Medicine,
Surgery and public health through time workbook

- This workbook has most of the information you need for the medicine exam.
- It also has tasks that you are required to complete on a weekly basis (5 tasks= 5 weeks)
- You will need to bring this book to every lesson to prove you have completed the tasks
- You will be able to use this booklet for revision for the exam but do not rely completely on it

1. Overview of information chart
2. Revision notes - time periods in more detail
3. Key individuals
4. Factors
5. Tasks 1-5
<table>
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<tr>
<th>Period dates</th>
<th>Causes of illness</th>
<th>Treatments</th>
<th>Who treated the sick</th>
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<tbody>
<tr>
<td>10,000 BC</td>
<td>Natural Accidents</td>
<td>Natural remedies</td>
<td>Mothers</td>
<td>Surgery-Trepanning or Trephining to release evil spirits</td>
<td>Prehistoric man tended to toilet away from their camp and bury it so that enemies could not use it to send evil spirits to them</td>
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<td></td>
<td>Wounds and colds</td>
<td>Steam to help chest pain</td>
<td>Or witch doctor – these were important members of the community, sometimes dressed as an animal to ward off evil spirits</td>
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<td></td>
<td>Evil spirits set to harm you by an enemy</td>
<td>Prayers, chants and amulets</td>
<td>Medicine man</td>
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<td>Egyptians</td>
<td>Gods and evil spirits cause epidemics</td>
<td>*Natural and herbal remedies - honey for infections, Malachite (which came from North Africa) used around eyes and make-up but helps infections</td>
<td>Priests/Physicians/Doctors</td>
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<td>3,000 BC - 322 BC</td>
<td>Sekhmet- Goddess of war and plagues</td>
<td>*Prayers and chants</td>
<td>Isis – God of healing</td>
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<td></td>
<td>Blocked Channels</td>
<td>*Purging</td>
<td>Daau- God of the eye</td>
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<td></td>
<td>Undigested food caused blockages and eth gas from rotting food made people sick</td>
<td>*Doctors often recorded symptoms and how they treated patients</td>
<td>Taweret-Goddess of childbirth</td>
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<td>People sick</td>
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<td></td>
<td>Individuals were responsible for keeping themselves clean. Due to location and religion everyone tended to was regularly and keep their homes clean.</td>
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<td>Toilets were wooden stools above a cup of sand- toilets had to be emptied by hand</td>
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<td>Era</td>
<td>Major Events</td>
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<td>Ancient Greece (776BC - 146BC)</td>
<td>Hippocrates refused to believe the Gods cause disease. Hippocrates promoted the ideas of observation, recording and comparing of symptoms before treating. Treatments were natural, the balancing of the four humours or letting the illness run its cause. Doctors stressed the importance of a healthy diet and exercise.</td>
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<td>Patients believed they were healed by the god Asclepius and his daughters. In reality they were healed by the priests.</td>
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<td>Ancient Roman (75BC - 476AD)</td>
<td>The four humour theory continued as did the treatments advised by Hippocrates. Galen developed the idea of opposites. Herbal remedies were still used by doctors, many contained honey and garlic which would have helped to kill infections.</td>
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<td>Trained doctors/Galens</td>
<td>Galen made huge advances in anatomy. Famous for his public dissection of a live pig to show how the nerves and therefore the brain controlled the body not the heart.</td>
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<td>Galen - primarily a surgeon learned a lot from working with gladiators. He dissected animals in public to prove his point.</td>
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<td>Physicians</td>
<td>The difference between arteries and veins and is discovered by Erasistratus. The importance of the brain and the nervous system discovered by Herophilus.</td>
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<td>The Greeks were in charge of keeping themselves healthy. They understood that exercise was important as was a healthy diet.</td>
<td>Hippocrates - the four humors, the Hippocratic oath, large collection of books on how to treat hundreds of illnesses.</td>
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<td>Medieval Islam</td>
<td>Built on Greek and Roman ideas. Believed illness could be caused by Allah (gvd)</td>
<td>Built on Greek and Roman ideas. Believed that Allah did not create problems that there was no treatment for.</td>
<td>Doctors had to pass medical examinations by AD 931 in order to practice. Hospitals were later developed throughout the Islamic world, with the most famous being those in Damascus and Cairo.</td>
<td>Only performed surgery as a last resort. Invented an anesthetic by soaking a sponge in narcotics and holding this over patients mouth and nose. Externally surgery- tumors and cataracts</td>
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<td>Ibn Sinna Muslim who lived in Spain who wrote a text book covering all aspects of medicine. Al- Razi Wrote over 200 books</td>
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<td>Renaissance</td>
<td>There were no changes to the beliefs about the causes of diseases</td>
<td>Bleeding Purging Herbal remedies</td>
<td>By 1400 there were over 500 hospitals in England organised through the Christian Church. Wise women University trained doctors</td>
<td>Andreas Vesalious proved a number of Galen’s claims wrong. He made detailed drawings of the human bone and muscle structure. Ambroise Pare used ligatures instead of cauterizing arteries (not everyone used followed his example)- a medical practice that is still used today</td>
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<td>16th century</td>
<td>Search for more logical causes</td>
<td>New focus on prevention through inoculation started by Jenner</td>
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<td>Edward Jenner creates vaccination for Smallpox by giving patients the cowpox virus. This meets quite a bit of opposition.</td>
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<td>1800 - 1900</td>
<td>Miasama (bad air) was blamed for the Cholera Epidemic. People infected with cholera suffered muscle crampes, diarrhoea, dehydration and a fever. The patient would most likely be killed by dehydration. Cholera returned regularly throughout the century, with major outbreaks in 1848 and 1854.</td>
<td>Natural, logical and scientific methods, the causes of many diseases were identified quickly: Typhus, Tuberculosis, Cholera, Pneumonia, Dysentery</td>
<td>Trained doctors. Mothers still provide basic care. Reform of nursing women win the right to become doctors. First female doctor is Elizabeth Blackwell. First female doctor in the UK is Elizabeth Garrett-Anderson.</td>
<td>1845 - Horace Wells uses nitrous oxide as an anaesthetic for the first time. 1846 - First successful use of Ether as an anaesthetic in surgery by William Morton. The anaesthetic had some very severe drawbacks. In particular, it made patients cough. 1847 - James Simpson discovers Chloroform. He struggles to get the medical world to accept the drug above Ether. Doctors were wary of how much to give patients. Only 11 weeks after its first use by Simpson, a patient died under chloroform in Newcastle. The patient was only having an in-growing toenail removed (non-life threatening). It took the backing of Queen Victoria when she was given chloroform during childbirth in 1853 for chloroform and Simpson to gain worldwide publicity. 1847 - Ignaz Semmelweiss orders his students to wash their hands before surgery (but only after they had been in the morgue). 1889 - William Halstead introduced the wearing of sterilised rubber gloves and surgical masks to prevent further infection in surgery. 1895 - X-Rays discovered by Wilhelm Röntgen. Though it is an important discovery, it is only WW1 and the treatment of soldiers that propels it into the medical spotlight. 1895 - Marie Curie discovers radioactive elements radium and polonium. She will eventually win two nobel prizes for her work on X-Rays and on Radium.</td>
<td>1848 - First Public Health Act in Britain. It allowed local authorities to make improvements if they wanted to &amp; if ratepayers gave them their support. It enabled local authorities to borrow money to pay for the improvements. It was largely ineffective as it was not made compulsory for Councils to enforce it. This was an element of the “Laissez-Faire” style of government. 1875 - Second Public Health Act – now made compulsory. Major requirement is that sewers must be moved away from housing and that houses must be a certain distance apart.</td>
<td>Edwin Chadwick reports on the state of health of the people in cities, towns and villages to the Poor Law Commission. He highlights the differences in life expectancy caused by living and working conditions. He proposes that simple changes could extend the lives of the working class by an average of 13 years. 1854 - Crimean War – Florence Nightingale and Mary Seacole contribute to the improvements in Hospitals. Florence Nightingale wrote two books that would have a worldwide influence, Notes on Nursing and Notes on Hospitals. John Snow proves the link between the cholera epidemic and the water pump in Broad Street, London. 1861 - Germ Theory developed by Louis Pasteur whilst he was working on a method to keep beer and wine fresh – changed the whole understanding of how illnesses are caused. 1867 - Joseph Lister begins using Carbolic Spray during surgery to fight infection. It reduces the casualty rate of his operations from 45.7% of deaths to just 15.0 % dying. Initially he received a lot of opposition as the spray was an irritant to the surgeons’ skin. Based on Lister’s work, surgery progressed towards Aseptic surgery (where there are no germs present during surgery). From 1887, all instrument were steam-sterilised. in 1880 he uses sterilised catgut for internal stitches.</td>
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<td>Year</td>
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<td>1900s</td>
<td>1905 - Paul Ehrlich discovers first “magic bullet” – Salvarsan 606 to treat Syphilis. The problem was it was based on arsenic and so could kill the patient too easily.</td>
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<td>1928 - Alexander Fleming – discovers Penicillin. The mould had grown on a petri dish that was accidentally left out. Fleming writes articles about the properties of Penicillin, but was unable to properly develop the mould into a drug.</td>
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<td>1901- Karl Landsteiner discovers that there are different blood groups - this leads to the first 100% successful blood transfusions.</td>
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<td>1916- Sodium citrate was added to blood to prevent it clotting. This meant that blood could now be stored for several weeks before being used.</td>
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<td>1930s - Archie McIndoe begins using skin grafts to reconstruct faces and hands in WW2. He carried out more than 4000 operations on burns cases. This results in the Guinea Pig Club being set up to help all those who he had treated.</td>
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<td>1950 - The first open-heart surgery is performed to repair a 'hole' in a baby's heart, using hypothermia.</td>
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<td>1906-1914- David Lloyd-George puts his Liberal Reforms into action. These were based on investigations by Seebohm Rowntree and Charles Booth that highlighted the state of poverty and its impact upon people's health.</td>
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<td>1911- National Health Insurance introduced in Britain – this entitled to medical treatment and sick pay. It worked by regular payments from: Government – 2d per week</td>
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<td>Employers – 3d per week</td>
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<td>Workers – 4d per week</td>
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<td>1942 - William Beveridge publishes the Beveridge Report. The report was the blueprint for the NHS and brought in the process of everyone working paying National Insurance.</td>
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<td>1946- National Health Service Act – provides for a free and comprehensive health service.</td>
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<td>1948 - First day of the NHS.</td>
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<td>1937-45 Florey &amp; Chain work on producing penicillin as a drug. Their success will make the drug the second most funded project by the USA in WW2. They fund it to the tune of $80 million and every soldier landing on D-Day in 1944 has Penicillin as part of his medical kit. (Over 2.3 million doses)</td>
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<td>1952- Francis Crick and James Watson discover the structure of DNA. They proved that it was present in every human cell and showed how it passed on information from parents to children.</td>
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Revision Notes – time periods in more detail

