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ABOUT THIS BOOK

This book is written for students following the Edexcel International GCSE (9–1) History specification and covers one unit of the course. This unit is Changes in Medicine, c1848–c1948, one of the Breadth Studies.

The History course has been structured so that teaching and learning can take place in any order, both in the classroom and in any independent learning. The book contains five chapters which match the five areas of content in the specification:

- Progress in the mid-19th century; Nightingale, Chadwick, Snow and Simpson
- Discovery and development, 1860–75; Lister and Pasteur
- Accelerating change, 1875–1905; Ehrlich, Koch and chemistry
- Government action and war, 1905–20
- Advances in medicine, surgery and public health 1920–48; the NHS

Each chapter is split into multiple sections to break down content into manageable chunks and to ensure full coverage of the specification.

Each chapter features a mix of learning and activities. Sources are embedded throughout to develop your understanding and exam-style questions help you to put learning into practice. Recap pages at the end of each chapter summarise key information and let you check your understanding. Exam guidance pages help you prepare confidently for the exam.

Learning objectives
Each section starts with a list of what you will learn in it. They are carefully tailored to address key assessment objectives central to the course.

Learning objectives
Understand the roles played by Fleming, Florey and Chain.

Evaluate the factors affecting the development of penicillin.

FLAMING'S DISCOVERY

During the First World War, a doctor called Alexander Fleming had worked in a military hospital in London. In 1922, he discovered that the proteins in his blood, which came from blood and other body fluids, killed many microorganisms; unfortunately, they also harmed themselves.

In 1928, Fleming was working on developing vaccines, so he did not pursue his research on lysosomes any further.

In 1931, Fleming became Professor of Bacteriology at St Mary's Hospital Medical School in London. He was interested in finding a new way of fighting infections in mice.

In 1932, he noticed that cultures of staphylococcus were not growing; over time, the cultures grew into each other so the sections of his painting would not be clear.

In 1934, he left the culture and as a result of his laboratory, leaving the return. He noticed that one of the cultures had been contaminated with a mould. He is believed to have discovered the mould in a pure culture and found that it could be used to kill certain microorganisms which caused diseases. He identified the mould as part of the penicillin genus and named it penicillin. This was different from magic bullets because it was not based on chemicals. Instead, it was an antibiotic, using backsides to attack other bacteria.

In fact, penicillin was not really a new discovery. During the Middle Ages, people knew that mould treated with lead or copper were sometimes effective against infection. It was spread around the world, although no one could explain why. In 1870, Joseph Liston had used penicillin to treat a nurse at King's College Hospital, after her wound did not respond to any antibiotics. Louis Pasteur and Ernest Duchesne had also noticed that various types of penicillin were effective against infection. So Fleming's discovery did not turn out to be a particularly significant breakthrough.

In 1929, Fleming published his research in a paper in the British Journal of Experimental Pathology. However, few people realised the importance of this discovery. Penicillin was difficult to produce – it was only possible to make small quantities at a time. Furthermore, laboratory tests suggested it was slowly to act and ineffective when mixed with blood. Fleming thought it would work better as an external cream than an internal drug. He failed to get funding to continue this research and returned to his original work.

Since the discovery of Salmonella typhi, scientists had been trying to develop another magic bullet that could be used to treat other illnesses. However, it was not until 1935 that the German scientist Gerhard Domagk tested Prontosil. This was based on a red chemical compound used to dye wool and leather. Domagk found that the chemical could be used to treat bacterial infections in mice. In 1938, Domagk's 6-year-old daughter Hildegard became ill after an accident in which an embroidery needle had gone into her hand. She developed a fever, her hand became swollen and red and stopped up at the arm. Her doctor recommended amputating her arm but it was too late. Fleming's discovery was confirmed when the Crum Brown was found in the pus. The symptoms would not have improved if Fleming's discovery had not been made.

Key term
Useful words and phrases are colour coded within the main text and picked out in the margin with concise and simple definitions. These help understanding of key subject terms and support students whose first language is not English.

Extend your knowledge
Interesting facts to encourage wider thought and stimulate discussion. They are closely related to key issues and allow you to add depth to your knowledge and answers.

Source
Photos, cartoons and text sources are used to explain events and show you what people from the period said, thought or created, helping you to build your understanding.
Exam-style question

Questions tailored to the Pearson Edexcel specification to allow for practice and development of exam writing technique. They also allow for practice responding to the command words used in the exams.

Skills

Relevant exam questions have been assigned the key skills which you will gain from undertaking them, allowing for a strong focus on particular academic qualities. These transferable skills are highly valued in the workplace.

Exam guidance

At the end of each chapter, you will find two pages designed to help you better understand the exam questions and how to answer them. Each exam guidance section focuses on a particular question type that you will find in the exam, allowing you to approach them with confidence.

Pearson Progression

Sample student answers have been given a Pearson step from 1 to 12. This tells you how well the response has met the criteria in the Pearson Progression Map.

