Q6) ‘Individuals had the greatest impact on the development of understanding about the causes of disease in Britain during the 19th century’. How far do you agree with this statement?

You may use the following in your answer:

* Louis Pasteur
* Communication

1. **Decode the question**
2. **List at least 5 OTHER factors that you *could* discuss in this question:**

* *Individuals*

1. **Then code the examples below to support your factors.** Use letters. e.g. I = Individuals

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| --- | --- | --- |
| 1. Pasteur used scientific experiments to prove the link between germs and disease. | 1. The Scientific Revolution c.1700 focused on finding scientific answers to big questions. | 1. Initially the British government did not help to improve understanding of disease. The ignored Koch’s work in 1884. |
| 1. In Germany, one of Koch's assistants showed that weakened diphtheria germs could be used to produce an antitoxin. | 1. Both Pasteur and Koch were equipped with a laboratory and team of scientists, paid for by the government. | 1. Without Pasteur and Koch, it might have taken much longer for theories about germs to develop. |
| 1. Scientists were better able to read the work of their peers. Koch’s discoveries about human diseases followed his reading of Pasteur’s work on animal diseases. Also, Tyndall’s theories in 1870 came as a result of his reading of the work of Lister and Pasteur. | 1. Pasteur was a determined and hardworking chemist. Even when he had a stroke and his daughter died, he continued to work. He was also spurred on by Koch's discovery of the Anthrax germ. This led to Pasteur developing a vaccine for cholera and anthrax. | 1. Overcrowding in industrial cities led to dangerous outbreaks of disease, which horrified the voting public. People became more interested in finding reasons for diseases, and therefore expected their government to intervene! |
| 1. When Pasteur developed a vaccine against the deadly animal disease, anthrax, he demonstrated this vaccine in front of audiences which included politicians, farmers and journalists in 1881. News of his success was sent around Europe by electric telegraph, by scientific articles and at conferences. | 1. The British government acted in making vaccination compulsory in 1852, further enforcing this in 1871 by forcing people to register their vaccinations. Their new willingness to intervene might be linked to the fact that more working class people gained the vote in 1867 and in 1884. | 1. Pasteur created a vaccine for anthrax and chicken cholera, then rabies in 1885, on Joseph Meister, a boy who had been bitten by a rabid dog. Other scientists then created vaccinations for typhoid (1896), TB (1906) and Diphtheria (1913) by copying Pasteur’s methods. |
| 1. The Enlightenment c.1700 meant that people were more interested in looking for rational explanations of disease. | 1. Improved microscopes made these discoveries possible. Clearer images and higher magnification mad it possible to spot microorganisms. | 1. It was by chance that Pasteur investigated cholera in 1865, because his daughter died from it. |
| 1. Teams of researchers working together became more important (often funded by the government). For example, Paul Ehrlich had been on Koch’s original research team during the 1880s and then applied this work to create the Magic Bullet or Salvarsan 606, the first cure for disease, specifically against syphilis. | 1. When Pasteur was developing a vaccine for rabies he worked with Chamberland and Roux. They tested this vaccine out on animals and then humans. Roux, one of Pasteur's assistants showed that the diphtheria germ (a contagious disease of the nose and throat) produced a poison/toxin. The vaccination for diphtheria was created in 1913. | 1. Louis Pasteur discovered that germs caused diseases. He published his theory in 1861 and carried out a series of experiments in 1864 to prove his theory further. This disproved incorrect theories about the causes of disease that had been relied upon by physicians since the Roman era. It disproved ‘spontaneous generation and miasma. |
| 1. Other scientists such as Tyndall and Lister helped to put the pieces of the puzzle together, in order to change attitudes towards Germ Theory. | 1. Koch used chemical dye to identify and stain specific microbes causing individual diseases. For example he identified the microbe for TB in 1882. | 1. Germ Theory offered no practical solution to the problem of disease on a mass scale; governments were therefore reluctant to promote the theory. |
| 1. Attitudes were slow to change and Germ Theory did not become an accepted fact until it was proven in the 1880s by Koch. | 1. Joseph Petri’s petri dish was an important invention that allowed Koch to experiment with dyes and identify bacteria. | 1. Businessmen were keen to find reasons for the causes of diseases, as an unhealthy population could not work. |
| 1. In 1871, rivalry between France and Germany peaked during the Franco-Prussian War, in which France lost. As a result of war, countries became interested in medical research as it was become more common that armies would die from disease, not bullets. Defeating disease could have a big impact on the battlefield, so both Koch and Pasteur received government funding for their work. | 1. In 1879, Pasteur was investigating chicken cholera since it was badly affected the poultry industry in France. One of his assistants, by accident, used an old/weakened sample of the chicken cholera microbe to inject the chickens with. They survived and survived when injected with a strong dose of the microbes. Pasteur, through this accident, was able to show that the weakened microbes built up the chicken's defences against the strong ones. | 1. Koch was a strong minded and rigorous scientist and doctor. Koch extended Pasteur’s work by using dyes to stain different microbes in a petri dish, to identify individual disease microbes. For example, in 1875 Koch found microbes that could be linked to anthrax in sheep. Then, in 1882, he identified the microbe for Tuberculosis, TB. Other scientists could then use his methods to identify other disease microbes, for example cholera in 1883 (Koch beat the French team of scientists), pneumonia in 1886 and meningitis in 1887. |