**Prehistoric Times: Before 3000BC:**

- They did not write, so much of our knowledge about their way of life comes from **cave paintings and archaeology**. We also study similar modern day tribes, such as the **Aborigines** to see how they lived.
- Prehistoric people were **nomads** – they had temporary shelters and travelled in search of food and followed animals to survive.
- The tools they used were simple and made from bone or flint.
- **Trephining** was commonly used by the **medicine man** to treat people. The belief was that it allowed the evil spirits to be released. Some skulls have been found with the holes rounded – this shows that they must have survived as the bone was growing back. There are pictures of hands with only three fingers painted on cave walls. They must have been able to do simple amputations.
- Ideas about the causes of disease were based on **superstition** and the **supernatural**, but they used some practical treatments. E.g. putting a broken arm in a clay cast to set the bone and burns were treated with sap from a tree.

**Ancient Egypt: 3000BC - 400BC:**

- They were NOT nomadic, but had settled into civilised societies and farmed on the edges of the **River Nile**. This gave them time to develop their knowledge of medicine and they learnt how to make bronze tools, which helped surgery.
  - They thought the cause of illness was like the Nile flooding because its **42 blood channels** became blocked. The body became ill if **undigested food** blocked the channels. To treat it you had to unblock the channels by taking laxatives, vomiting or having blood sucked out by leeches. They believed that illness was caused by blocking the blood channels in your body.
  - They also **traded** which meant they gained and shared their knowledge with other countries. They were the first people to **write**, so their knowledge could be passed on to future generations.
  - Most of their life was based on religion so most of their medical beliefs were too. With many people to organise and a large empire to control, a powerful government was needed. The **pharaoh** had absolute control and was worshipped as a God. Evil spirits entering the body caused illness. To cure this, the evil spirit had to be driven away. Evil spirits could be kept away by worshipping animals or wearing charms e.g.
- They were very religious and believed in many gods and the afterlife, almost everything in the Egyptian's world had something to do with religion.
- Some doctors used herbal cures or drugs, but they didn’t think the drugs brought about a natural cure, they thought they drove out evil spirits. Egyptian surgery was mainly based upon simple procedures such as **repairing a broken nose**. However, due to some of the ingredients they used, some procedures were successful. They commonly used **honey** which has natural anti-bacterial properties.
- The Egyptians could carry out simple operations such as **cutting away tumours**. They wrote about this knowledge on papyrus. The most famous book is the **Papyrus Ebers**. They also learned a lot from **Mummification**, such as the location and function of organs in the body. However, the brain was discarded and the heart was not allowed to be touched.
Ancient Egypt: The Egyptians developed a system of writing which meant that knowledge could be used by later generations. They did pray to the goddess who was thought to cause and cure epidemics and wore scarab brooches to frighten away the evil spirits who caused disease. They must have seen the connection between dirt and disease because both rich and poor washed frequently. Simple toilets and latrines have been found but it seems that the sewage was stored, later dug out and removed.

Did Mummification help or hinder medical progress?

√ In many ways, Mummification was excellent as it allowed them to discover things about the body such as the location of organs. Over time, they could also start to recognize how a person's lifestyle may have affected their health (organs would look different depending on cause of death).

√ We have learned a lot about Egyptians through the Canopic Jars. These were 4 jars that were buried with the person, each containing a vital organ - The liver, intestines (guts), lungs and stomach were each preserved so well that we have been able to analyse their lifestyles.

X Because the heart was needed in the afterlife, it was not allowed to be touched at all. Similarly, the brain was considered to be worthless, so was mashed up and either discarded or fed to cats!

X Because Mummification was a religious ceremony, it was vital that it was completed quickly. Many doctors would have had no time to study the body.

Ancient Greece: 800BC - 400BC

This was the first time that science began to get a stronghold. Some believed in supernatural causes and cures so they built healing temples called Asclepions. Asclepius was the Greek God of healing. At Asclepions the sick would bathe, make a gift to the gods, and rest. They would sleep in a dormitory and be cured by Asclepius' daughters and a snake.
The Temples of Asclepius were often very simple, but could be huge venues. The Asclepion at Epidaurus contained baths, a gymnasium, an athletics stadium and a theatre seating 14,000 people. Patients built up their strength by having regular meals and plenty of rest.

They could carry out simple operations and surgical tools have been found. The Greek city-states were frequently at war, and Greek doctors became experts at practical first aid. They also learned about setting broken and dislocated bones (they could cure a slipped disc by standing on the patient’s back). Overall though, very little surgical progress compared to the Egyptians.

