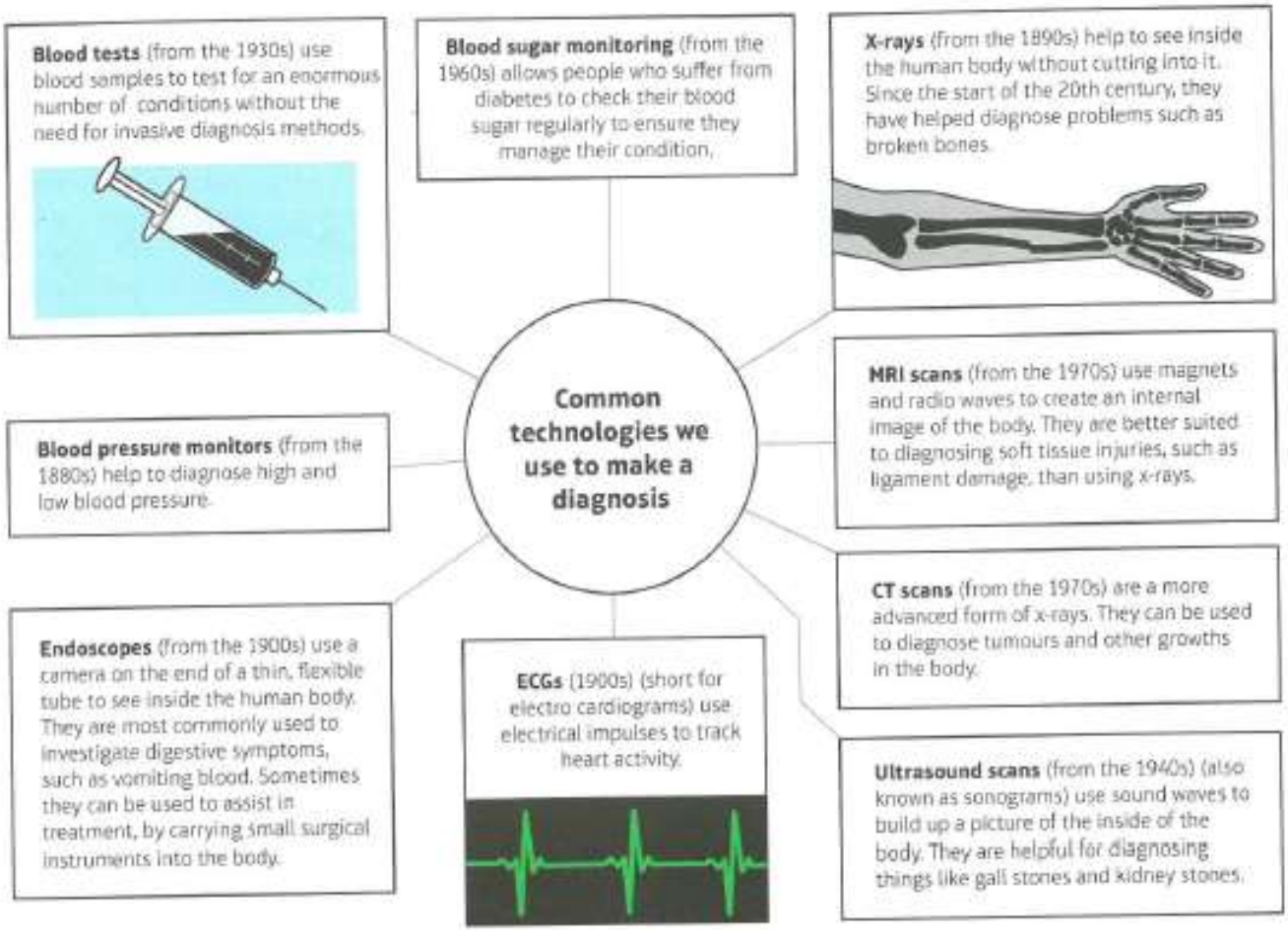
Improvements in diagnosis

Task: Use the diagram below to describe 3 ways that ***technology*** has led to a better understanding of the causes of disease and illness.

1:

2:

3:



2. Approaches to prevention and treatment

Advances in medicines

By the 1900s, 'cure-all' pills were being replaced by effective medicines for use in the home and by doctors. Developments in science enabled scientists to identify the exact chemical in willow bark that was beneficial for pain relief. This was then manufactured in huge quantities as **aspirin.**

Pharmaceutical companies became worldwide businesses. These companies were successful through investing in research and development (including employing scientists) to look for better remedies; using improved scientific techniques and equipment to identify the precise chemicals that work as medicines; using industrial technology to make huge quantities of each remedy and using commercial skills to market them worldwide; using experiments and experience to find out the exact dosages needed by patients.