***Intro, 4 x PEEL and Conclusion***

**Intro - Judgement**: *I agree / disagree that the main reason why …. was…..because without / if ….then ……*

**PEEL 1: The factor in the question**

**Point** *I agree that ……. was important …because….*

**Evidence** *For example / For instance……*

**Explain** *As a result / This led to / meant that / allowed….to….*

**Link** *However, this was not as important as … because* ***without*** */ if….. then….. / This was more important / the main reason why… than…. because* ***without*** */ if….. then…..*

**PEEL 2: Second factor**

**Point** *However….. was also a reason why …….because…..*

**Evidence** *For example / For instance……*

**Explain** *As a result / This led to / meant that / allowed….to….*

**Link** *However, this was not as important as … because* ***without*** */ if….. then…..*

*This was more important / the main reason why… than…. because* ***without*** */ if….. then*

**PEEL 3: Third factor**

**PEE 4: Fourth factor (if time!)**

**Conclusion:**  *In conclusion, I agree / disagree that the most important problem / reason why …. was…..because* ***without / if*** *….then …… This meant that…..*

**Example PEEL:**

*Individuals were important because they developed each others work to identify causes of disease and then vaccinations.*

*For example, Louis Pasteur identified germs as the cause of disease in 1861, which disproved ‘spontaneous generation, miasma and the Theory of the Four Humours. Koch also extended the work of Pasteur by proving his Germ Theory scientifically, identifying the specific microbes causing specific diseases by staining these individually in a petri dish, such as TB in 1882. Pasteur was then able to use the work of Robert Koch and Edward Jenner to create vaccines for multiple diseases. For example, Pasteur created a vaccine for anthrax and chicken cholera, then rabies in 1885, on Joseph Meister, a boy who had been bitten by a rabid dog.*

*The work of these individuals led to significant medical progress in identifying the causes of diseases because, once the real cause of disease was understood, doctors and surgeons could begin to effectively prevent and treat disease. For example, Joseph Lister was able to prove that germs caused infection after surgery and developed the use of carbolic acid to prevent infection.* Without Pasteur and Koch’s work on germs, *antiseptic methods and aseptic conditions could not have been developed, as Lister would not have had the theory to explain why his methods worked. Pasteur’s link between Koch and Jenner’s work also led to further vaccinations being created; he was able to explain how they worked where Jenner had not been able to in 1796. Other scientists created vaccinations for typhoid (1896), TB (1906) and Diphtheria (1913) by copying Pasteur’s methods.*

*Although this is a significant factor, I disagree that it was the main factor. I believe that public attitudes were in fact the most significant factor because without public acceptance of these new theories, they had little impact outside of the scientific community.*

‘Jenner’s vaccination against smallpox was a major breakthrough in the prevention of disease in Britain during the period c1700–c1900.’ How far do you agree? Explain your answer. ***[16 MARKS]***

You may use the following in your answer:

* Cowpox
* Germ Theory

You **must** also use information of your own.

**1.** Read through the evidence below and shade/mark to indicate whether the statements **support or challenge** the statement in the question.