We know that the Greeks picked up many Egyptian ideas. They came to believe that disease had natural causes and could be prevented. They also believed in keeping themselves clean. They tried to eat the correct food for the time of year and to exercise. They did not use water for flushing away sewage.

HIPPOCRATES put forward a natural theory based on the four humours. The body had to be in balance. The Humours were connected to the seasons. It was wrong, but set medical development in the right direction.

Hippocrates also believed in clinical observation. Doctors had to observe their patients, recognise the illness and suggest a cure. He also stated that personal hygiene and exercise could prevent disease.

Diagnosis - Prognosis - Observation - Treatment

ARISTOTLE’S studies led him to suggest that the heart provides the body’s heat and the brain cools it down. Though this was incorrect, it would provide a better understanding of the function of the heart in the body.

A Medical library was built at Alexandria. This would be the centre of all medical knowledge throughout the Ancient World. It housed medical books collected from India, China and Mesopotamia as well as those by Greek doctors and writers. Human dissection was allowed for a time at Alexandria.

The Romans: 500BC - 500AD

The Romans are important because they went much further than any other people in the Ancient World. The Romans wanted clean water and good drainage for people throughout their empire. In other words the Romans were the first people to plan and carry out a programme of public health on a large scale.

The Romans believed it was important to build their settlements - their cities, villas, villages and army forts - in healthy places near good springs, rivers or wells. They built conduits (channels) to provide public fountains for people to use. When the water had to go over hills and valleys the Romans built aqueducts. They were so well built that a number are still standing today.

Besides clean drinking water, the Romans also believed in the importance of personal cleanliness. Wherever the Romans settled, they built public baths.

The Roman interest in public health led to them building latrines. They also used water to flush away the waste products. Rome had huge sewers which emptied into the River Tiber.

The Romans were able to provide organised, could enforce peace, could use slaves as a cheap labour force.
• They built a **huge empire** in Europe. The empire included a wide range of different tribes and races, which usually co-operated with the Romans. This greatly increased trade and therefore the Empire benefited from a much more varied diet and better exchange of medicines.

• **Galen** developed the theory of the Four Humours to now include the use of opposites. Any imbalance in the body caused by a humour expanding and causing illness could be treated with the opposite of the illness to put the humours back in balance. E.g. for a cold you took a hot bath.

• **Galen** also wrote over 350 medical books. His books would still be the foundation of medical knowledge 1400 years later. His books remained influential because his ideas fitted in with the ideas of the Christian Church, which would control education in the Middle Ages. He believed that the body had been created by one god, who had made the body fit perfectly together.

• **Galen** worked with gladiators in Pergamum so gained a good knowledge of our anatomy. His most famous experiment showed the impact of the brain. He cut the vocal chords of a pig that was undergoing surgery. This clearly demonstrated how the **nervous system** takes messages from the brain to the muscles.

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**Medieval Western Europe: 500 - 1500 AD**

• After the collapse of the Roman Empire much of Western Europe no longer had strong government. They were not organised and didn’t see the importance of hygiene. There were many wars and a break down in communication between countries.

• The **Catholic Church** was very powerful and there was return to the belief that God caused and cured disease. Education was often restricted to Monks and natural ideas were not encouraged as they went against God and the Church. Most knowledge from the Greeks and Romans was lost. Some churches and monasteries collected, copied and wrote books about religion, but also about herbs and medicine. They were handwritten, rather than printed, so it was not easy to spread knowledge quickly.

• The **Black Death in 1347-1350** killed more than 25 million people across Europe. There were three types of Plague:

  1. **Bubonic Plague** - this was the most common type of plague. Approximately 90% of plague victims suffered from this type. It was carried on the fleas on rats. About half of all victims died within 7 days of contracting the disease.

  2. **Pneumonic Plague** - this was the most deadly type of plague. It only affected about 5% of the population but nearly 98% of victims died. It was an airborne disease and people died from drowning in their own blood.

  3. **Septicemic Plague** - this was the most rare type of plague. 100% of cases died within 24 hours, and so it was not easily transmitted from one person to another.

• Cures for disease were based around the supernatural. E.g. pray, take a blessed potion, go on a pilgrimage, and flagellate (whip) yourself as a punishment from God. People would pay small fortunes for things like an **abracadabra pendant** that was supposed to prevent you getting the Plague.

• There were some natural cures, e.g. **blood letting**, testing urine and the use of **leeches**. Some doctors also used **astronomy and astrology**.

• Public health conditions grew worse. Rivers were used as dumping grounds for sewage and other waste and also as sources of drinking water. As towns grew in size, the problem became worse. Town governments passed laws against dumping sewage and other waste but could not suggest ways of dealing with the problems.
Military surgeons carried out simple operations on wounded soldiers. Wine and hot cauterising irons were used (these ideas were taken from the Arabs). Wine was used as a cleaning agent (antiseptic). Most surgery was simple and external, such as removing cataracts. Most surgery was carried out by barber-surgeons rather than trained doctors. There was also opposition to surgery, surgeons were called thieves, man killers and cheats. Most surgery was either controlled or limited by the Christian Church. It was considered to be a religious crime (heresy) to question the work of Galen. You could be killed for it!

Medieval Islamic World: 500 – 1500 AD

- The Prophet Muhammad said: "Make use of medical treatment, for Allah has not made a disease without appointing a remedy for it, with the exception of one disease, namely old age." Medicine was readily accepted in Islam, in direct comparison to Christianity where new ideas were often forbidden.
- It was healthier to live in Arab-occupied Europe than in the Christian-ruled areas because the Arabs believed in cleanliness.
- AVICENNA (Ibn Sina) wrote the Canon of Medicine, which contained all known treatments of disease. This encyclopedia was translated into Latin. It became the textbook for medical education in the schools of Europe from the 12th-17th century.
  - RHazes (Al-Razi) noticed the difference between measles and smallpox. He was also an expert surgeon and was the first to use opium for anaesthesia. He also emphasized the importance of psychological factors on health (such as having a positive attitude, avoiding stress, etc.).
  - They were very religious and followed the teachings of Islam. This told them to care for the sick and as a result they built many hospitals. Knowledge from the Romans and Greeks was not lost, doctors studied their books and kept medicine alive. The Crusades (religious wars with the west) meant that many Ancient ideas and new developments were kept mainly within the Islamic world.
- Greek books were translated into Arabic, some Islamic doctors wrote their own books on surgery. Operations were carried out; even the removal of bladder stones, they stopped the flow of blood by using a cauterising iron. Improvement in surgery was limited due to dissection being forbidden due to religious reasons.

The Renaissance: 1500 – 1750

- The word Renaissance means rebirth. Roman and Greek ideas were studied again and improvements were made. The Reformation also occurred, this is when England became Protestant. As a result the Catholic Church had less control over people's lives and dissection was allowed. It also led to people challenging old ideas and asking questions to find out more.
- The 1665 Plague epidemic was the last major one in Britain. During the Great Plague, when bubonic plague came back to London, there was more of an understanding that poor hygiene caused poor health. The Lord Mayor ordered the streets to be cleaned and although it made London a healthier place, it did little to stop the Great Plague spreading. Almost 70,000 people died from Plague in London alone in 1665.
- Inventions such as the printing press helped to spread new ideas across Europe. There was also an improvement in art due to careful observation - artists such as LEONARDO DA VINCI made detailed anatomical drawings. These helped to improve knowledge about the body as they were printed in books. The microscope and telescope were invented and technology inspired men to understand the human body more.
King Charles II was very interested in science and set up the **Royal Society** in 1661, experimentation and new approaches were encouraged.

