

Paper 1 – History of Medicine

Revision Guide



Medicine Through Time

You must know the characteristics of each time period and the contributions of the individuals within those time periods. You need to be able to explain why individuals/inventions caused medicine to improve. You also need to understand the different themes across the time periods that contributed to the development of medicine.

For each time period, there is a detailed version of your class notes, as well as a spider diagram of the main points. To revise content, highlight the main points for the time period (cause of disease, treatments, public health measures, important discoveries etc), find the factors (you could colour them in different colours) and find the examples of improvements in medicine.

Factors:

Chance
Government
Religion
Individuals
War
Science and technology
Communication

Individuals:

Greek – Hippocrates
Roman – Galen
Renaissance – Vesalius, Harvey, Sydenham
18th and 19th century – Jenner, Chadwick, Snow, Bazalgette, Simpson, Lister, Pasteur, Koch, Nightingale, Seacole
20th century – Ehrlich, Domagk, Fleming, Florey, Chain, Beveridge, Bevan

Medieval medicine

The Roman Empire fell in 500AD. After the Romans, the early Medieval period was filled with fighting between tribes and all the Roman public health measures disappeared. Gradually, the Christian church took the place of the Roman government, meaning Galen's ideas were promoted because his work contained ideas on the intelligent design of humans that matched the church. Fighting between tribes also made travelling difficult, so new medical ideas weren't spread around and a lot of the medical books that had been owned were burnt or unable to be read by the people. The situation did improve in the later Middle Ages and wasn't as bad in the Muslim world.

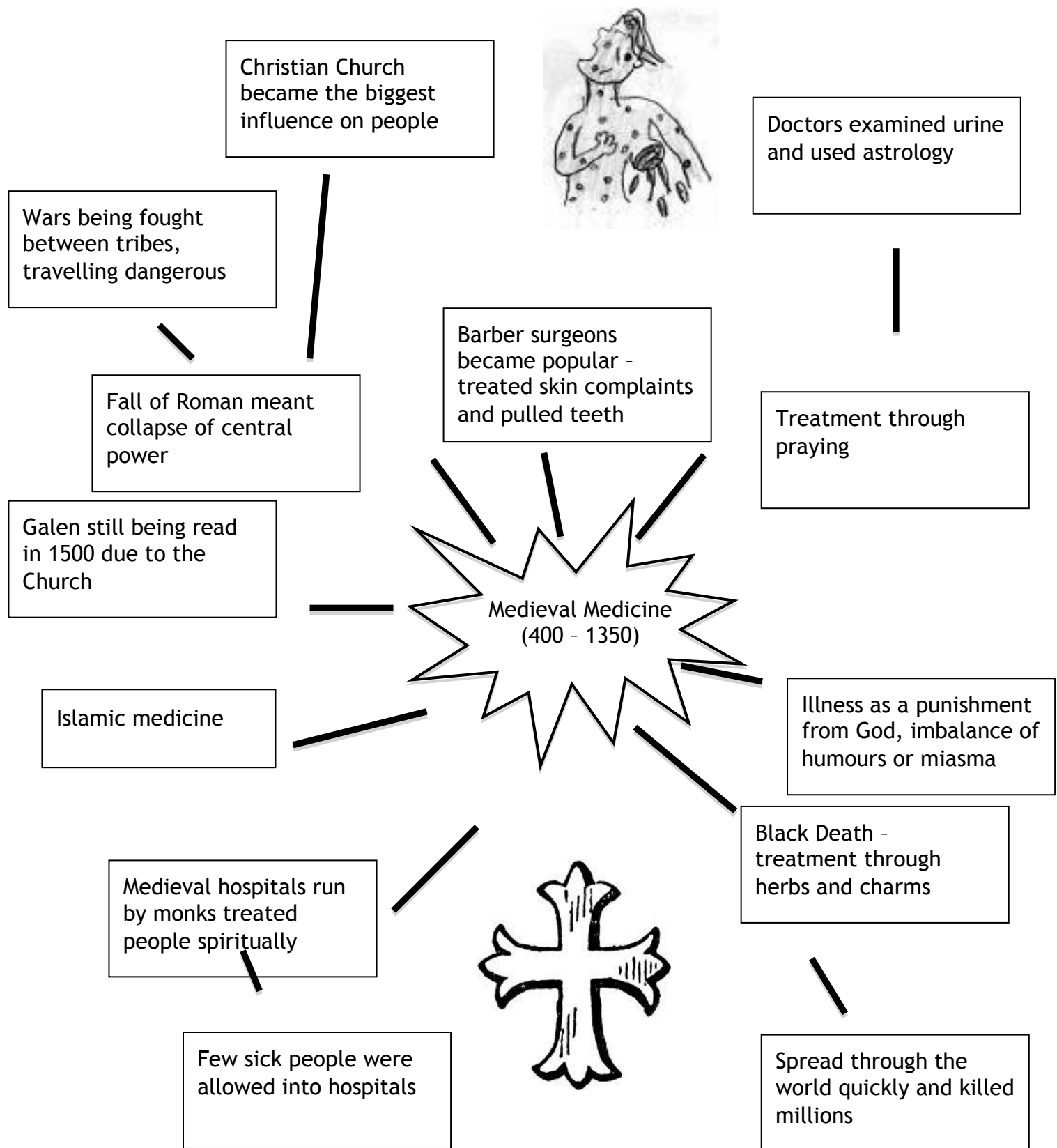
Medieval doctors mostly used herbal remedies to treat people, although they would also investigate the astrology of the patient and consult urine charts. Medieval people believed in miasma – that disease was caused by bad air, and in Galen's Theory of the Opposites and would treat your excess humours.