Advice on answering the question

Three key questions about the exam question are answered here in order to explain what the question is testing and what you need to do to succeed in the exam.

Commentary

Feedback on the quality of the answer is provided to help you understand your strengths and weaknesses and show how they can be improved.
1917
- Gillies set up a plastic surgery unit at the Queen’s Hospital in Sidcup, Kent
- Two revolutions in Russia: Balfour Declaration

1918
- End of First World War
- First World War: developments in X-ray, military hospitals, blood transfusions, brain surgery and plastic surgery

1919
- Ministry of Health established
- Isolation hospitals created for tuberculosis patients
- League of Nations founded
- Versailles Peace Treaty

1920
- Wall St Crash
- St Valentine’s Day Massacre
- Hitlack becomes German chancellor
- Roosevelt introduces New Deal
- Fleming discovers penicillin

1921
- Treaty of Versailles
- Munich Putsch

1923
- Lenin dies
- Munich Putsch

1924
- Lenin dies
- Germany invades Soviet Union

1928
- Fleming discovers penicillin

1933
- Hitler becomes German chancellor
- Roosevelt introduces New Deal
- Floresy and Chain begin work on penicillin

1939
- Outbreak of Second World War
- Britain leaves Palestine

1941
- Trotsky murdered
- Germany invades Soviet Union

1942
- Beveridge Report
- Second World War: developments in plastic surgery, blood transfusions, brain and heart surgery

1944
- Bomb plot against Hitler

1945
- End of Second World War
- United Nations founded

1946
- National Health Service Act

1947
- Truman Doctrine
- India and Pakistan become independent countries

1948
- Israel founded
- British leave Palestine
- National Health Service begins

1949
- National Health Service begins

1950
- Wall St Crash
- St Valentine’s Day Massacre
- Treaty of Versailles
- Munich Putsch

1916
- Battle of the Somme

1917
- Two revolutions in Russia: Balfour Declaration
In the mid-19th century, people did not know what caused disease and they usually blamed it on a problem in the body or on miasma (something bad in the air). This meant that their attempts to prevent or treat illness, either at home or in hospitals, were unlikely to work.

The level of care offered in hospitals was fairly basic and most people were nursed at home. However, during the Crimean War (1854–56) Florence Nightingale took a team of nurses to the British army hospital where they improved the care being offered to injured soldiers. The standard of hygiene in the hospital was also improved and this appeared to reduce the number of deaths from infection.

People’s reluctance to go through an operation was understandable. Surgery consisted of basic operations which had to be carried out as quickly as possible because there was no pain relief. Even if the patient survived the operation itself, there was a high death rate afterwards because of infection. The discovery that ether could be used as an anaesthetic, followed by Simpson’s use of chloroform, solved the major problem of pain. However, not all the consequences of these discoveries were positive.

Another factor affecting people’s health was the standard of housing. In most towns, the quality of housing was very poor and, because many people lived closely together in unhealthy conditions, disease spread quickly. Chadwick recommended various improvements but they were not all implemented. However, the work of Snow showed the importance of improved hygiene and access to clean water in order to prevent the spread of cholera.
1.1 WHY HAD MEDICINE NOT MADE MORE PROGRESS BY 1848?

LEARNING OBJECTIVES

- Understand that medical knowledge is linked to scientific knowledge and technology
- Analyse the role of factors affecting progress in medicine
- Evaluate the standard of medicine in 1848.

Although there had been developments in medicine in the years leading up to 1848, there were a number of reasons why more progress had not been made.

Medical understanding of what caused disease in 1848 was based on ideas that made sense at the time. However, we now know these ideas were wrong. The idea of Four Humours (Figure 1.2) in the body was developed by the Ancient Greeks but it lasted for a very long time because it seemed logical. People knew that blood was an important part of the body and they could see bile when people vomited. They could also see watery mucus, or phlegm, when people had a cold.

They observed illness and saw that sometimes people became hot and flushed, while at other times they were pale and cold; sometimes people vomited and at other times they coughed and sneezed. It made sense to think that illness was caused by an imbalance in the body’s humours but this prevented people from developing a correct understanding of disease. This, in turn, prevented progress in treatment and prevention. Treatments were based on the Theory of Opposites (see Figure 1.3).

FOUR HUMOURS

KEY TERM

Theory of Opposites the idea that if your illness was caused by too much of one humour, the balance of your humours could be restored by eating or drinking something with the opposite qualities
An alternative explanation of disease was based on the idea of miasma – that disease was carried in unpleasant smells and harmful fumes in the air. People understood that there was often a high rate of disease in poor areas, where people lived in dirty, unhygienic – and smelly – conditions. They also knew that disease tended to spread more quickly in hot weather. This made the idea of miasma logical: the bad smells (which got worse in summer) were somehow linked with disease.

We know that disease is caused by microorganisms and we understand that different microorganisms cause different diseases. However, microorganisms are too small to be seen without a microscope and, although scientists knew they existed, there was little scientific research being carried out on them at this time. People didn’t know about the link between microorganisms and disease; instead, a theory developed, called spontaneous generation. This theory claimed that rotting material (for example, the remains of food, excrement, dead animals, rotting vegetables and plants etc.) created maggots, fleas and disease.