- However, there was hardly any change; treatments were still based on a mixture of supernatural and the four humours. It was a rebirth of old ideas - ideas from the Greeks and Romans were studied again and some improvements were made, but much of these ideas were wrong in essence. A good example to show that treatments had not progressed is to look at the treatment and subsequent death of King Charles II in 1685. He was treated with laxatives, bloodletting and vomiting.

  - Most progress was made in other areas of medicine, especially anatomy: **ANDREAS VESALIUS** dissected human bodies to help him understand how they worked and commissioned life-like drawings. Galen had dissected animals, but this had led to mistakes.
  
  - Vesalius found that Galen had been wrong about the **human jaw**. Galen wrote that it was made of two bones, whereas Vesalius found only one. He also found that the **septum in the heart** was too thick and had no holes for the blood to flow through, as Galen had said.
  
  - Vesalius published his book "The Fabric of the Human Body". This completely mapped the bones, organs, muscles, etc. of the human body.

- **AMBROISE PARE** developed surgery by challenging old ideas and methods. Pare was forced to use a lotion of **oil of roses, egg yolks and turpentine** when he ran out of oil to treat gunshot wounds on the battlefield. This chance event worked, it caused less pain and healed wounds more quickly. **Silk threads (ligatures)** were used by Pare to tie up arteries rather than stop bleeding by using a cauterising iron. However, ligatures for amputations were not really practical until the invention of the **tourniquet** two centuries later. Also, without antiseptics or knowledge of germs, the silk thread used as ligatures **easily carried bacteria** into the body and caused infection.

  - **WILLIAM HARVEY** demonstrated the function of the heart and how blood flows around the body through veins and arteries. Harvey's discoveries concluded that:
    - the heart works like a pump
    - blood flows in one direction only around the body
    - one-way valves stop the blood going the wrong way
    - blood is re-circulated and not replaced

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**Disease 1750 - modern day**

**The 18th Century**: **EDWARD JENNER** discovered the cure for Small Pox by chance and the first real **vaccination** against disease was introduced. In 1796, he carried out his now famous experiment on **eight-year-old James Phipps**. Jenner inserted pus taken from a **cowpox** pustule and inserted it into an incision on the boy’s arm. He noticed that milkmaids who suffered the mild disease of cowpox never contracted smallpox, one of the greatest killers of the period, particularly among children. Jenner subsequently proved that having been inoculated with cowpox Phipps was immune to smallpox. Jenner was **widely ridiculed**. Critics, especially the clergy, claimed it was repulsive and ungodly to inoculate someone with material from a diseased animal. A satirical cartoon of 1802 showed people who had been vaccinated sprouting cow’s heads. Vaccination saved lives and the idea of injecting people with a disease to prevent them catching the full disease is the foundation of modern vaccinations.
The 19th Century: During this period scientists worked hard to find out more about what caused disease. This was due to the growing rise in epidemics, e.g. cholera. The turning point was in 1861 when Louis Pasteur proved his germ theory of disease - germs in the air caused decay, (It was found by chance whilst he was working on why some wine went bad during production). Before Pasteur, the accepted theory of the cause of disease was called Spontaneous Generation - Germs caused disease and came from anything decaying. Pasteur proved that bacteria could be removed by boiling and then cooling the liquid. This process is now called pasteurisation. Pasteur extended this theory to explain the causes of many diseases - including anthrax, cholera, TB and smallpox. He also found vaccinations for these. He is best known for his work on the development of vaccines for chicken cholera in 1881 and rabies in 1885.

Robert Koch took Pasteur’s work and developed it to identify specific germs that caused disease in humans. Koch and Pasteur were from different countries and were rivals; this spurred them on to further discoveries and encouraged governments to fund their research. Koch and his team developed ways of staining bacteria to improve the bacteria’s visibility under the microscope. From this, he found the germs of two feared diseases - anthrax and Tuberculosis in 1882. He had developed research techniques that others could use throughout the world.

The 20th Century: After 1900, chemical drugs that cured disease were discovered. In 1909 Paul Ehrlich discovered the first magic bullet - a compound of arsenic, which killed the syphilis germ, called Salvarsan 606. This, however, was also very dangerous and unstable. In 1932 the second magic bullet was developed by Gerhardt Domagk. He used a red dye called Prontosil in a last-ditch effort to cure his daughter who was suffering from blood poisoning. Although Prontosil was successful, it did have a rather odd side effect - it turned his daughter red!

Penicillin was discovered by accident by Alexander Fleming in 1928. He had left his Petri dishes unwashed over a two-week holiday and then noticed that a mould growing on the Petri dish was killing the streptococci bacteria on the petri dish. However, he was unable to convert this into a format that could be used in animal trials.

Howard Florey & Ernst Chain found Fleming’s paper on Penicillin in an old journal and sought to take his work further between 1939 and 1945. During the Second World War, Florey and Chain turned their department at Oxford into a penicillin factory. Trials of penicillin were held at the Radcliffe Infirmary in Oxford from 1941 and were successful. However, the British scientists struggled to produce the quantities of penicillin needed to sustain their clinical trials on humans and turned to the United States for help. The US government funded Penicillin to the tune of $80 million and it became the second most funded project in WW2. 1944, mass production would enable 2.3 million units of Penicillin to be available to the soldiers that landed on D-Day. In 1945, Fleming, Florey and Chain were awarded the Nobel Prize for Physiology or Medicine.

In 1953 Francis Crick and James Watson discovered the structure of human DNA and how it is passed on from parents to children. In the 1990s the Human Genome Project, a worldwide project, began working out exactly how each part of human DNA affects the human body. Understanding DNA opens up many possibilities, such as...

- Gene therapy - using genes from healthy people to cure the sick
- Customised drugs - creating drugs to cure one person's particular health problem
- Genetic engineering - allowing parents to ‘design’ their children, including gender and even hair colour
- **Genetic screening** - identifying the illnesses people could suffer from and being able to prevent them.

The **WORLD HEALTH ORGANISATION (WHO)** was set up in 1948 by the United Nations. The WHO's greatest success has been the wiping out of smallpox. They began their campaign in 1967 and by 1980 was able to declare that smallpox had been wiped out across the globe. In 1987, the WHO launched a campaign to fight HIV/AIDS, which destroys the body's immune system. Two-thirds of HIV infections are in sub-Saharan Africa. In Zimbabwe, the adult rate of HIV infection is almost 25% (compared to 0.2% in the United Kingdom).

However, there have also been problems with some drugs:
- Between 1959 and 1962 a new drug called **Thalidomide** was given to women to reduce morning sickness. It had not been properly tested and this led to children being born with deformed limbs.
- 'Superbugs' such as **MRSA** have developed an ability to resist science's efforts to kill them, either with antiseptics or antibiotics. These have particularly been a problem in NHS hospitals.
- **CJD** is a rare and fatal brain disease that appeared in 1996. The most likely explanation for its occurrence was from people eating beef from cattle that had been infected with a disease known as BSE.

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**Surgery 1750 - modern day.**

19th Century: Much surgery was carried out but there were three main problems - patients died because of pain, infection and bleeding.

Pain was overcome by the discovery of anaesthetics. **Nitrous Oxide** (Laughing gas) was discovered in 1799 by **HUMPHREY DAVY**. Although he published a paper on its properties, he failed to notice its medical benefits as an anaesthetic. **HORACE WELLS** first used laughing gas during and operation in 1844 but failed to get it recognised. His former colleague **WILLIAM MORTON** took his idea further with the development of **Ether** as a useable anaesthetic. Many surgeons at that time used Ether, despite it being very dangerous and the fact that it caused many respiratory problems. In 1847 **JAMES SIMPSON** discovered the use of **Chloroform**. Surgeons then became more confident and performed more complex operations, but patients still died of infection. Many people also opposed anaesthetics, they were scared as some patients were allergic and died, also it was against their religious beliefs, especially during child birth.