Barber surgeons became popular in the Middle Ages. They would cut your hair and perform basic operations on your skin or perform bleeding. They were cheaper than educated doctors.

Public health collapsed in Medieval England. The Roman systems were allowed to fall apart and until the later Middle Ages there were no regulations on what could be thrown in the River Thames and where rotten food and sewage should go. This meant butchers threw their waste into the river, sewage flowed down the middle of streets into the river and wells and cesspits were often next to each other. In the later Middle Ages laws were passed that made littering illegal and paid teams of men to clean up the streets.

Medieval hospitals were run by the Christian church and operated in line with Christian teaching. Hospitals weren't used to treat the sick, as they are today, instead they were used to help people such as the elderly and orphans. They encouraged healing through prayer and so hospitals didn't take pregnant women or sick people who might disrupt the prayer the patients were doing. Lepers were treated in leper hospitals outside of the city walls. Almshouses grew up to house the elderly. Monasteries also offered hospital care, with medicines mostly being made with the herbs in the garden of the monastery.

In 1348, the Black Death came to England on ships from China and the continent. It killed between a third and a half of the population of Europe. You could get different types of plague, but bubonic plague where boils (or buboes) appear on your skin, and pneumonic plague where plague attacks your lungs, were the most common. We now know that the plague was brought to England by the Oriental Rat Fleas that lived on the ships and in the clothes of the sailors, but without microscopes or an understanding of germs, Medieval people were desperate. Medieval people came up with theories of their own about what caused the plague, such as earthquakes, deadly fogs and the poisoning of the water by Jews. As doctors didn't know what caused the plague, they also couldn't cure it, but came up with their own treatments such as allowing a frog to suck out the poison from your body. Because England was such a religious country, people called flagellants also travelled around England publically whipping themselves in the hope they would stop the spread of the plague.



Change: hospitals, influence of the Christian Church, astrology

Continuity: religion, herbs, Galen's ideas

Regression after the fall of Rome but it got better as time went on!

Renaissance medicine

The word 'renaissance' means re-birth and the Renaissance period was one of a re-birth of ideas that saw some great leaps forward in medicine. People started to ask questions about the medical treatments and theories they used and started to experiment with new ideas.