* Supports
* Challenges

|  |  |  |
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| Jenner’s vaccination was the first time a specific disease could be effectively prevented. | By 1802 the Jennerian Society which had been established in London and promoted vaccination and within two years 12,000 people vaccinated. | Jenner was willing to offer free vaccinations so that all groups within society could receive protection from Smallpox. By 1800, 100,000 people had been vaccinated worldwide. |
| Vaccination was soon being used worldwide. By 1803, it was being used in the USA and, in 1805, Napoleon had the whole of the French army vaccinated, ironically while it was fighting a long war against Britain. By 1812, Jenner’s work has been translated into Arabic and Turkish. | The only development in the prevention of disease before Jenner’s vaccination was inoculation; patients could be given a fatally strong dose of smallpox or pass the disease onto others. Also, inoculation was very expensive, often £20 per patient, which meant that the majority of the population were not protected against smallpox. So Jenner’s vaccination was a huge breakthrough. | Pasteur did not publish his germ theory until 1861, so Jenner did not know that bacteria caused disease or exactly how vaccinations worked. Therefore, it was not possible to learn from this discovery how to prevent the spread of other diseases. |
| Many people resisted Jenner’s vaccination because they disliked the idea of using a disease linked to animals or because vaccination was sometimes incorrectly applied and seemed to fail. An anti-vaccine league was formed in 1866. It therefore had limited effect until it was made compulsory and enforced by the government in 1853 and 1871. | Jenner’s vaccination only dealt with one disease, as it depended on the chance link between smallpox and cowpox; even if the link was understood, it could not be replicated for other diseases, such as cholera and typhoid, which were killing thousands in epidemics. | Preventive measures against disease did not change – during the cholera epidemics of the nineteenth century, local authorities ordered barrels of tar to be burned, based on the idea of miasma. |
| Only after the work of Pasteur and Koch in the late nineteenth century could vaccination be understood and others developed. | Jenner’s vaccination succeeded in preventing one of the major killer diseases of the period. In 1980, the World Health Organisation declared that smallpox had been eradicated from the world. | Pasteur’s germ theory linked disease to microbes that were bred by dirt and lived in water supplies. This gave campaigners the scientific argument to force local councils and the government to take action in towns and cities. |

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1. Now read these two example paragraphs. Explain what you think is good and what could be done to improve each paragraph. You may wish to code the paragraph to indicate PEE (optional)

P

E

E

KEY:

**Student 1:**

*To an extent Jenner’s work on smallpox did lead to breakthroughs in the prevention of disease by moving away from inoculation where patients could sometimes be given a fatally strong dose of smallpox or pass the disease onto others. Also, inoculation was very expensive, often £20 per patient, which meant that the majority of the population were not protected against smallpox. However, Jenner’s discovery in 1796 proved that small pox could be vaccinated against. He tested his theory on James Phipps and then 23 others to prove the validity of his results. In 1802 the Jennerian Society was established in London and promoted vaccination, and within two years 12,000 people had been vaccinated. Even Napoleon vaccinated his army in 1805. Eventually the government acted in making vaccination compulsory in 1852, further enforcing this in 1871. Thus smallpox, a once major killer in 19th Century Britain, was no longer such a threat. By 1980, the World Health Organisation declared smallpox non-existent.*

**What is good about this answer**?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**How could this answer be improved**?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Student 2:**

*However, it was not until the work of Louis Pasteur and Robert Koch, that Jenner’s vaccination technique could be applied to other major killer diseases.  In 1861, Pasteur’s germ theory linked disease to microbes that were bred by dirt and lived in water supplies. In 1875 Robert Koch found microbes that could be linked to anthrax in sheep. This was a clear step forward from the work of Edward Jenner and therefore more significant; Jenner had discovered a link between cowpox and smallpox, but had not understood the reasons why this worked.*

**What is good about this answer**?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**How could this answer be improved**?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* 1. **Use the essay plan below to answer this question in your book.**

**Intro:** I partially agree; although Jenner’s vaccine was important in that it was the very first successful vaccine and therefore a major breakthrough in preventing disease, it could only prevent one disease and needed the work of other individuals and interventions to become transferable to other diseases.

**Paragraph 1 topic: FOR**

**P – Jenner’s vaccination was the first time a specific disease could be effectively prevented.**

E – The only development in the prevention of disease before was inoculation - China and Turkey – spread after Lady Mary Wortley Montague had her children inoculated in 1721 - patients could be given a fatally strong dose of smallpox / pass onto others - very expensive, often £20 per patient, which meant that the majority of the population were not protected against smallpox. However, Jenner’s discovery – 1796 (pub 1798) proved could be vaccinated against by testing on James Phipps and then 23 others.

E – As a result - instead of a minority being ineffectively or fatally inoculated, a large numbers were vaccinated -1802 Jennerian Society, London, within two years 12,000 people vaccinated - compulsory vaccination by 1852 (strictly enforced from 1872) – smallpox no longer such a threat.