Understanding of the body was also limited. Doctors would observe a few dissections during their training but most people believed in a life after death and therefore wanted to be buried. The bodies that doctors could use were mainly those of criminals who had been executed. This made it difficult to plan any research on the symptoms of disease or to study particular conditions such as diabetes or arthritis.
Lack of understanding of the causes of illness was a key reason for the limited progress in medicine. Because understanding was faulty, doctors’ training was also faulty and ideas about prevention and treatment were likely to be ineffective.

When the number of crimes punishable by death was reduced in 1823, there were fewer criminals’ bodies available for dissection. Many medical schools paid cash for corpses, especially if they were fairly fresh. This meant that graves were sometimes robbed so that the body could be sold. Two criminals, Burke and Hare, carried out several murders in Edinburgh in order to sell the bodies.

This lack of understanding is closely linked with the level of technology available at the time. If microscopes had been stronger, perhaps scientists would have been more curious about germs.

Other reasons for the lack of progress include the problem of funding for research and the development of new ideas. The government did not feel responsible for issues like this and hospitals usually relied on charity for funding. This meant that little money was left over for research.

Attitudes were also important. Many doctors wanted to keep on doing what they had always done; they didn’t want to have to learn new ways of treating patients. Also there was no proof that their methods were wrong.
Florence Nightingale came from a wealthy middle-class background. Her family was shocked that she wanted to go out to work and even more surprised that she wanted to train as a nurse; this was considered a very low-status job at the time. There was no formal training for nurses in Britain so she visited various hospitals in Britain during the 1840s. She then spent 3 months in 1851 at a centre in Kaiserwerth, Germany, where training for nurses had begun in 1833.

In 1853, she became superintendent of a small nursing home in London, called the ‘Institution for Sick Gentlewomen in Distressed Circumstances’. However, she had met Sidney Herbert, the Secretary for War, in 1847 and he now asked her to take a team of 38 nurses to work in the military hospital at Scutari. Britain was fighting against Russia in the Crimean Peninsula, in the Black Sea. Many British soldiers were being injured in the Crimean War but a large number of the deaths that occurred were caused by infection rather than the original injuries.

When she arrived, Nightingale found the hospital was crowded, with almost 10,000 patients in appalling conditions.

- Many men were sharing beds or lying on the floor and in the corridors.
- Their clothes were infested with lice and fleas.
- Diseases such as typhoid fever and cholera were common.
- Many patients had diarrhoea.
- It was difficult to get enough medical supplies (such as bandages and medicine) to the hospital.
- Food supplies were limited and of poor quality.

1.2 WHY DID FLORENCE NIGHTINGALE GO TO SCUTARI?

**LEARNING OBJECTIVES**

- Understand the actions of Florence Nightingale at the hospital in Scutari
- Analyse the impact of her work
- Evaluate the importance of her work.

Conditions at Scutari

ACTIVITY

1. Make a set of flash cards for the new vocabulary in this section.
2. Based on the knowledge that people had in the mid-19th century, which seems the most sensible explanation of illness – the Four Humours, miasma or spontaneous generation?
3. Explain why limited knowledge and understanding of the causes of disease prevented progress in medical treatment.
4. Discuss with a partner the importance of each of the problems in preventing progress in medicine, then draw a picture or symbol to represent each problem. The size of each picture should reflect the importance of that barrier to progress.
The roof leaked and the wards were dirty and infested with rats and mice.

Although Florence Nightingale had no idea that this was the case, the hospital was actually built on the site of an underground cesspool, where human waste collected. This affected both the water supply and the air in the hospital.

**SOURCE C**

A painting from 1857 called ‘The Mission of Mercy: Florence Nightingale receiving the Wounded at Scutari’.

**NIGHTINGALE’S ACTIONS**

**SOURCE D**

From an official report about the state of the army hospitals in the Crimea.

The nurses’ duties included washing the soldiers’ wounds and preparing for the morning visits of the medical officer; to accompany the medical officer and dress the wounds. They also had to take his orders about diet, drink, and medical comforts to Miss Nightingale. They had to see that cleanliness, both of the wards and of the person, was attended to. We have reason to believe that the services of these hospital attendants have been extremely valuable.

Nightingale and her nurses scrubbed the surfaces clean and washed all the sheets, towels, bandages and equipment. She believed in miasma and the importance of fresh air, so she had windows opened to improve the flow of air. Nightingale and her nurses cleaned the kitchens and improved the quality of the food. A fund of money, a lot of it raised by the *Times* newspaper, meant that she could buy new supplies, including 200 towels, clean shirts, soap, plates and cutlery.

**EXTEND YOUR KNOWLEDGE**

The situation in the hospital, and Nightingale’s work there, was reported in the *Times* newspaper. A wealthy woman called Angela Burdett-Courts was interested in the report. She had already used some of her fortune to provide housing, a school, children’s playgrounds and medical care for poor people in London.