The period had lots of new inventions. The printing press allowed medical books to be produced and printed much cheaper and more accurately than if a monk was copying a book out. Artists such as Leonardo Da Vinci drew realistic drawings of the human body and had his drawings accompanied by medical explanations written by anatomists. These all helped medical books to be published and ideas to be passed on.

Vesalius worked on the anatomy of the human body. Human dissection was still banned by the Church so he stole bodies from graves, melted the flesh from the bones and had detailed drawings done of each bone. He showed that Galen was wrong in some of his theories and encouraged other doctors to question what they had been told was the truth, especially upsetting the church.

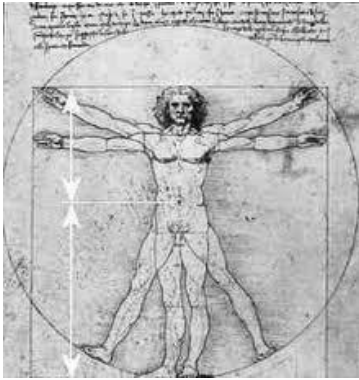
Harvey was an English doctor who made discoveries about blood. He worked out that the heart acted like a pump, that blood flowed in one direction around the body and that the human body contained a fixed amount of blood (it wasn't being constantly burnt up and renewed as Galen had believed). He worked out his ideas by experimenting on both animals and humans. Because microscopes hadn't been invented yet, he was criticised for coming up with the idea that there were tiny blood vessels in the body and so his ideas didn't make much of an impact until later.

These doctors came up with ideas and theories that questioned Galen and pushed medicine forward. They didn't, however, find a way to cure the problems of the average people and the illnesses and diseases they were dying from, so the theories had little impact on the health of the overall population.

The plague returned in 1665, this time called the Great Plague. It probably came from Holland on trade ships and hit London, Sunderland, Newcastle and Southampton. Over 70,000 people in London died, when there were around 400,000 people living there. In London, the Lord Mayor passed orders to deal with the plague such as:

- sealing houses containing the plague, writing a red cross on the door and leaving the door locked for 40 days, even if some people in the house were healthy
- searchers were paid 10 p to decide if a person died from the plague
- funerals were no longer held in daylight and public entertainment was banned
- dogs and cats were killed
- fires were lit in the streets and rubbish cleaned up

The plague died out as the weather became very cold.



Printing press invented causing books to become cheaper and more available

New theories but few actual treatments so not much difference for the poor

Miasma caused disease, influence of the Church was reducing

Vesalius - dismantled the human skeleton and had accurate drawings made

Renaissance Medicine
(1350 - 1750)

Pare - ointment for wounds, ligatures, artificial limbs

Renaissance = rebirth

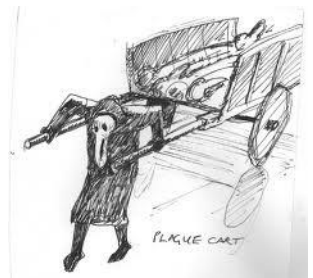
Harvey - blood flow, measures the amount of blood in the body

Rebirth of science, art and medicine

Public health measures to deal with the Great Plague, 1665

Change: new inventions, art, new ideas from individuals

Continuity: miasma



18th and 19th century medicine

NB – there is a lot to remember for the 18th and 19th century so this is a timeline

Surgery in the early 1800s often killed the patients. They suffered from shock as there was no painkiller, they often bled to death and there were no anaesthetics. The biggest problem was infection as they still believed in miasma so there were no medicines to stop blood poisoning, those that survived surgery often died afterwards as the surgeons didn't clean their instruments or wash their hands.

Public health was also a struggle. Because of the Industrial Revolution, lots of people had moved from the countryside into the towns. As the industrial population exploded, housing and working conditions deteriorated, epidemics spread, water carried disease and houses were overcrowded and damp. The government also practiced 'laissez-faire', the belief that they should 'leave alone' the health of the population because it wasn't their responsibility (they thought their responsibility was things like the country's economy and the army).