'Magic Bullets' – the development of sulphonamide drugs:

In 1909 Paul **Ehrlich** developed the first chemical drug that killed bacteria inside the body (**Salvarsan 606**). He called this a 'magic bullet' because it found and destroyed the bacteria that caused syphilis. Gerhard Domagk tried out a chemical mix called **Prontosil** on mice and discovered that it killed the bacteria that caused blood poisoning. Domagk tried it on his daughter when she developed blood poisoning and she survived – she was the first human cured by a chemical cure. Scientists discovered that the important chemical in both Salvarsan 606 and Prontosil was **sulphonamide**. Drug companies then developed sulphonamide cures for diseases such as pneumonia and scarlet fever.

The development of antibiotics (destroys bacteria in the body):

War played a crucial part in the development of penicillin (as you will find out later in this booklet). However, when WWII in 1945 there was still a great deal to do to make antibiotics available for the whole population. This took place because of:

- Investment in the discovery and development of other antibiotics by pharmaceutical companies
- Scientific techniques and equipment were improved to develop antibiotics
- After 1948 the government- funded NHS provided antibiotics for free
- Scientists and doctors communicated their research so they could learn from each other.

Task: Use this information to complete the table.

Key word	Explanation
aspirin	
Salvarsan 606	
Prontosil	
Antibiotics	

The NHS: Improved access to care

Two events led to the development of the NHS:

- In 1928 all adults over 21 were able to vote. The development of real democracy increased demands from working people for the government to make changes to improve health care.
- A crucial change in attitudes came in World War Two (1939-45) as the feeling of togetherness built the belief that everyone should have good health care. Also, people wanted a better future after the sacrifices of war and middle-class families in the countryside had been shocked at the unhealthy and undernourished children who were evacuated to live with them.

Also, during WWII in 1942, William **Beveridge** was asked by the government to write a report on what could be done to improve people's lives. He recommended setting up a National Health Service (NHS) free to everyone and paid for from taxes.

The NHS was launched in 1948 by the government. Its aim was to provide medical care for the entire population of Britain, paid for by weekly payments from wages (National Insurance). The new NHS took over existing hospitals and GP surgeries.

The NHS aimed to provide the same level of care for everyone, no matter how rich or poor they were. Workers who earned under a certain amount could still get medical care through the 1911 National Insurance Act.

At first, hospitals and GP surgeries did not change much by the launch of the NHS, as there was not a lot of money after WWII to spend on medical care. Therefore, access had improved because the NHS was available to all, however the quality of provision has not improved in the short term.

During the 1960s, however, the government implemented changes to improve the NHS. Plans were made to ensure that hospitals were evenly spread across the whole country. In 1966, a GP's charter was introduced, which encouraged GPs to work in group practices and gave them incentives to keep up with medical developments. The government had to manage the NHS rather than just fund it. This led to improvements in the standard of care.

High-tech medical and surgical treatments in hospitals

Hospital treatments have changed a lot since 1900. Treatments that we consider routine today, like hip replacements and blood transfusions, did not exist before 1900. Once the 3 major problems of surgery – pain, blood loss and infection – had been solved, doctors were able to carry out more daring and intrusive surgeries than ever before. The development of new machinery to treat the body and even replace parts of it also improved treatment in hospitals.

	New technology	Treatment made possible
Medical treatments	Advanced x-rays	Doctors can now also use x-rays to target and shrink tumours growing inside the body, using a treatment known as **radiotherapy**. Combined with chemotherapy, this is an effective treatment for many types of cancer.
	Smaller, cheaper machines	Processes like **dialysis**, where the blood of patients with kidney failure is 'washed' by a machine, and **heart bypasses**, where a machine performs the functions of the heart, have become more widely available as machines have become smaller and more portable.
	Robotics	Better **prosthetic limbs** are now produced. This is partly in response to the number of soldiers surviving bomb attacks in recent wars in Iraq and Afghanistan.
Surgical treatments	Microsurgery	The first successful kidney transplant was performed between identical twins in the USA in 1956. This paved the way for transplants of other organs, including lungs (from 1963), and livers and hearts (from 1967). These were made possible by improved surgical techniques, including the use of microsurgery to reattach tiny nerve endings and blood vessels.
	Laparoscopic (keyhole) surgery	Using tiny cameras and narrow surgical instruments, surgeons can now operate inside the body through tiny incisions some distance away from the area to be operated on. This allows for quicker healing and less trauma to the body.
	Robotic surgery	Surgeons can now use computers to control instruments inside the body, allowing for more precise surgery with smaller cuts. Operations can be performed on a tiny scale where precision is of vital importance – for example, in brain surgery.