**Paragraph 2 topic: FOR**

**P – worldwide impact and recognition**

E –1800, 100,000 worldwide; 1803 – USA; 1805, Napoleon - whole of the French army; 1812, translated into Arabic and Turkish; honours from cities and universities; a special medal from Napoleon; ring from the Empress of Russia; letter from Thomas Jefferson, the President of the USA; statues in various cities, including London and Tokyo.

E – Eradicated worldwide. By 1980, the World Health Organisation declared smallpox non-existent.

**Paragraph 3 topic: Against (needed others’ work to explain and replicate technique)**

**P – only dealt with one disease; not until the work of Pasteur and Koch, that technique could be applied to others**

E – depended on the chance link between smallpox and cowpox; he’d noticed by chance that farmers in Gloucestershire did not want to be inoculated because they had had cowpox; but work of others made applicable - 1861 germ theory linked disease to microbes; Robert Koch extended the work of Pasteur, staining microbes with dyes to identify which caused which diseases (1876 anthrax, 1882 TB and typhoid, 1883 cholera....). Pasteur applied to create vaccine for anthrax and chicken cholera, then rabies. Other scientists then created vaccinations for typhoid (1896), TB (1906) and Diphtheria (1913)…..

E – Jenner’s not replicated for other diseases. Only after Kock’s work that Pasteur was able to apply

**Paragraph 4 topic: Against (attitudes did not change; needed gov intervention)**

**P – Many sceptical and reluctant; laissez-faire.**

E – anti-vaccine league 1866; some thought they would turn into a cow; Royal Society even refused to publish his report, so Jenner himself paid for it in 1798

E – It therefore had limited effect and resistance in 185; not effective until it was made compulsory in 1872 and enforced by government.

**Conclusion: Weigh up -** Jenner important as first step *but* needed government intervention to implement and the work of P and K to apply to other diseases; only once the public accepted Germ Theory and the government intervened to make vaccination compulsory would the reluctant public change its attitude.

“The main reason that penicillin was developed in the early 20th century was because of the work of individuals.”   
Do you agree? You may use the following:

* Alexander Fleming
* WWII

You must also use information of your own.

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| 1. In 1928, Alexander Fleming noticed that mould had grown in a petri dish and had killed the staphylococcus germ next to it. This mould was penicillin. | 1. Fleming made his discovery after returning from holiday. He had left the staphylococcus in an open petri dish on his work bench whilst away. | 1. Fleming published his findings in 1929, stating that the mould was an antiseptic. He only tested it on bacteria and not on living organisms. Therefore he had no evidence of it being useful. |
| 1. Florey and Chain built on Flemings work in the 1930s by testing it on 8 mice and later Albert Alexander, to prove it was an antibiotic. They had heard about Flemings work from the article that he’d written in 1929. | 1. Florey and Chain applied to the British government for funding. They received only £25. By 1939 the British government was only interested in WW2. | 1. Unlike magic bullets, penicillin could not be created from chemicals; it had to be grown in a broth and exposed to air. In order to produce large quantities of penicillin, Florey and Chain needed funding, space and technology. 2000 litres were required to treat one case of human infection – this was 3,000 times the amount used on mice. |
| 1. Florey and Chain Florey and Chain turned their university department into a penicillin-producing factory. This was because no British firm could supply the required technology, partly because of the damage caused to factories during the Blitz. | 1. In December 1941, the USA entered the Second World War, and the US government was now willing to fund the mass production of penicillin. They knew that in war many soldiers were likely to die from infection. | 1. Florey went to meet the US government. The government agreed to fund their research for 5 years and to pay 21 pharmaceutical companies to mass-produce penicillin. |
| 1. The US government started to provide interest free loans to those companies willing to buy the expensive equipment required for the mass production of penicillin. | 1. It has been estimated that around 15% of wounded British and American soldiers would have died without being given penicillin to fight their infections during WWII. Thousands of injured soldiers returned to fight much quicker than they would have done without penicillin. | 1. The discovery of penicillin led to huge government-sponsored programmes to develop and produce it, as well as the growth of the pharmaceutical industry. This meant that penicillin became available for doctors to prescribe and led to other antibiotics such as streptomycin (1944) to treat tuberculosis, tetracycline (1953) to clean up skin infections and Mitomycin (1956) which is used as a chemotherapy drug. |

**Example PEEL**

**Point** *The factor of scientific understanding was also important because it led to the proof that penicillin was an antibiotic.*