1796 – Jenner discovers smallpox

Smallpox was very infectious and if it didn't kill you, it would leave scars all over your body from blisters. Before Jenner, inoculation (adding a small amount of pus from a mild case of smallpox to an uninfected person to try to build a resistance to the disease) was used in China and Turkey. An English woman, Lady Mary Wortley Montagu had her children inoculated in Turkey during a smallpox epidemic in 1721 and they survived. She was very influential and so within ten years, the rich in England were having themselves and their children inoculated, but it was very expensive and unpredictable, if the dose was too large the person caught smallpox. Edward Jenner, a country doctor in Gloucestershire had trained with a brilliant surgeon who encouraged his students to push the boundaries. Jenner realised that if you had cowpox, as many milkmaids did, you wouldn't get smallpox. In 1796, Jenner injected James Phipps with cowpox and then six weeks later gave him smallpox, he survived. He did his experiment 23 times before publishing it as 'vaccination' (after the Latin for cow) in 1798. Parliament gave him £30 000 to open a vaccination clinic and in 1852 the British government made vaccination against smallpox compulsory. Jenner couldn't explain why his vaccination worked so it took a long time for people to be able to replicate his ideas with different diseases.

Many people didn't like Jenner's ideas and he was often ridiculed in newspapers. Some people didn't understand Jenner's evidence so didn't trust his experiment, he couldn't explain how a disease from a cow stopped a disease in a person so didn't trust him. Doctors didn't always want to start vaccinating people because they were making so much money out of inoculation. Also, doctors didn't do the vaccinations properly, sometimes mixing up needles and sometimes using infected needles instead. When Jenner submitted his paper to the Royal Society, they rejected it and when government made it compulsory to be vaccinated, people hated it even more. People didn't like

being told what to do by doctors and some refused to have their children vaccinated.

1847 – Simpson discovers chloroform

In 1799 Sir Humphry Davy discovered laughing gas as a way of numbing pain and suggested it could have a medical use. In 1846 in America, ether was used to put patients to sleep and it became popular in England too. But, ether made people cough and vomit whilst in surgery so it was not very practical.

In 1847, James Simpson from the School of Midwifery at Edinburgh University discovered chloroform. He invited some of his colleagues to test out different chemicals and they were all knocked out after sniffing chloroform. He mostly used it when women were in labour, which people didn't like because they believed women were supposed to suffer during childbirth. Chloroform was unpredictable and correct doses were difficult to administer, for example in 1848 Hannah Greener died after inhaling too much chloroform during an operation. Chloroform didn't make surgery safer as with patients unconscious, doctors performed more complex operations that took infection deeper into the body. However, in 1857, Queen Victoria used chloroform during childbirth, helping it to become more widely accepted.

1854 – Florence Nightingale goes to the Crimea

Before Nightingale, hospitals had not been pleasant. Nurses in hospitals were untrained and often paid in gin and the poor who went there were not treated well, whilst the rich went to voluntary hospitals that they paid a subscription to. Nightingale's family were rich and influential and didn't want her to become a nurse. She believed that being a nurse was God's plan for her and she wanted to help the poor. She had trained in Germany and been a nurse in a London hospital for rich women but when war between Britain and Russia was declared in 1854, a member of the government asked Nightingale to go out to Scutari hospital in the Crimea and sort out the appalling conditions in military hospitals. She took 38 nurses with her and took 6 months to clean the hospital. The nurses fed the patients, cleaned the bedding, hired builders to rebuild part of a ward and reduced the death rate from 40% to 2%. To pay for all the changes, she wrote to the government and friends of her family and offered to pay for the work herself. She returned to Britain after 2 years a national hero (The Lady With The Lamp) and gave a report to the government explaining the changes she could make in hospitals in Britain. In 1860, she wrote 'Notes on Nursing' and set up Britain's first training school for nurses at St Thomas' Hospital using the money raised in her name while she had been in the Crimea, making nursing a respected profession. In 1863 she wrote 'Notes on Hospitals' and showed them how to make wards airy and bright to stop miasma.