When she read about Nightingale’s work, she decided to help by providing a £150 drying closet machine, which could dry 1,000 pieces of wet linen (such as sheets) in less than half an hour.

**THE IMPACT OF NIGHTINGALE’S WORK**

Army medical staff had resisted the idea of nurses coming out to work in the Crimea because they felt that women would not be able to cope with the conditions there. They also felt that the women’s medical knowledge was limited; when Nightingale wanted to make changes, they saw her comments as criticism and resented her. However, her habit of making a final round at night, checking on all the patients, gained her the nickname of ‘The Lady with the Lamp’ and made her very popular with the patients and back in Britain.
Nevertheless, the death rate at Nightingale’s hospital was higher than at the other hospitals, even with all her improvements. It was not until 1855, when a government sanitary commission repaired the drains and improved the supply of drinking water, that the death rate began to fall dramatically.

**EXAM-STYLE QUESTION**

**ACTIVITY**

1. What barriers to progress did Nightingale face at Scutari?
2. Nightingale believed disease was spread by miasma. How does this explain her actions in the hospital?
3. Would she have gained her favourable reputation in Britain if the drains had not been repaired and the water supply improved?

**HINT**

This question is testing your knowledge by asking you to give two examples of difference. Make sure that in each case, you identify the difference and support it with details about (a) the situation when Nightingale arrived and (b) how the situation changed as a result of her work.

1.3 **HOW MUCH PROGRESS WAS THERE IN SURGERY?**

**LEARNING OBJECTIVES**

- Understand the key features of surgery in 1848
- Analyse the reasons why there was a low standard in surgery
- Evaluate the extent to which the problems of surgery had been overcome by 1860.

In the mid-1840s, the medical training course for doctors took 4 years. It included lectures on illness and treatment, practical experience in a hospital, and practical experience of midwifery and surgery.

However, surgical operations were either very basic procedures, such as cutting open a boil, or life-threatening ones, such as cutting out a tumour or the amputation of a limb. Amputation would often become necessary if a broken bone poked through the skin and became infected.

**KEY TERM**

**tumour** a growth in some part of the body; some tumours are harmless but others can affect the body or even cause death.

**THE PROBLEM OF PAIN**

Pain had been a major problem in surgery. Before the 1840s, the only types of pain relief available were alcohol, a form of opium, or being knocked unconscious. In most operations, the patient was awake and often screaming in pain so the surgeon’s assistants, or dressers, had to hold the patient down. The “best” surgeon was not the one who cut most skilfully but the one who cut the quickest. However, advances in chemistry seemed to be solving this problem.
Blood loss was obviously a problem so a tourniquet would be used to reduce the flow of blood in the artery. However, even when patients survived the operation, a high percentage of them died afterwards as a result of infection.

Many operations were carried out in the patient’s home, which was not hygienic – although conditions in hospitals were often far worse! There was little understanding of how infection happened and the surgeon would wear old clothes that were already stained with blood and pus, rather than spoil decent clothes. If patients were lucky, the surgeon might wash his hands before the operation. Equipment was wiped clean or washed briefly between patients; it was not sterilised. The sponge used to wipe away blood was just rinsed out, and bandages were washed and then reused. In addition, there were often lots of people in the operating theatre, as well as the surgeon and his assistants: medical students and wealthy people who supported the hospital with money would watch the operation, making infection even more likely.

**SOURCE E**
A painting from the first half of the 19th century. It shows an operation to remove a tumour being carried out in the patient’s home.

**SOURCE F**
A surgeon describes an operation before the use of anaesthetics.

The patient is brought into the operating theatre, which is crowded with men who are keen to see the operation and the shedding of blood. She is laid upon the table. She knows the intense agony which she is about to suffer. The surgeon tries to reassure her with kind words and tells her that it will soon be over. She is told to be calm and to keep quiet and still. Assistants hold her struggling body down and the operation begins.

At last it is all over. Faint because of the pain, weak from her efforts to break free and bruised from the force used to hold her still, the girl is carried from the operating theatre to her bed in the wards to recover from the shock.

**EXTEND YOUR KNOWLEDGE**
Robert Liston was widely regarded as one of the best surgeons for two reasons. Firstly, he was very strong (he could compress the artery with one hand while using the amputating knife with the other). Secondly, he was very quick – his record time for an amputation was 28 seconds!

However, he is often remembered today for a couple of operations that went wrong. In one case, he was working so quickly when amputating a leg that he cut off the patient’s testicles as well. In another case, he accidentally cut off two of his assistant’s fingers. The assistant later died from infection; a spectator – who was spattered in blood – had a heart attack and died; and the patient died as well!