In 1847, **IGNAZ SEMMELWEIS** noticed that the death rate of mothers was higher in the wards where they were treated by medical students who had come straight from the dissecting room. He decided that students who had just been dissecting mothers who had died from the disease transferred the disease to healthy mothers. Semmelweis made all the medical students **wash their hands** between patients, despite the disagreement of his superior, who did not believe hand-washing had any effect. The mortality rate of mothers dropped from about 18% to 1%. **JOSEPH LISTER** overcame the problem of infection in 1867 by using **carbolic acid** in a spray to kill infection in wounds. Originally this was unpopular due to the mess that carbolic spray created and the time that it took, however once the death rate decreased and Pasteur's germ theory was accepted it became widely used.
During the Crimean War in 1854, two key individuals also helped progress in surgery. FLORENCE NIGHTINGALE concentrated her efforts on cleaning the army hospital at Scutari. She reduced the death rate of wounded soldiers from 40 per cent to only 2 per cent. She became a national heroine and on returning home, she set up her first nursing school. In 1859, she wrote her book ‘Notes on Nursing’, and in 1863 ‘Notes on Hospitals’. Both books were very influential all over the world, providing the basis for training nurses and hospital design. MARY SEACOLE paid her own way so that she could help out in the Crimean War. She set up her ‘British Hotel’ providing food and drinks to the soldiers. She also treated soldiers on the battlefield. After the war, as she returned to Britain, her skills and experience was largely ignored. It is only recently that her work has received the acclaim it deserved.

The end of the 19th century saw the start of the development of aseptic surgery. Koch’s discoveries led to surgical utensils being steam-sterilised and in 1889 WILLIAM HALSTEAD introduced the wearing of sterilised rubber gloves and surgical masks to prevent further infection in surgery. The problem of bloodloss, however, would not be solved until the 20th century.

20th Century: The discovery of blood groups by KARL LANDSTEINER in 1901 meant that transfusions were now possible. Previously, patients that had used transfusions would randomly die on the operating table. This was especially important during the World Wars. In the 1910s it was discovered that by adding anticoagulant and refrigerating the blood it was possible to store it for some days, thus opening the way for blood banks. During WW2 blood banks were set up and these have continued ever since.

WILHELM RÖNTGEN discovered X-rays in 1895 and these became very important in WW1. Surgeons needed to locate bullets and shrapnel lodged deep within wounded men and x-rays were the answer. Radiation therapy followed on from Röntgen’s discovery of x-rays through the work of MARIE CURIE. She and her husband discovered radium, which has been used ever since to diagnose and treat cancers.

In the 1940s, ARCHIE MCINDOE learned how to rebuild surgically the faces of airmen (the ‘Guinea Pig Club’) who had suffered burns in the war. He carried out over 4000 operations on burns cases and pioneered the first plastic surgery. In 2002, nearly 7 million cosmetic surgical procedures were performed in the US alone. In 1950 WILLIAM BIGELOW performed the first open-heart surgery to repair a ‘hole’ in a baby’s heart, using hypothermia. The first organ transplant surgery was done in 1967 by CHRISTIAN BARNARD who transplanted a heart. The patient died after 18 days, but much had been learned and it was still considered to be a resounding success.

The later 20th century saw the increasing use of keyhole surgery, endoscopes, micro-surgery and ultrasound scanning to minimise invasive surgery. It is now possible to make plastic hearts and pace makers.

Public Health 1750 – modern day

Industrial Revolution: As more and more people moved into the towns to work, houses were built as close together as possible. Many of them were damp and overcrowded. There were no planning and building regulations as the government believed in laissez-faire. There was little understanding of the true causes of
Many towns had no sewers and everywhere there were stinking toilets and piles of filth which seeped into rivers from which drinking water was taken. All this encouraged disease, especially among the poor. On top of this, working conditions in the factories were appalling. Workers had long hours, short breaks and could easily fall ill through the work itself, such as swallowing cotton fibres or textile dust.

Tuberculosis, Typhoid (spread by water and food) and Smallpox attacked people already weakened by overcrowding, poor diet and exhaustion. The average life expectancy for a poor person born in Manchester in 1830 was only 19. In 1831 a new disease hit Britain and forced the government to take action - Cholera. It terrified people because it could kill them in a matter of hours. It struck people suddenly and at random, with victims losing 1/2 litre of fluid an hour through diarrhoea and vomiting.

In the 1830s the government asked Edwin Chadwick to look into the links between poverty and bad health. His report, 'The Sanitary Conditions of the Labouring Population of Great Britain', proved the links between poor living conditions and bad health.

Average age of death in 1842:

<table>
<thead>
<tr>
<th></th>
<th>Manchester</th>
<th>Leeds</th>
<th>Liverpool</th>
<th>Rutland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gentlemen and professional people</td>
<td>38</td>
<td>44</td>
<td>35</td>
<td>52</td>
</tr>
<tr>
<td>Tradesmen</td>
<td>20</td>
<td>27</td>
<td>26</td>
<td>41</td>
</tr>
<tr>
<td>Labourers</td>
<td>17</td>
<td>19</td>
<td>15</td>
<td>39</td>
</tr>
</tbody>
</table>

Chadwick's report contained many shocking details of what many people had to face every day. He recommended better quality housing, good sewage systems and fresh water. The cost of this, however, would have to be met by the ratepayers, who could afford to live in much better conditions, and so was fiercely opposed by many of them. From 1837 all births, deaths and marriages had to be registered. William Farr used this information to build an accurate picture of where death rates were highest and what people died of. His work, coupled with Chadwick's report put more pressure on towns and the government to do something about public health.

The result was the Public Health Act of 1848. The 1848 law allowed towns to set up a Local Board of Health but these boards could not force towns to take any action. The Act was not compulsory and only a few local authorities took action. By 1872 only 50 councils in Britain had appointed Medical Officers of Health. The taxpayers in particular did not support this Act:

"The Board of Health has fallen. We prefer to take our chance with cholera than be bullied into health" - The Times, August 1854

In 1854, there was a major cholera outbreak in London. It had devastating outcomes with over 500 fatalities. Nearly all families lost at least one member (regardless of socioeconomic class). By talking to local residents, John Snow identified the source of the outbreak as the public water pump on Broad Street. John Snow had now proved the link between cholera and poor water supply. However, until Pasteur's Germ Theory will be published, many scientists still clung to the 'bad air' theory.
How John Snow proved that the Broad Street Pump was causing the deaths from Cholera.

After Snow had collected his evidence he was allowed to remove the handle of the water pump in Broad Street. It was later discovered that a leaking cess pit containing sewage was only 3ft away from the well and was contaminating the water.

Public Health conditions worsened despite Snow’s work. The summer of 1858 was very hot and as river levels fell, and horrid smells spread across London and into the Houses of Parliament. This was referred to as ‘The Great Stink’. This led to JOSEPH BAZALGETTE designing and building London’s sewer system.

In 1867 working men finally got the right to vote. This now put pressure on the government to do something about public health as it could now affect their popularity and votes. The result was the 1875 Public Health Act. This Act was compulsory rather than optional and so had a much greater impact. All towns were now forced to provide clean water, proper drainage and sewage, and the appointment of a Medical Officer of Health. However, even by the end of the 19th century, public health had not been revolutionised. Infant mortality was actually higher than it was at the end of the 18th century.

In 1889, 46 years after Chadwick’s report, a wealthy businessman called CHARLES BOOTH published his findings of living conditions in the East End of London which still highlighted poor living conditions and ill health. He discovered that 35% of people in the East End were living in poverty - far more than had been claimed. His work was then couple with the work of SEEBOHM ROWNTREE who also investigated living conditions and poverty in York and published his report in 1901. Rowntree had proven that more than a quarter of people in York lived in poverty. Together, their work put huge pressure on the governments to do something about public health once and for all.