Mary Seacole also worked in the Crimea. She was Jamaican and went to Britain hoping to go to the Crimea with Florence Nightingale. She didn't get an interview so paid to go out there herself. When there, she set up the British Hotel where soldiers could sleep, be given hot food and looked after. She also went onto the battlefield and treated dying soldiers. Seacole and Nightingale did not get on and Nightingale accused Seacole of running a brothel.

1842 – Edwin Chadwick's report

After a series of cholera epidemics, the Poor Law Commission employed Edwin Chadwick to make a report on the conditions of the workers in towns and the people in the countryside. He questioned thousands of people before releasing 'The Report on the Sanitary Conditions of the Labouring Population of Great Britain'. He believed that miasma was making the workers ill and spreading disease and made some recommendations, such as:

- appointing medical officers
- cleaning the water and improving removal of waste from streets
- improving housing

The government didn't believe this was something they should be involved in and did nothing until 1848 when a new cholera epidemic hit England. They also didn't feel they could ask rich tax payers to pay more money to improve the position of the poor. Under the 1848 Public Health Act, they recommended:

- setting up a Board of Health to improve living and housing conditions
- building houses with drains and toilets

They could improve their towns by borrowing money from the government, rather than making tax payers pay for the improvements. However, this was not compulsory and most towns chose to ignore the suggestions.

1854 – John Snow links cholera to water

In 1831, 1832, 1848 and 1854, cholera epidemics hit overcrowded towns like Liverpool and Leeds. In 1831, it killed 50 000 people. People with cholera turned black just before they died and thousands died in days. Towns cleaned up the streets hoping that it would stop miasma spreading disease, but it didn't work because cholera is spread by water being infected with sewage. John Snow was a doctor working in Soho, London. In the area around Broad Street, over 700 people died of cholera in a few days. Snow researched and discovered that the link between all the victims was the Broad Street water pump. One of the ways he worked this out was through a woman who died of cholera a long way from Broad Street because she was having water delivered to her from the pump because she preferred the taste, another was because the local brewery gave their employees free beer to drink and they all survived. Snow removed the handle from the pump and discovered that a pipe from a toilet was leaking sewage into the water supply, causing cholera. This proved that cholera was not caused by miasma, but by being in contact with people who were ill. The government still didn't act on this information.

1858 – The Great Stink

The summer of 1858 was particularly hot. During the heat wave, the River Thames, which was full of rubbish, dead animals and chemicals from factories and smelt dreadful. The government were meeting on the banks of the Thames at the Houses of

Parliament and asked to be moved because the smell was so bad. This caused the government to act on the advice they had been given by Snow and Chadwick and employed Joseph Bazalgette, an engineer, to build sewers around London. He designed pumps to push the sewage to the sea and Bazalgette was given the equivalent of £1 billion to build the sewers.

The government then went into action improving the lives of the poor in the cities by introducing the 1875 Public Health Act making Chadwick's earlier suggestions compulsory.

This was especially important for the government as working class men had been given the vote in 1867 and the government needed to think of ways to get their support. All these caused the death rate to fall and people's general health to slowly improve.

1861 – Germ Theory discovered

Before Pasteur, scientists had seen germs inside blood from sick people under microscopes. It was believed that the disease caused the germs and the theory was called 'spontaneous generation' because the germs appeared of their own accord when someone was ill. Pasteur, a scientist not a doctor, started to question these ideas. In the 1850s, Pasteur developed Pasteurisation to stop alcohol turning sour. He found a micro-organism that he called a germ and discovered that if you boiled the alcohol the germs would die. He used this method with beer, milk, wine and vinegar. To prove spontaneous generation wrong, Pasteur put identical liquid in two glass containers and boiled them to kill all the germs. He bent the spout of one of the containers so air couldn't reach the liquid, whilst leaving the other open. He used this to prove that germs are only found in places they could reach and that the germs infected the liquid and turned it sour. He published this in 1861 as Germ Theory. In 1865, Pasteur proved that silk worms were killed by a disease caused by a germ in the air, proving that what happened in alcohol also happened in animals. Many doctors struggled to believe that something as small as a germ could harm something as big as a human so the tests stopped there until Koch came along.