**BLOOD LOSS AND INFECTION**

**KEY TERM**
tourniquet something wrapped tightly around a limb to reduce the flow of blood

**ACTIVITY**
1. Explain why the lack of effective pain relief was a barrier to progress in surgery.
2. Explain why the lack of understanding of infection increased the death rate among patients.
3. Draw a spider diagram summarising the problems of surgery in the mid-19th century. You could include ideas such as pain, speed, infection and blood loss.
Scientists had begun to investigate the chemical properties of various gases and nitrous oxide (laughing gas) was known to make people unaware of pain, even though they were fully conscious. It was used in dentistry in the USA in 1844–5 by Horace Wells, but it was not considered suitable for a surgical operation. Then William Morton, a dentist in the USA, experimented with the gas ether in 1846 and found that it had a stronger effect on the patient.

Robert Liston, in Britain, heard about Morton’s work. Later in 1846, Liston used ether during an operation to amputate a leg. The people watching were astonished that the patient did not need to be held down and even more astonished when he woke up and seemed unaware that the operation had taken place.

Ether seemed to be a wonderful form of pain relief but there were problems. It sometimes caused vomiting and it irritated the lungs, making the patient cough. Another problem was that ether could leave the patient asleep for hours or even days. The gas was also highly flammable which was dangerous when the operating theatre was lit by candles or gas.

James Simpson wanted to find a better anaesthetic and carried out experiments, inhaling various gases. He was sometimes quite reckless – on one occasion he tried a gas on some rabbits and, seeing that they appeared to be peacefully unconscious, he was ready to try the gas himself. An assistant persuaded him to wait until the next day, when they found that the rabbits had died overnight!

This doesn’t seem to have worried Simpson. He continued to experiment and discovered chloroform was an effective anaesthetic: he and his friends woke up one morning slumped around the table where they had inhaled chloroform the night before.
Chloroform did not seem to have the same side effects as ether and Simpson, who was Professor of Medicine and Midwifery at Edinburgh University, used it in 1847 for women in childbirth. Shortly afterwards, he became the official physician to Queen Victoria in Scotland and she used chloroform when she had her eighth child in 1853. Partly as a result of newspaper publicity about this miracle pain relief, and partly as a result of royal approval, patients began to ask for chloroform in their operations and it became much more widely used.

When Simpson died in 1870, 50,000 people lined the route of his funeral and money was collected to put up a statue in his honour. The work of men such as Liston, and Simpson, combined with advances in the science of chemistry, meant huge advances had been made in dealing with the problem of pain in surgery.

SOURCE I
A drawing showing the unveiling of the statue of Simpson.

ACTIVITY

1 Write a letter or a newspaper article describing Liston’s use of ether. Make sure you include comparisons with a normal operation so that ether is clearly shown to be a wonderful discovery.

2 Which of the problems associated with ether do you think would matter most to:
   - the patient
   - the surgeon?

3 Do you think Simpson took necessary risks in order to investigate the effects of gases on humans or was he reckless, risking his own death and that of his friends?

4 Which of the following points is the clearest evidence that Simpson’s work was seen as a major breakthrough in dealing with the problems of surgery?
   a Other doctors elected him President of the Royal College of Physicians of Edinburgh in 1850.
   b He was knighted for his services to medicine and when he died, his family was offered a burial spot in Westminster Abbey.
   c Thousands lined the streets for his funeral and a public collection paid for a statue to be erected.
THE IMPACT OF CHLOROFORM

SOURCE J

From a notice issued in 1855 by Dr Hall, the Chief of the Medical Staff of the British Army during the Crimean War.

Dr Hall would like to caution Medical Officers against the use of chloroform to treat serious gunshot wounds. He thinks few patients will survive where it is used. He knows that public opinion, based on mistaken kindness, is against him. However, he feels that the pain of the knife is a powerful stimulant, and it is much better to hear a man shout loudly than to see him sink silently into the grave.

Chloroform seemed to have solved the problem of pain in surgery but there were problems associated with its use.

◆ The Christian Church was opposed to the use of chloroform in childbirth because the Bible says that after Adam and Eve were made to leave the Garden of Eden, Eve was told childbirth would be painful.

◆ Many doctors were opposed to its use in childbirth because it was not known how chloroform might affect the baby.

◆ It was difficult to get the dose of chloroform right – enough to put the patient to sleep but not so much that they died.

◆ Some doctors felt that a patient who was unconscious was more likely to die than one who was kept awake by pain.

◆ By using chloroform, many surgeons felt confident enough to attempt longer and more complicated operations, often deeper inside the body.

SOURCE K

Snow’s chloroform inhaler, invented in 1848.

John Snow was able to solve this problem by inventing a chloroform inhaler in 1848. This controlled the dose of chloroform, but the problems of infection and blood loss remained. Indeed, the death rate rose, to the extent that the next few years have been called the ‘Black Period’ of surgery.