The 20th Century: Once the link between conditions and disease had been proven by Pasteur’s germ theory, governments began to take responsibility for housing, hospitals, food quality, pollution, child care etc. It was the beginning of the welfare state. The Liberal Government under the direction of DAVID LLOYD GEORGE that took office in 1906 was determined to improve public health conditions. They introduced a number of important reforms:
The Liberal Reforms:
1902 - Midwives had to be properly trained and registered.
1906 - Free school meals for poor school children.
1907 - All births had to be registered and a health visitor visited each mother to make sure she knew how to protect her baby’s health.
1908 - Government paid Old Age Pensions.
1909 - Back to back houses banned.
1911 - National Health Insurance Act—working men received sickness pay and could see a doctor.
1912 - Clinics held in schools to give children free medical treatment.

After promising ‘Homes fit for Heroes’ for returning soldiers from WW1, Lloyd George created a new Housing Act in 1919 that ensured that councils provided good home for working people to rent. A quarter of a million new homes were built. In the 1930s, many old, unhealthy slum houses were cleared and another 700,000 new houses were built. However, the economic depression of the 1930s meant unemployment rose to over 3 million. This meant that the National Health Insurance Act was failing.

Why was 1900—1939 a time of progress in public health?
• Liberal Government (1906—1914) decided it was time for the government to tackle social evils present in society.
• The laissez-faire attitude of the 19th century became less fashionable as attitudes towards causes of poverty changed.
• New research by Booth & Rowntree highlighted real causes of poverty. (Sickness, low wages, old age & unemployment.)
• War - The nation was shocked to discover 40% of the soldiers fighting in the Boer war suffered from malnutrition.

World War Two had a big impact on people’s attitudes to public health. It was a ‘Total War’, meaning that all parts of society were vital. People were fighting on the home front as well as on the front line, and so the feeling grew that everyone should have access to good health care, not just the wealthy. This led the government to commission up the Beveridge Report in 1942. Sir William Beveridge recommended a free national health service that would be paid for from taxes. Doctors, nurses and other medical workers would become government employees instead of charging the sick privately for treatment. The Beveridge Report was greeted with enthusiasm by many people and over 600,000 copied were sold. However, despite the general enthusiasm, there was powerful opposition, mainly from the doctors themselves.

Why was the NHS introduced in 1948?
• Impact of WW2. The government was aware that medical services had to be adequate to cope with casualties and so increased its involvement.
• The Beveridge Report, 1942 was a best seller, indicating that the public supported the idea that the state had a responsibility to care for its people.
• The election of the Labour Party in 1945. The Conservatives felt that a ‘Welfare State’ would be too costly whereas the Labour Party were prepared to push ahead with social reform.
• The work of Aneurin Bevan - his speeches in parliament won huge support and he also persuaded the doctors to work for the NHS.

1948 - The start of the National Health Service. Treatment is based on the need and not the ability to pay. All people in Britain were provided with medical treatment completely free of charge. Since then however more and more charges have been introduced, this is because new drugs are expensive, average life expectancy has increased and an increased burden is being placed on the service.
The Key Service of the NHS:

The effect of the National Health Service on people's health was dramatic. For the first time ever, everyone had the right to free health care. Before the NHS many could not afford to visit the doctor, let alone buy medicines or have regular treatment. By the end of the 20th century, however, the NHS was facing one financial crisis after another. Prescription charges, introduced in the 1950s, rose steeply. Charges were introduced for dental treatment and eye tests. Unable to pay for the necessary staff, many beds remained empty while the waiting lists grew longer.

Why has the NHS ended up costing so much?
The provision of free health care for all resulted in people being healthier and living much longer. The NHS had many more people to look after, many of them at an age where they needed increasing amounts of treatment, such as cataract operations or hip replacements. Developments in science and technology resulted in a far greater range of treatments being offered, many of which were extremely complex and expensive. Organ transplants, ultrasound scans, open heart surgery and laser treatments are just a few examples of everyday services offered today.
Key individuals

Hippocrates (c.460-377 BC)
- His ideas were followed by Galen.
- He had many followers and a number of medical books were written around his work. These books emphasised.
  - Natural explanations
    Hippocratic doctors looked for natural causes for diseases rather than blaming gods or spirits. They thought that the proportions of the four humours inside each human being affected a person's health. This theory was a turning point because it said that illness was caused by natural factors inside the patient.
  - Clinical Observation
    Hippocratic doctors observed the whole patient, noting all symptoms. They carefully recorded everything that happened and wrote it down. Only then would they diagnose the illness, describe what would happen and perhaps treat it. This is still the core of modern methods of medical treatment.
  - Code of Behaviour
    Doctors had to treat their patients with respect, not take advantage of them. To this day, doctors take the "Hippocratic Oath" to behave properly.

Claudius Galen  120 AD
- He was Greek and trained as a doctor at the Asclepion in Pergamum.
- His medicine was based on the ideas of the Greeks and Romans.
- He carried on the work of Hippocrates by teaching that doctors should study the symptoms of a disease before they treated it.
- He followed Hippocrates’ observation methods and believed in the theory of the four humours. He developed many treatments, based on the theory of opposites.
- Galen stressed the importance of understanding the skeleton and the functions of parts of the body.
- He gained some knowledge of anatomy and physiology from treating wounded gladiators.
- He discovered that the brain controls the body through the nerves and proved his theory by dissecting a pig!
- He realised the need to carry out experiments, but human dissection was not acceptable. He had to base his ideas on the anatomy of animals but this often led to mistakes in his descriptions (e.g. about the jaw bone and heart).
- Galen was very important. He gave lectures and wrote over 60 books, drawing together the ideas of all the great doctors of the ancient world in the 500 years since Hippocrates.
- Galen talked about 'the creator' in his books. This made his work acceptable to both Christian and Islamic cultures as it fitted in with their teachings.
- His theories, even his mistakes, formed the basis of doctors’ training during the Middle Ages and the Renaissance.
Andreas Vesalius 1514—1564 (Anatomy)
- Vesalius became Professor of Anatomy at Padua University in Italy, an important centre for medical training during the Renaissance.
- He said it was vital for doctors to dissect human bodies to find out about the human structure and how it works.
- He published his great book 'The Fabric of the Human Body' in 1543 it showed the human body in greater detail then ever before. He was able to include detailed anatomical drawings.
- He was able to prove that some of Galen's theories were wrong e.g. the heart and the jaw.
- Vesalius is important because
  - He proved Galen had made mistakes; this encouraged others to find out more.
  - He encouraged dissection and careful observation.
  - His work was accurate and printed, therefore available for training doctors.

William Harvey 1578—1657 (Physiology)
- He studied in Italy at the University of Padua where he became interested in anatomy and in particular, the work of Vesalius.
- He experimented and used scientific method, measuring the flow of blood through the heart. Experimenting on humans and animals.
- Harvey discovered that blood circulated around the body in a ‘one-way’ system.
- He proved that the heart was a pump that forced blood around the body through arteries. Veins then returned the blood to the heart where it was recycled.
- In 1628, Harvey published details of his work in his book 'An Anatomical Exercise Concerning the Motion of the Heart and Blood in Animals'.
- Harvey is important because
  - He proved Galen's theory (that blood moved through the heart by passing through walls in the septum and that the body made new blood as its supplies were used up) which had been popular for 1400 years was wrong.
  - He showed the importance of scientific methods, tests and proof.
  - He encouraged others to investigate blood circulation.
- However.....
- His ideas were considered eccentric and his work made little difference to general
Ambroise Pare 1510—1590 (Surgery)
- He trained as a barber surgeon.
- He developed his skills as a surgeon whilst treating soldiers during wars. Usual treatment for gunshot wounds was to chop off damaged limbs and dip the stump in boiling oil. Small wounds were cauterised with a red hot iron.
- In 1536 he ran out of oil and so he treated the gunshot wounds with simple dressings (turpentine, oil of roses and egg yolks) & bandages rather than using boiling oil. This was a chance discovery.
- He also believed God had guided him to use ligatures to stop the bleeding after amputations rather than a red hot cautery iron.
- The practice of using ligatures introduced germs from the surgeon’s hands into the wound and thereby increased the chances of infection (until antiseptics).
- The Paris College of Physicians tried to stop the publication of his texts and never accepted Paré because he was only a barber-surgeon but Paré had the support of the king.