1867 – Lister invents carbolic spray

Before doctors accepted Germ Theory, they didn't worry about infection, leaving wounds open and not washing their hands or equipment. Joseph Lister was working at Glasgow Royal Infirmary and thought that germs might be making patients die after operations. He had previously worked at researching infections like gangrene. Carbolic spray had been used to treat sewage and Lister experimented with spraying carbolic spray during surgery. He used a pump spray that soaked everything in the room in antiseptic acid. This started a revolution in cleaning in hospitals. But, carbolic spray wasn't accepted straight away. It cracked surgeons' hands, was expensive and often surgeons tried to copy Lister but were not so systematic with their cleaning so the patient still got an infection and the doctors blamed it on carbolic spray not working. Lister was also not as charming as Pasteur and wouldn't do big showy demonstrations so people didn't find it as easy to accept his ideas.

But, after Koch discovered the germ that caused blood poisoning, aseptic surgery was accepted. From 1887 instruments were steam sterilised and from 1894, rubber gloves began to be used. This made the surgeons more daring and led to an operation to fix a stab wound to the heart in 1896.

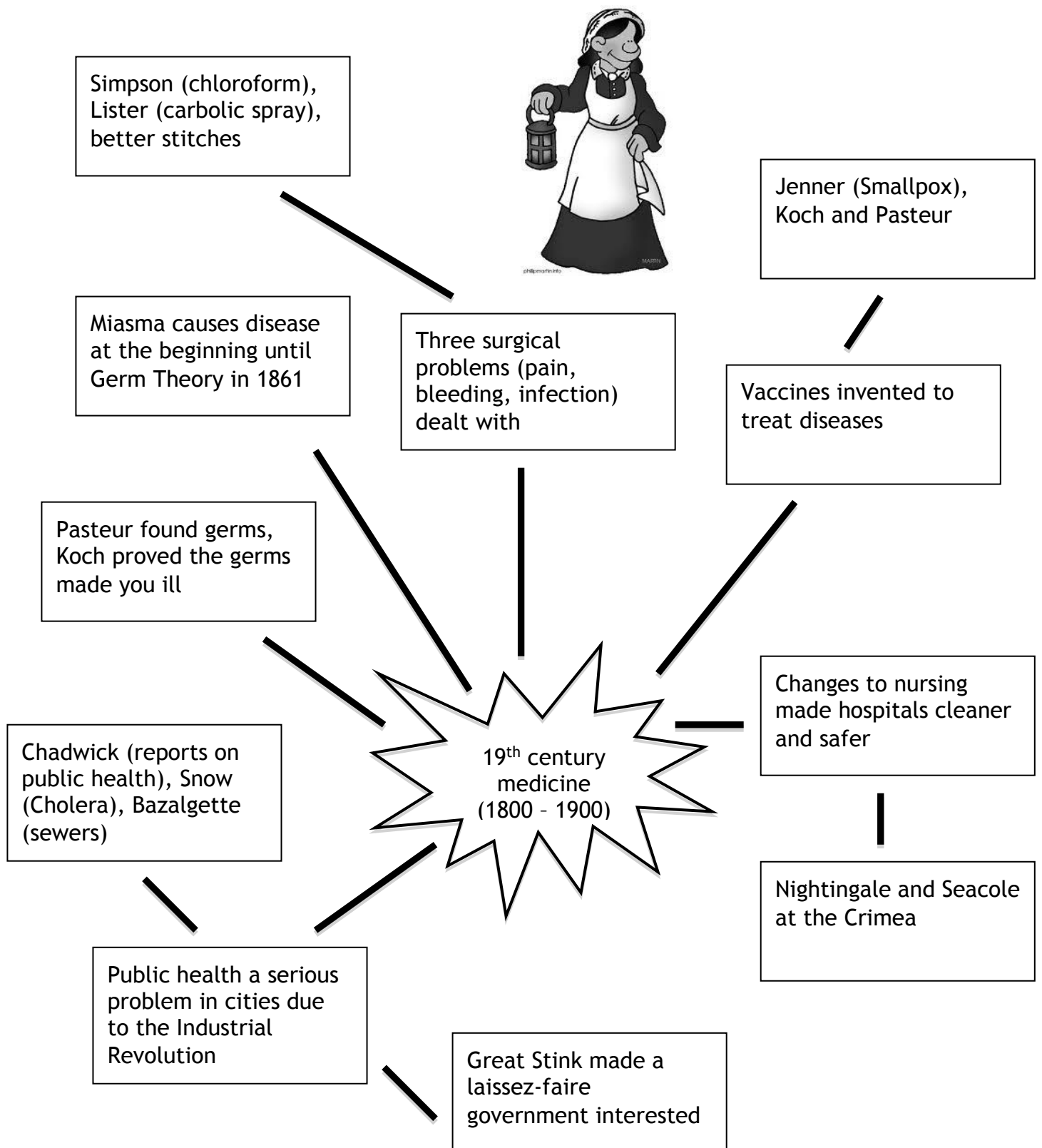
1875 – Koch finds anthrax germs

Robert Koch had been intrigued by Pasteur's work on Germ Theory and so in 1871 his wife bought him a microscope for his birthday. He used this to look at anthrax bacteria from a dead sheep. He found the bacteria, grew it, gave anthrax to a mouse and then proved that diseases could replicate in different mice by repeating the process 20 times. Koch was given a permanent job by the German government and a team of assistants to help him. They then found the bacteria that caused TB, cholera, typhoid and tetanus. Koch also developed a way of staining bacteria purple so you could easily see it.

1879 – Pasteur and chicken cholera