EXTEND YOUR KNOWLEDGE

The problem of getting the dose right was seen in the death of Hannah Greener in 1848. She was a 14-year-old girl who was having an ingrowing toenail removed; this was a minor but painful operation, so she was given chloroform. However, she died almost immediately.
THE PROBLEM OF INFECTION

Chloroform gave surgeons more time to work, so they could carry out more complicated operations, often going deeper inside the body. However, they still did not understand hygiene and infection. The surgeon’s bloody hands and the unhygienic equipment now took germs right into the body, causing infection. The bedsheets and the dressings (bandages) had usually been used before – often, they still had stains and germs on them – and they also passed infection to the patient. As a result, many patients developed gangrene around the surgery wound. This infection often developed into sepsis, until the patient died. The increased length of operations also caused other problems. For example, if the blood supply to a part of the body was cut off for too long during an operation, this increased the risk of gangrene.

EXAM-STYLE QUESTION

Explain two causes of the Black Period in surgery. (8 marks)

HINT

A cause is something which leads directly to an outcome (in this case a change), not simply something that happened before change occurred. You need to be able to show the link between the causes you identify and the changes in surgery.

Problems and solutions in surgery

- Pain
  - Ether solved the problem of pain but had side effects.
  - Chloroform solved the problem of pain and appeared to have fewer side effects, especially once the inhaler meant that dosage could be controlled.

- Infection
  - This had not been solved.

- Blood loss
  - This had not been solved.
  - Tourniquets were used to restrict the flow of blood but there was a risk to the patient if the blood supply was restricted for too long.

EVALUATION

Solving the problem of pain was a major breakthrough; without this, few people would be willing to undergo surgery and other developments would have little effect.

Surgeons were now encouraged to try more complex operations.

The death rate actually rose because there was more risk of infection in more complex operations.

This meant that surgeons still could not do lengthy operations.

In groups of four, prepare a news interview for the year 1860. One of you should be a doctor who thinks anaesthetics should be used. Another person should be a doctor who is opposed to anaesthetics. A third person is a nurse who has cared for patients after operations both before and after the use of anaesthetics. The fourth person is the interviewer. All of you will need to know good and bad points about the use of anaesthetics in order to ask and reply to questions and convince the readers. You might want to give examples of operations or include quotes from patients.
Changes in farming and the rapid development of factories during the Industrial Revolution had caused many workers to move to new industrial towns in the early 19th century (see Table above). However, houses were of very poor quality because they were built quickly. Landlords felt that workers only needed basic homes and they also knew that factory workers received low wages and would only be able to pay low amounts of rent.

**LIVING CONDITIONS**

**KEY TERM**

**privy** a toilet consisting of a wooden seat over a cesspool

Groups of houses in the poorer areas of industrial towns were often arranged in narrow, dark streets, called ‘courts’, which could contain hundreds of people. Often a family would live in a single room and 50 people or more might live in one house. Houses were usually damp, with little light or ventilation. In bad weather, the ground floor and cellar could become flooded and a single privy might be used by 100 people. Water could be collected from a local pump shared by 20–30 families. The water was often taken from polluted rivers and was only available for a few hours three to five times a week. In these conditions disease spread rapidly.

There were already many killer diseases in Britain at this point. Although a vaccination had been developed to prevent smallpox, relatively few people had been vaccinated. There was no prevention or treatment for typhus, typhoid fever or influenza. Many patients who survived these diseases were so weak that they died if they caught another illness such as pneumonia or bronchitis.

Possibly the most frightening disease was cholera, which killed very quickly – sometimes within a single day. The symptoms involved general pain and muscle spasms together with extreme vomiting and diarrhoea, until death was caused by dehydration. Approximately 20,000 people had died in the epidemic of 1831–32.
The lack of understanding of disease is shown by the fact that the MPs in parliament discussed whether to order a day of prayer when there was another cholera epidemic in 1848. They decided not to do so and instead left matters to local authorities, who adopted measures based on the idea of miasma. For example, barrels of tar were burned in the street and people were told to keep warm but also keep clean.

The belief that disease was spread by miasma made it seem that cholera would mainly affect poor people, who lived in very unhygienic conditions. Source L shows an understanding that diseases like cholera spread quickly in dirty conditions. The word ‘court’ is used to make a joke, linking the type of street and ‘King’ cholera.

Dr Robert Baker’s report on the 1832 cholera epidemic in Leeds described the standard of housing in the poorer parts of the city.

- Many of the streets were bare earth so they became muddy and filth collected in the mud.
- Nineteen streets did not have a sewer and another 10 only had a sewer covering part of the street; the sewers had only recently been finished in an area where 30,540 people lived.
PROGRESS IN THE MID-19TH CENTURY

CHANGES IN MEDICINE, c1848–c1948

EDWIN CHADWICK AND THE 1848 PUBLIC HEALTH ACT

A cartoon drawn in 1852, called ‘A Court for King Cholera’.

- **Stagnant water** created offensive smells.
- In some poorer parts of town, human excrement was collected to sell to farmers. In one yard in the city of Leeds, so much human waste had been collected that it took 75 cart loads to remove it!

**SOURCE L**

**ACTIVITY**

1. How many health hazards can you see in the drawing of a typical court (Figure 1.5) and Source L, ‘A Court for King Cholera’?
2. Why would these conditions make the miasma explanation of disease seem likely to be true?
3. Based on the level of understanding in the 1840s, suggest ways individuals might be able to protect themselves from cholera and measures that local authorities could take.