Task: Highlight / underline the key information on the NHS and high-tech treatments. Create a revision resource of your choice here on the key points:

New approaches to prevention: mass vaccinations

Vaccinations and public health reforms put an end to the devastating epidemics of smallpox and cholera, but scientists needed more time to find vaccines for other diseases. The table shows how long it took for vaccines to be developed.

1896	1906	1913	1927	1952	1954	1964	1988	2008	2015
Typhoid	TB	Diptheria	Tetanus	Whooping cough	Polio	Measles	MMR	HPV	Meningitis B

The government now took more responsibility for public health and what its citizens wanted. The laissez-faire (let it be) attitude was now behind them due to:

- Increased understanding of the cause of disease
- Increased understanding of methods of prevention, including compulsory vaccinations, passing laws to provide a healthy environment (such as the Clean Air Acts of 1956 and 1968 to prevent smog and pollution) and communicating health risk.

Government vaccination campaigns KEY DATES:

1942: the first national vaccination campaign against diphtheria. This was started during WWII due to fears that cramped conditions during air raids would lead to an epidemic.

1956: Jonas Salk develops a polio vaccination, then a more effective vaccination in 1962. The number of infections dropped rapidly (last case in the UK 1984).

New approaches to prevention: government lifestyle campaigns

Advertising campaigns warn against dangers to health such as smoking, binge drinking, drug use and unprotected sex.	Stoptober event: encourages people to stop smoking for a month.	Change4Life campaign encourages a healthy lifestyle. 

Task: Explain why there was rapid progress in disease prevention after 1900.

3. Case studies

Fleming, Florey and Chain's development of penicillin

One crucial change has been the development of **antibiotics**, at first described as 'magic drugs'. They saved so many lives by **stopping infection**. Read the stages of the discovery of the first antibiotic, penicillin, below:

Stage 1: Fleming's discovery of penicillin (1928)	Many soldiers in WWI (1914-18) died from infected wounds. Chemical antiseptics were used to kill many infections, but they did not heal infections caused by strepcocci and staphylocci bacteria, and those soldiers died. Alexander **Fleming** was sent to France to study these wounds and then, back in England, he worked on finding a way to deal with these bacteria. He went on holiday and left a pile of petri dishes containing bacteria on his bench. When he returned, he noticed mould on one of them. Around the mould (see the image), the staphylococci bacteria had disappeared. He then experimented with this penicillin mould on living cells, discovering that it killed bacteria without harming the cells. He used it to treat a colleague's eye infection. However, it took a long time to create enough penicillin to use. In 1929 he wrote about penicillin in a medical journal but nobody thought his article was important. He had no evidence of it being useful. 
Stage 2: Florey and Chain's research and trials (1938)	In 1938 Howard Florey and Ernst Chain were researching how germs could be killed and read Fleming's article on penicillin. They realised that it could be very effective and they got £25 funding from the government. Instead Florey asked for money from America and got enough for 5 years' research. They discovered that penicillin helped mice to recover from infections, but that they needed a lot of it to treat a person. They tried to grow it themselves. In 1941 they tested it on Albert Alexander, a policeman who had septicaemia. He was dying. The penicillin worked and Alexander began to recover, however they ran out of penicillin after 5 days and then he died.
Stage 3: Wartime need for penicillin (1941)	In 1941 American joined WWII and the US government realised the potential of penicillin for treating wounded soldiers when Florey approached them with this. They gave interest-free loans to US companies to buy the equipment needed to make it. Soon British firms were also mass-producing penicillin. Over 2.3 million doses were made – enough to treat the allied wounded on D-Day.
Stage 4: After the war	After the war penicillin began to be manufactured and used by everyone, not just the army.

Task: Highlight / underline the key information on the development of penicillin. Create a revision resource of your choice here on the key points:

The fight against lung cancer in the 21st century

Task: Use the information below to complete the tasks on P.17.

Diagnosing lung cancer:

Before advanced technology	Advanced technology
• Usually diagnosed using an **X-Ray** machine, but often cancer could be mistaken for something less threatening.	• **CT scan** (creates a more detailed picture of the inside of the body) • **PET-CT scan** (if the cancer does not look very advanced) uses a radioactive dye to identify cancerous cells. • **Bronchoscopy** (if the cancer looks more advanced) a tool that is passed in to the patient's lungs, where is collects a sample of cells for testing.