France and Germany were rivals during this period. France had lost the Franco-Prussian war in 1871 and Pasteur had a severe stroke, spurring him to work harder. He got money from the French government and a team of scientists and vets to deal with chicken cholera, a problem for the French farming industry. The team were struggling to make a weakened form of the disease. When Pasteur's team went on holiday, some chicken cholera was left out. Charles Chamberland, one of Pasteur's team, accidentally used this on his return and discovered that exposure to the air had killed the disease and injecting it into the chicken had made it immune. Pasteur named this 'vaccination' in Jenner's memory. Pasteur then moved on to making a weak form of anthrax in 1881. He did a public demonstration to show the vaccine worked. In 1882 he made a rabies vaccine that worked.

The 19th century undoubtedly saw massive improvements in medicine. However, many people couldn't afford to see a doctor, infant mortality was still high and doctors frequently couldn't cure their patients.



Change: Germ Theory, vaccinations, new ideas on surgery, government intervention in public health, foundations of modern medicine

Continuity: Nightingale was sent by God, Chadwick believed in miasma



Medicine in Modern Britain

After Pasteur had discovered Germ Theory in 1861 and Koch and Pasteur had developed vaccines for diseases such as anthrax, the next step was to find drugs to kill the diseases in the body. The first person to attempt this was Paul Ehrlich, a member of Koch's research team. He developed a drug in 1909 called Salvarsan 606, a 'magic bullet' that sought out syphilis (an STI) bacteria and killed it. It was called '606' as it took 606 attempts to find a combination that worked. However, it wasn't always successful, the drug contained cyanide which often killed the patient as well as the germs. This was developed in 1932 by Gerhardt Domagk who invented Prontosil, a red dye that found and killed the bacteria that caused blood poisoning. He discovered this worked after his daughter, Hildegard, was playing with her guinea pig in his laboratory and pricked her finger on a needle. After she developed blood poisoning, he injected her with Prontosil and she survived. These drugs were called sulphonamides because the thing that made them work was a chemical that came from coal tar (something that could only be seen under an electron microscope) and were soon used to attack meningitis, scarlet fever, gonorrhoea and pneumonia. These drugs massively reduced deaths of women in childbirth.