Edwin Chadwick had been involved with the workhouses, places where poor people could go when they were too old or too ill to work and support themselves. The money for these workhouses came from local taxes, called rates, but many people resented spending too much money on the poor. Chadwick had published a report in 1842, called *The Sanitary Conditions of the Labouring Population*. In this report, he had suggested that it would be better to spend the money from taxes on improving the housing and living conditions of the poor and keeping them healthy. This would be more useful than letting them live in dreadful conditions so that they became too ill to work.
and had to be supported in a workhouse. His recommendations had included providing clean water and removing rubbish and sewage.

At first, Chadwick’s ideas had little support but further cholera epidemics, which also affected the middle and upper classes, drew attention to issues of hygiene. The 1848 Public Health Act:
- set up a General Board of Health
- allowed towns to set up their own local Board of Health, employ a medical officer, organise the removal of rubbish and build a sewer system
- appointed three commissioners (people in charge) for the Board of Health; Chadwick was one of the three commissioners and was also made a commissioner for London’s Metropolitan Commission of Sewers from 1848 to 1849.

However, the impact of the 1848 Act was very limited. One problem was that the terms of the act were temporary; the Board of Health was only set up for 5 years and ended in 1854. More importantly, the act allowed local authorities to improve hygiene but did not force them to do so. Consequently, some local authorities took no action.

Another problem was that Chadwick was a difficult person, who was often arrogant and aggressive. As a result, he found it hard to get his ideas accepted even though over 50,000 people died in the epidemic of 1848–49. Attitudes were slow to change and many people did not like the idea that local taxes should be increased in order to help the poor – especially when there was no actual proof that disease was linked to hygiene.

ACTIVITY

1 Chadwick was not a doctor and had no medical background. Why was he involved in medical issues during the 1840s?
2 If Chadwick’s ideas had been fully implemented, how effective do you think they would have been in controlling epidemics of infectious diseases?
3 Why were his ideas only partially implemented?

Figure 1.6 Causes and consequences of the 1848 Public Health Act
Another epidemic in 1854 helped to change people’s attitudes. Dr John Snow had suggested in 1849 that cholera was being spread by polluted water. He now conducted research that proved his idea was correct.

He investigated an outbreak of cholera in Soho in London using scientific methods of careful observation and records. He made a map showing all the deaths in the area and noticed that they seemed to be centred around the pump in Broad Street.

John Snow’s map of the cholera outbreak in Soho.
1. Within an area roughly 200 metres from the Broad Street pump, there had been 500 fatal cases of cholera.

2. In houses that were nearer to another water pump, there had only been ten fatalities. In all of these cases, the families of the deceased confirmed that they got their water from the Broad Street pump.

3. Workers in a factory near to the Broad Street pump had been badly affected. Eighteen workers had died.

4. Residents of a local workhouse, who had their own water supply, had not been badly affected. Only five had died, out of 335.

5. Workers at a local brewery, who drank free beer, were not affected. The brewery also had its own water supply.

6. A woman living in Hampstead, several miles to the north of Soho, had died of cholera. It was discovered that she had once lived on Golden Square in Soho, and had a bottle of water sent up from the Broad Street pump every day because she liked the way it tasted.

Snow's research was convincing. He explained why some people did not catch cholera even though they lived near the Broad Street pump. He also showed that some people who did not live nearby could still have caught the disease after drinking polluted water from the pump. His theory was further confirmed when the handle was removed so that no water could be collected from the pump – and the deaths from cholera stopped.

Reverend Henry Whitehead worked with John Snow to investigate how the cholera epidemic had started. He found that the first case could have been the baby daughter of Sarah Lewis, who lived at 40 Broad Street. The cholera had caused diarrhoea and Sarah had soaked the dirty nappies in water, which she then emptied into the cesspool in front of her house. When Reverend Whitehead’s ideas were investigated, it was found that the brick lining to the cesspool was cracked and polluted water had leaked to the Broad Street pump, 1 metre away.

Snow’s work had demonstrated the link between cholera and infected water and this put pressure on the water companies, local authorities and parliament to improve water supplies. However, people still did not know why other diseases spread, because the link between microbes and disease had not yet been understood.
RECAP

RECALL QUIZ

1. Explain three different ideas about the cause of disease in the mid-19th century.
2. Name three problems Florence Nightingale found at the army hospital in Scutari.
3. Give three examples of improvements made by Nightingale.
4. Explain three barriers to progress in surgery in 1848.
5. Why did people prefer to use chloroform rather than ether in operations?
6. Why did the use of anaesthetics lead to the Black Period in surgery?
7. What was a court in an industrial town?
8. What were the terms of the 1848 Public Health Act?
9. How did John Snow prove there was a link between infected water and cholera?
10. How did the Great Stink push the government into taking action on the issue of public health?