Florence Nightingale (Nursing)
- In 1854 the Crimean War broke out. Florence worked as a nurse in the emergency hospital at Scutari.
- Florence led a party of 38 nurses to clean up the hospital, she cleaned up the wards’ toilets and kitchens. The death rate among the soldiers fell.
- She then spent 3 years advising government on changes to Army hospitals.
- Florence Nightingale used her fame to help her change the face of nursing forever.
- In her book ‘Notes on Nursing’ she explained her methods. This became the standard textbook for future generations of nurses.
- In 1860 she set up the Nightingale School of Nursing in St Thomas’ Hospital, London to train nurses.
- Florence Nightingale brought a new sense of discipline and professionalism to nursing.

Mary Seacole (Nursing)
- She was a black West Indian, who faced racial prejudice. She paid her own way to the Crimea where she worked near the battlefield tending to the sick and wounded.
Edward Jenner (Vaccinations)
- He was a country doctor in Gloucestershire and a member of the Royal Society.
- He was interested in the latest developments in science and knew that experimenting was vital to making progress.
- He had heard rumours that dairy maids with cowpox didn’t catch smallpox. He decided to test to see if one disease prevented the other.
- In 1796 Jenner tested his theory by injecting James Phipps with cowpox and then later with smallpox. James survived and Jenner tested his theory on others, all of whom survived.
- Jenner named this process vaccination and published his results in 1798.
- He was opposed by many doctors; he was an unknown country doctor and he could not explain why his method worked.
- The general public were also worried, they did not understand the process and some of them were terrified of being injected with an animal disease.
- Jenner himself did not fully understand how vaccinations worked, he just proved that it did.
- Jenner is important because
  - The government accepted his idea as they could see his success rate, they funded a vaccination clinic and later made vaccination compulsory.
  - His work laid the foundation for the future. He had begun to combat disease by immunisation. The idea of injecting people with a disease to prevent

Edwin Chadwick (Public Health)
- He believed that improved public health provision and a healthy workforce would save money rather than cost money.
- The report, which described levels of sickness and mortality shocked some of the privileged classes.

James Simpson (Anaesthetics)
- In 1847 he discovered the benefits of chloroform as an anaesthetic.
- His discovery meant that surgeons now had more time to operate, which meant that they could do more complex operations. However the death rate actually increased as mistakes were made, and the risk of infection was still great.
- Anaesthetics was strongly opposed by some doctors, nurses and the public.
Joseph Lister (Antiseptics)

- In 1867 he began to use carbolic acid to kill infections in wounds.
- Sprays were used in operating theatres. These were quite unpopular with some as they were messy and involved extra work, they also made instruments slippery to handle. However as a result of his work death rates from infection began to drop rapidly.
- Lister met opposition to his ideas this was because
  - It takes time for people to accept new ideas.
  - New ideas can mean more work.
  - New ideas can make those who did things the old way look foolish, incompetent or uncaring.

Louis Pasteur (Germ theory)

- Micro-organisms had been seen through microscopes but scientists thought that they were caused by disease and appeared because of illness. This was the theory known as spontaneous generation.
- In 1861 Pasteur published his ‘GERM THEORY’ which stated that living organisms fall from the air and cause decay.
- In 1864 Pasteur devised a series of experiments to prove his germ theory. He proved that the air contains micro-organisms, that microbes are not evenly distributed in the air, that microbes in the air cause decay and that microbes can be killed by heat.
- He showed the importance of testing ideas in a scientific way. A German, Robert Koch built on his work.
- Hearing of Koch’s work Pasteur came out of retirement and from 1887-1881 he began to work on vaccines.
- He discovered a vaccine for chicken cholera & anthrax in animals and a vaccine against rabies that also worked on humans.

Robert Koch

- Koch was a German scientist, influenced by Pasteur’s work. In 1872 he began research into the micro-organisms affecting animals and people.
- He showed that pus from patients’ wounds were caused by germs on the surgeon’s hands. This paved the way for aseptic surgery. The whole operating theatre, equipment, clothes were germ free before the operation started.
- His careful research and observation using the microscope, photography and dyes led to a breakthrough in the fight against two of the deadliest diseases of the late 19th century. In 1882 he identified the bacteria causing tuberculosis (TB). A year later, in 1883, he identified the bacteria causing cholera.
### Alexander Fleming
- In 1928 Fleming discovered a mould called penicillium that killed several different bacteria.
- Fleming realised that this mould could kill germs but he did not have the skill in chemistry to purify the mould.
- He wrote a paper on his findings.
- Between 1939 and 1945 Florey and Chain developed Fleming’s work by producing pure penicillin and getting it mass produced.

### Paul Ehrlich
- In 1899, Ehrlich became interested in antibodies. These were produced naturally by the body to fight specific germs, without harming the rest of the body.
- He called these antibodies ‘magic bullets’, but he discovered they didn’t always work.
- He and his team looked for synthetic chemical ‘magic bullets’ to cure disease.
- At first his success was limited, however he later developed Salvarson 606.
- Salvarson was the first man-made chemical ‘magic bullet’.
- Ehrlich faced a lot of opposition and it was 20 years before a second magic bullet was found.
- However other hi tech drugs did follow.

### Sir William Beveridge
- He was a leading civil servant.
- In 1942 he published a report in which he stated that the government should create a ‘welfare state’, taking charge of social security ‘from the cradle to the grave.’ He argued that all citizens had the right to be free from hunger, disease, ignorance, squalor and idleness. The report was a best seller and influenced the creation of the NHS in 1948.

### Auerien Bevan
- Minister of Health who introduced the National Health Service.
- He was very influential in convincing doctors that the creation of the NHS was a positive step, brokering an agreement with the British Medical Association that led to 90% of doctors getting involved in the NHS when it was introduced.
| **The god Asclepius** | • Greek god of healing  
| | • He had two daughters, Panacea and Hygeia who assisted him with healing  
| | • He was worshiped at special temples called Acsclepions  
| **Avicenna** | • Also known as Ibn Sinna  
| | • Arab doctor, who lived from 980-1037 AD in Spain  
| | • Wrote a million-word textbook covering all aspects of medicine  
| **Paracelsus** | • Born in 1483 in Germany  
| | • Disagreed with Galen over Four Humours and thought disease attacks body from outside  
| | • Devised mineral remedies to help cure disease, e.g. mercury and arsenic  
| **Lady Grace Mildmay** | • Born in England in 1552  
| | • Wealthy and well educated, e.g. read books on surgery and Avicenna  
| | • Influenced by Galen’s ideas as well as those of Paracelus  
| **Richard Wiseman** | • Born in 1622  
| | • Was a surgeon in Dutch and Spanish navies, as well as a doctor to Charles II  
| | • Influenced by work of Galen, but admired Paré’s advice on amputation  
| **Elizabeth Garret** | • Born in 1836  
| | • First woman doctor to qualify in 1865 and founded The New Hospital for Women in London  
| | • In 1876 a law was passed allowing women to enter medical professions  
| **Ignaz Semmelweiss** | • Hungarian doctor born in 1818 who worked in Austria  
| | • Insisted that doctors washed their hands after dissections to reduce cross-contamination with patients  
| | • Called doctors who didn’t wash their hands ‘murderers’  
| **Dr John Snow** | • In 1854 he made the connection between outbreaks of cholera and infected water supply  
| | • Based his work on meticulous studies of Broad Street, London  
| | • Conducted house-to-house interviews and recorded findings on a map  
| **Christian Barnard** | • Pioneered the use of heart transplants in twentieth century  
| | • Used teams of surgeons and doctors sharing their expertise  
| | • New retroviral drugs used to ensure organs were not rejected by the body |
Factors

A factor is something, which contribute to the result of something else. For example the weather is an important factor to consider when planning a picnic. Good weather is more likely to result in a successful picnic.