The discovery of sulphonamides and magic bullets led to the development of penicillin. In the 1800s, John Sanderson had discovered that penicillin mould killed everything around it and Lister had used penicillin mould on a nurse's infected wound. Other scientists picked up and dropped research into penicillin until, in 1928, Alexander Fleming from St Mary's Hospital, London, started his research. He was made more determined by watching the suffering of the soldiers in WWI who were affected by the staphylococcus bacteria and often died in pain. Fleming generally worked in a messy laboratory and had left some plates of staphylococcus germs on the side when he went on holiday. When he returned, the germs were dead. Penicillin mould, which was being grown in the laboratory above him, had flown into the window and landed on his petri dish, killing the germs. Fleming made a list of all the germs that penicillin mould would kill and published his findings in 1929. He used the mould as an antiseptic to kill infection in a colleague's eye but didn't take it any further as he didn't have the facilities to carry out the research. He didn't inject it into animals or people.

In the 1930's, Florey and Chain read Fleming's research and three days after WWII broke out, asked the government for money to develop Fleming's idea. However, with WWII starting, the government only gave them £25. With the help of a team of people, they made enough penicillin for tests on mice. They injected them with infections and then penicillin and the mice lived. They needed 3000 times more to test on humans and so turned their lab into a penicillin factory, growing it in milk bottles. In early 1941 they treated Albert Alexander who had got an infection after being scratched by a rose bush. No other drugs had worked on him and he had to have one of his eyes removed. The infection responded to penicillin and Alexander started to recover. However, the penicillin ran out and he died. This confirmed to Florey and Chain that the drug was worth pursuing and in 1941, Florey got funding from America (who were not yet

involved in WWII) to mass-produce penicillin. By 1944, penicillin was being used at D-Day and 15% more wounded soldiers would have died without it. After the war, penicillin was mass-produced for the public to treat infections such as pneumonia, tonsillitis and meningitis.

The Second World War also improved the health of the general public. City children were evacuated into the countryside where their health, diet and hygiene improved and rationing improved people's diet by adding vitamins. In 1940 a national diphtheria campaign vaccinated all children.

Also due to WWII, the NHS was introduced. People had to pay for a visit to a doctor and for their medicine so in 1911, the government had introduced National Health Insurance so workers could get help when they were ill. This was only effective for those who were working however, and women and children still didn't get medical help. In 1942, William Beveridge wrote a report explaining the problems facing people living in Britain. He said there were five 'giants' that needed to be overcome:

- squalor – poor housing should be pulled down, new towns should be built the countryside
- diseases – people who really needed medical help couldn't afford it, so dentists, injections and health care should be free (this would become the NHS)
- ignorance – schools and teachers should be found, children should stay in education until the age of 15 so they are more capable of looking after themselves
- idleness – people needed jobs so new factories would be opened
- want – people weren't able to pay for the things they needed, so family allowance, free schooling and health care were suggested

The Labour Party came to power promising that they would implement Beveridge's suggestions. In 1948, the NHS started. It was initially opposed by doctors who preferred being paid privately and by tax payers who thought it would be too expensive. Bevan, the Minister for Health, promised the doctors a salary and by the time the NHS opened, 90% of doctors were behind the plan. Public health care from 'cradle to the grave' had a massive impact on the health of the people, especially improving the health of women and children.



Magic bullets found the disease and killed it

Housing rebuilt, NHS, pensions, free school meals

Germs caused disease

Welfare state was introduced

Penicillin discovered by Fleming by accident and developed by Florey and Chain

20th century medicine
(1900 - 2000)

Modern war needed better medicine - X-rays, blood transfusions and plastic surgery

Governments paid for it to treat soldiers in WWII

DNA discovered



Change: NHS, welfare state, new inventions, DNA, penicillin

Continuity: Germs

Medicine keywords

Write a definition next to these key words:

Anaesthetic

Antiseptic

Anatomy

Barber surgeon

Cauterise

Germ theory

Hippocratic Oath

Inoculation

Vaccination

Ligature

Laissez Faire

Magic bullet

Miasma

Permissive

Spontaneous Generation

Theory of the Four Humours

Theory of the Opposites