**Evidence** *For example, it was Fleming’s scientific research and understanding of staphylococcus that led him to make his accidental discovery in 1928. In the early 20th century, scientists had moved towards lab-based medicine, and research was carried out using samples by microbiologists (rather than doctors). Fleming had been investigating the bacteria in a lab in petri dishes. However, his assumption that the mould was an antiseptic rather than an antibiotic delayed progress, as it meant that he did not test it on living organisms. In the 1930s, Florey and Chain used a number of lab-based scientific methods to prove that penicillin had antibiotic properties, such as their experiment on 8 mice. They used 4 mice as a control group and injected it into the other 4 mice to prove that it cured the infection. Also, they developed scientific methods of producing the penicillin ‘mould juice’; unlike magic bullets, penicillin could not be created from chemicals, as it had to be grown in a broth and exposed to air. 2000 litres were required to treat one case of human infection – this was 3,000 times the amount used on mice.*

**Explain** *The scientific methods and experiments used by all three scientists helped the development of penicillin because, firstly, they provided proof that penicillin was an antibiotic. Secondly, Florey and Chain’s methods of mass-production in their make-shift lab provided the basis for huge pharmaceutical companies to copy this process, once they’d received funding from governments. Florey and Chain were also able to prove that they would need far greater funding and technology if it were to be mass-produced, which provided the impetus for government to intervene.*

**Link** *However, this was not as important as the role of the government. Without the funding from the government, none of these scientific methods and research would have been applied on a mass scale; penicillin would have remained an unfunded antibiotic that had only been tested on one person and 8 mice.*

It is highly debatable whether the main reason there was little progress in the period c1250 - c1700 was because of the role of the government.

Some people may agree with this because it wasn't until the 19th century and certainly in the 20th century more prominently when the government actively started to take an active role in public health. However on the other side of the debate is the fact that it was the government who did play a role in prevention of the plague when it came around again in 1666. I am going to explore both sides of this debate in this essay before drawing to a conclusion to explain where I will explain why I disagree with the statement.

One reason why I disagree with this is the Church. There were many religious- linked treatment methods that were incredibly popular in the period c1250 - c1700. This is because most of these methods had been approved and encouraged by the church who controlled most aspects of society in this time. 'Hospitals' in that time period were based in monasteries and provided people with just a bed and a place to rest. Nuns and Monks encouraged people to repent, pray to God and touch holy relics in order to receive God's blessings which were viewed as essential 'remedies' for cleansing and healing one's soul. Most of society were illiterate and they achieved very little knowledge of the outside world that wasn't linked to the church's beliefs about God, heaven and hell. Doctors were trained at universities that were controlled by the churches and so there was no room for scientific alternatives to the church's main belief about illness - a punishment from God for sins. Therefore this shows that it was not the role of the government that was the main reason for a lack of progress as the church had more authority and power in this time.

One reason I agree with this is because of the attitudes of society. This is due to the fact that the government did not have much of an impact in healthcare in the medieval or the renaissance era. Popular treatments outside of the church included herbal remedies which could easily be purchased from traditional wise women or apothecaries which were very popular and available to all people. Therefore this shows that the government's limited role in healthcare was responsible for the lack of progress down to the fact that people preferred and trusted other herbal related remedies. Society trusted these simply because they were viewed as having traditional healing properties and the government did little to provide alternatives.

However on the other hand one reason why I disagree with this is because of quarantine houses. The government set these up after the second epidemic of the plague disease hit Britain in 1666. In order to stop the disease from spreading the government set up pox houses/pest houses in order to house people who had already caught the illness to stop them from getting into contact with other people. This initiative helped stopped the spread of the illness and was a new preventative method paid for by the government. In addition to this they also paid for local authorities to clean up the streets to stop the disease from spreading and banned all public fairs and meetings to keep people safe. Therefore this shows that the government were not responsible for the lack of progress in healthcare in the period c1250 - c1700.

To conclude I think that the role of the government was limited in healthcare in the period c1250 - c1700 but there were other factors such as the role of the church and attitudes of society who were very religious which made it harder for medicine to progress. There are some examples of government intervention in healthcare in this time but because society was so religious it would have been hard to suggest any alternative treatments to the ones that were already around. Doctors such as Vesalius, Harvey and Sydenham could not have a long term impact on medicine with their new ideas because most doctors still preferred to use the same texts by Hippocrates and Galen in their practice. Therefore i think the church made it difficult for other factors to have a role in medicine rather than the government

***Strengths: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***

***Improvement suggestions: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_***

***Mark: \_\_\_\_\_\_\_\_ / 16***