CHECKPOINT

STRENGTHEN
S1 Explain why a lack of understanding of the causes of disease prevented progress in medicine.
S2 Explain the importance of Simpson's use of chloroform.
S3 Explain why disease spread so quickly in industrial towns.

CHALLENGE
C1 In which aspect of medicine had there been most improvement between 1848 and 1860?
C2 Why were parliament and local authorities so slow to take action to improve public health?
C3 What barriers to progress in medicine still existed in 1860?

SUMMARY

- There was little understanding of the causes of disease in 1848 and therefore it was difficult to make any progress in medicine.
- Florence Nightingale made many improvements to the care of injured soldiers in the army hospital at Scutari.
- Her work was publicised in Britain, drawing attention to problems in medicine.
- Surgical operations needed to be quick because there was no effective pain relief.
- Simpson discovered that chloroform was an effective anaesthetic.
- The problems of blood loss and infection had not been solved so progress in surgery was still limited.
- Edwin Chadwick wrote a report highlighting the appalling housing conditions in industrial towns.
- The Public Health Act 1848 was an important move towards improving public health but its terms were not compulsory.
- When there was a cholera outbreak in 1854, John Snow proved that it was spread by infected water.
- Despite some practical improvements in surgery and public health, medicine did not progress very far as people still did not understand how disease was spread.
Question to be answered: Explain two causes of improvements in surgery in Britain from 1848–60. (8 marks)

Analysis Question 1: What is the question type testing?
In this question, you have to demonstrate that you have knowledge and understanding of the key features and characteristics of the period studied. In this particular case, you need to show your knowledge and understanding of changes in surgery.

There is a focus on improvement, so you have to show that these changes made surgery better. You also have to explain why the changes occurred. There must be a clear link between the reason you give for each change and the specific improvement that took place.

Analysis Question 2: What do I have to do to answer the question well?
Obviously, you have to write about changes in surgery but don’t simply write everything you know. You have to show why each change was an improvement and why that change happened. If you just write about surgery, you are unlikely to do this. You should start by identifying an improvement and then providing detail to explain why that improvement happened. If you were writing a plan, your key points would be: identify the first change; why it was an improvement; why it happened; identify the second change; why it was an improvement; why it happened.

In this case, you might consider how Simpson’s work in developing the use of chloroform, and Snow’s work in developing an inhaler to regulate the dosage, both made surgery better. You can gain 4 marks for explaining the causes of improvement, and 4 marks for your use of accurate and relevant supporting detail. However, if you only talk about one cause, you cannot get more than 4 marks in total.

Analysis Question 3: Are there any techniques I can use to make it very clear that I am doing what is needed to be successful?
This is an 8-mark question and you need to make sure you leave enough time to answer the part c question fully, as that is worth 16 marks. This is not an essay and you don’t need to give a general introduction or conclusion. However, it is helpful to structure your answer as two separate paragraphs, making it clear to the examiner that you are explaining two causes. It can also be helpful to use phrases like ‘One improvement in surgery was… The problem was… The improvement was caused by…’; ‘Another improvement…’ and so on.

There are three levels in the mark scheme. At Level 1, you provide general information about surgery and make a simple statement about the cause of improvement. At Level 2, you can explain the cause(s) of improvement and you include some specific supporting detail. To get Level 3, you need to make the connection between the cause and the improvement very clear; you must support your answer with specific details.
The mark scheme has a range of marks within each level. If you cover one cause of improvement better than the other, your mark will be at the lower end of the level awarded. To get full marks, you need to give a clear explanation of each cause of improvement and you need to provide good supporting detail.

Answer A
Surgery was very painful c1848. People had to be held down during the operation and the surgeon was expected to work quickly. In 1847, Simpson experimented with the use of chloroform. However, sometimes people died so John Snow invented an inhaler.

Answer B
One improvement in surgery was the use of anaesthetics. The problem was that surgery was very painful c1848 and so people only agreed to an operation as a last resort. In 1846, the use of ether was found to deaden the pain and meant that surgeons could take more time over their operations. There were side effects to the use of ether and this led Simpson to experiment in order to find a better alternative. He found that chloroform seemed to be an effective anaesthetic with fewer side effects than ether. Simpson’s determination and experiments made the situation better for both the patients and the surgeon.

Another improvement in surgery was Snow’s chloroform inhaler, which he invented in 1848. One of the problems with chloroform was the difficulty in regulating the dosage and this led to some sudden deaths, as in the case of Hannah Greener. Improvements in technology meant that it was easier to produce equipment and the inhaler allowed the surgeon to control the dosage more accurately, which made it less likely that too much chloroform would be used. This improvement was caused by Snow’s desire to prevent deaths from chloroform and improvements in technology that made it possible to produce the inhaler.

Challenge a friend
Use the Student Book to set a part (b) question for a friend. Then look at the answer. Does it do the following things?

- Identify two changes
- Provide detailed information to explain why these changes were improvements
- Provide detailed information to show why these changes happened.

If it does, you can tell your friend that the answer is very good!