There are a number of factors influencing the success and development of medicine, surgery and public health.

REMEMBER: Factors can both help and hinder (not help)

Science and technology
- Experiments and investigations e.g. Edwards Jenner’s
- New equipment e.g. the microscope
- Inventions e.g. aqueducts

War
- Fighting can result in more opportunities to practice surgery
- Not needing to fight can provide opportunity to develop new ideas

Chance
- Discoveries made by accident

Religion or spiritual beliefs
- It can help by developing ideas e.g. mummification developed the knowledge of the body
- It can also cause problems, the Christian Church preserved all of Galen’s works but ignore other doctors ideas if they did not fit with the idea there was only one God.

Government
- A strong government can provide stability and allow them time to experiment
- A government may pay for improvements
- They may not be interested in the health of the population

Individuals
- Famous doctors or scientists who make discoveries or improve treatment
The exam is divided into three sections, medicine and treatment, public health and surgery.

**IF YOU MIX THESE UP YOU WILL NOT GET MARKS**

1. Write definition for each of these sections to help remind you of what you need to discuss in them and match the examples to the section. Some may go in more than one section

**Medicine and treatment is about**

**Public health is about**

**Surgery and anatomy is about**

- Roman Baths
- Hippocrates four humor theory
- Theory of opposites
- Galen
- Germ theory
- Public health acts
- Pare ligature
- Vesalius
- Miasma
- Harvey
- NHS
- Trephinning
- Mummification
- Pasteur
- Koch
- Lister
- Simpson
2. Complete the chart - make sure you include as much detail as you can

<table>
<thead>
<tr>
<th>Time period</th>
<th>Natural treatments</th>
<th>Supernatural treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prehistoric</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Egyptian</td>
<td></td>
<td></td>
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<tr>
<td>Ancient Greece</td>
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<tr>
<td>Ancient Rome</td>
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<tr>
<td>Medieval</td>
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<tr>
<td>Renaissance</td>
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<tr>
<td>1700s 18&lt;sup&gt;th&lt;/sup&gt; Century</td>
<td></td>
<td></td>
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<tr>
<td>1800s 19&lt;sup&gt;th&lt;/sup&gt; Century</td>
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</tr>
<tr>
<td>1900s 20&lt;sup&gt;th&lt;/sup&gt; Century</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3. On a separate piece of paper copy out this chart. Complete it for each of the individuals listed in the first column.

<table>
<thead>
<tr>
<th>Individual</th>
<th>What they did</th>
<th>How that changed medicine/public health/surgery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hippocartes</td>
<td></td>
<td></td>
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<tr>
<td>Galen</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vesalius</td>
<td></td>
<td></td>
</tr>
<tr>
<td>William Harvey</td>
<td></td>
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<tr>
<td>Pare</td>
<td></td>
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<tr>
<td>Florence Nightingale</td>
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<tr>
<td>Edward Jenner</td>
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<tr>
<td>Edwin Chadwick</td>
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<tr>
<td>James Simpson</td>
<td></td>
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<tr>
<td>Joseph Lister</td>
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<tr>
<td>Louis Pasteur</td>
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<tr>
<td>Koch</td>
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<tr>
<td>John Snow</td>
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<tr>
<td>Fleming</td>
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<tr>
<td>Ehrlich</td>
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<td></td>
</tr>
<tr>
<td>William Beveridge</td>
<td></td>
<td></td>
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<tr>
<td>Bevan</td>
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</tr>
</tbody>
</table>

4. Either create a mind map that explains in detail how each factor impacted on development for each of the following time periods or write it in subheadings.

- Prehistory
- Ancient Egypt
- Ancient Greece
- Ancient Rome
- Medieval
- Renaissance
- Medieval
- 18th century
- 19th century
- 20th century

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**Government**

The Pharaoh felt that public health was not their responsibility so this hindered its development. The Pharaoh paid to have his own physician to tend his family and court.
5. Using some of these key words will help improve the quality of your answer. Write a definition for them.

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amputation</td>
<td></td>
</tr>
<tr>
<td>Amulet</td>
<td></td>
</tr>
<tr>
<td>Anatomy</td>
<td></td>
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<tr>
<td>Antibiotics</td>
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<tr>
<td>Antiseptics</td>
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<tr>
<td>Arteries</td>
<td></td>
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<tr>
<td>Bacteria</td>
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<tr>
<td>Cauterise</td>
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<tr>
<td>Cesspool/cesspit</td>
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<tr>
<td>Chloroform</td>
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<tr>
<td>Dissection</td>
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<tr>
<td>Embalm</td>
<td></td>
</tr>
<tr>
<td>Faeces</td>
<td></td>
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<tr>
<td>Health authority</td>
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<tr>
<td>Hippocratic oath</td>
<td></td>
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<tr>
<td>Incision</td>
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<tr>
<td>Infection</td>
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<tr>
<td>Inoculation</td>
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<tr>
<td>Leeches</td>
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<tr>
<td>Ligature</td>
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<tr>
<td>Miasma</td>
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<tr>
<td>Papyrus</td>
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<tr>
<td>Physician</td>
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<tr>
<td>Plague</td>
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<tr>
<td>Sterilise</td>
<td></td>
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<tr>
<td>Supernatural</td>
<td></td>
</tr>
<tr>
<td>Transfusion</td>
<td></td>
</tr>
<tr>
<td>Trepanning/ trephining</td>
<td></td>
</tr>
<tr>
<td>Witch Doctor/ Shaman/ medicine man</td>
<td></td>
</tr>
</tbody>
</table>
Causal connective will also help improve your writing these show how different aspects are connected to each other

<table>
<thead>
<tr>
<th>Casual connective</th>
<th>A sentence using it that you may use in the exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>As a result</td>
<td>As a result of Germ theory Koch was able to identify the different types bacteria which case different disease for example anthrax.</td>
</tr>
<tr>
<td>Consequently</td>
<td></td>
</tr>
<tr>
<td>Therefore</td>
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<tr>
<td>Thus</td>
<td></td>
</tr>
<tr>
<td>Following</td>
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<tr>
<td>In order to</td>
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<tr>
<td>However</td>
<td></td>
</tr>
<tr>
<td>Even though</td>
<td></td>
</tr>
</tbody>
</table>

Additive and comparison connective will help you compare and discuss

<table>
<thead>
<tr>
<th>Comparison connective</th>
<th>A sentence using it that you may use in the exam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternatively</td>
<td></td>
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<tr>
<td>On the other hand</td>
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<tr>
<td>However</td>
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<tr>
<td>In addition</td>
<td></td>
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<tr>
<td>Moreover</td>
<td></td>
</tr>
<tr>
<td>In comparison</td>
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</tbody>
</table>

FOR EXAMPLE
Using the phrase for example will help you remember to back up your point
Complete these sentence by adding in the examples.

- Galen made many improvements to the care of patients for example..
- The Romans had a very good public health system for example...
- The first public health act provided a set of regulations for people to follow for example...