Science and technology in lung cancer treatment:

Transplants *– it is possible to replace a cancerous lung with a transplant from a healthy donor.*

Radiotherapy *– concentrated waves of radiation are aimed at the tumour to try and shrink it.*

Chemotherapy *– patients are injected with many different drugs, which either shrink the tumour before surgery, prevent the cancer from reoccurring or provide relief from the symptoms of cancer.*

Genetic research *– it is not yet possible to use genetics to treat lung cancer, however scientists have been studying genes of lung cancer sufferers to help doctors prescribe more effective treatments.*

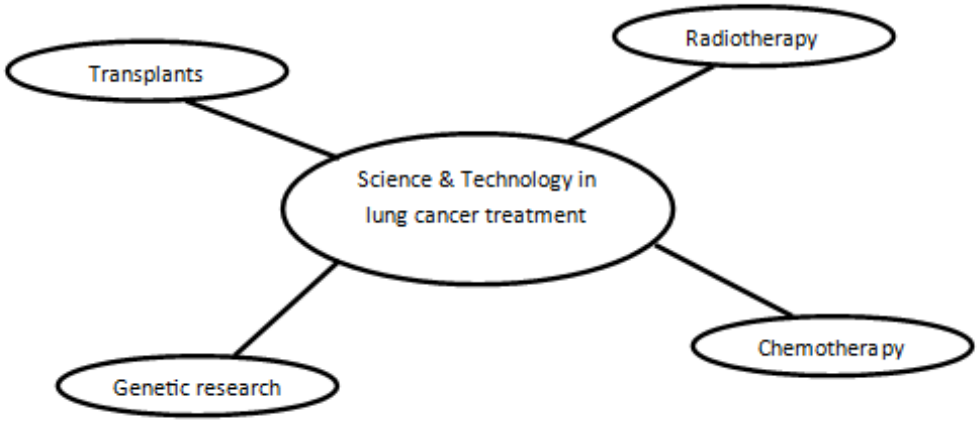
Prevention – the British government take action:

Changing behaviour The government passes laws to **force** people to change behaviour that damages their health.	**Influencing behaviour** The government controls communication to **influence** people to change behaviour that damages health.
In 2007, the government **banned smoking in all workplaces**. People were no longer allowed to smoke in pubs, cafés, restaurants or offices. In 2015, the **ban was extended to cars** carrying children under the age of 18. There is significant evidence to suggest that second-hand smoke has a negative impact on health, particularly among children. Although many still argue that a smoking ban is an attack on personal choice, others argue that it is not the choice of the child to be exposed to the smoke. Therefore, the government stepped in to protect their health.	The **ban on tobacco advertising** began with a ban on cigarette television advertising in 1965. Over time, the rules governing how and where cigarettes could be advertised were extended, until the government banned cigarette advertising entirely in 2005. This included the sponsorship of major sporting events in the UK, such as the Grand Prix.
In 2007, the government **raised the legal age for buying tobacco** from 16 to 18. They did this to try to reduce the number of teenagers who smoke.	The government has produced many **campaigns to advertise the dangers of smoking** over the past decades. These have included highlighting the impact of pregnant women smoking, the number of chemicals included in cigarette smoke and statistics about the health impacts and the diseases caused by regular use. Education to discourage young people from smoking is now included in schools.
Increased taxation on tobacco products was introduced to encourage people to stop smoking.	Government research in 2012 suggested that it is important to discourage young people from smoking. Now, all cigarette products in shops must be **removed from display**.

Case Study: Lung Cancer in the 20th Century

Task One—Technology used in diagnosis today:

Task Two—



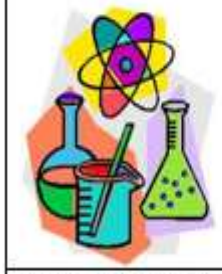
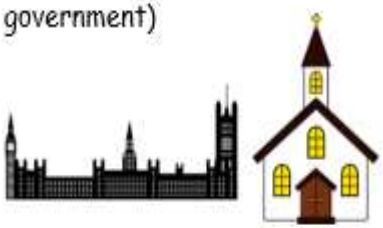
Task Three— Government action to combat lung cancer

Encouraging smokers to quit

Preventing people from starting smoking

Protecting non-smokers from the dangers of second-hand smoke

Task Four— How has government action developed since the cholera epidemics?

FACTORS LOG	How did it help the development of medicine?	How did it hinder the development of medicine?
Individuals 		
Science and technology 		
Institutions (Church and government) 		
Attitudes in society 		

Individuals log

Key individual:	How did they develop medicine?
Watson and Crick	
Franklin	
Ehrlich	
Domagk	
Beveridge	
Salk	
Fleming	
Florey and Chain	