endorsed for edexcel

EDEXCEL INTERNATIONAL GCSE (9–1)

eBook included

# HISTORY

## CHANGES IN MEDICINE, c1848–c1948

Student Book

Cathy Warren

Series Editor: Nigel Kelly

Pearson

EDEXCEL INTERNATIONAL GCSE (9–1)

# HISTORY

## CHANGES IN MEDICINE, c1848–c1948

Student Book

Cathy Warren

Series Editor: Nigel Kelly

Published by Pearson Education Limited, 80 Strand, London, WC2R 0RL.

www.pearsonglobalschools.com

Copies of official specifications for all Pearson qualifications may be found on the website: https://qualifications.pearson.com


Edited by Stephanie White and Sarah Wright
Designed by Cobalt id and Pearson Education Limited
Typeset and illustrated by Phoenix Photosetting, Chatham, Kent

Cover design by Pearson Education Limited
Picture research by Sarah Hewitt
Cover photo/illustration Mary Evans Picture Library: Sueddeutsche Zeitung Photo
Inside front cover Shutterstock.com: Dmitry Lobanov



First published 2017

19 18 17
10 9 8 7 6 5 4 3 2 1

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

ISBN 978 0 435 18540 4



Printed in Slovakia by Neografia

**Acknowledgements**
The publisher would like to thank the following for their kind permission to reproduce their photographs:
(Key: b-bottom; c-centre; l-left; r-right; t-top)

**Alamy Stock Photo:** Antiqua Print Gallery 11, Granger, NYC 48, Ian Dagnall 7, Lebrecht Music and Arts Photo Library 37, M&N 36, PF-(wararchive) 76, Photo Researchers, Inc 60, Photo-Lithographed & Printed By James Akerman 35b, Pictorial Press Ltd 18, War Archive 75, World History Archive 67, 95; **Alexander Fleming Laboratory Museum (Imperial College Healthcare NHS Trust):** 90; **Banknotes.com:** 58; **Bridgeman Art Library Ltd:** Bibliotheque de la Faculte de Medecine, Paris, France / Archives Charmet 51, Yale Center for British Art, Paul Mellon Collection, USA 35t; **Getty Images:** Bettmann 23, Daily Herald Archive 92, Fox Photos / Stringer 88, 97, Hulton Archive / Stringer 49, 69, Hulton Archive / Stringer 49, 69, Otto Herschan / Stringer 31, Popperfoto 106, Science & Society Picture Library 84, Science Photo Library 2, Stefano Bianchetti / Contributor 57, Topical Press Agency / Stringer 66, Universal Images Group 16; **Great Ormond Street Hospital:** 38; **Mary Evans Picture Library:** 59, 89, Peter Higginbotham Collection 46, 55, Illustrated London News Ltd 25; Permission granted free with thanks to **www.plaquesoflondon.co.uk** for permission to use their photograph: 78; Reproduced with the kind permission of **East Grinstead Museum:** 100; **© Royal College of Physicians:** 5; **Science Photo Library Ltd:** 12, 29; **The Blond McIndoe Research Foundation Ltd:** 99; **TopFoto:** 65; **Wellcome Library, London:** Copyrighted work available under Creative Commons Attribution only licence CC BY 4.0 http://creativecommons.org/licenses/by/4.0 9, 10; **Out of copyright/public domain:** 50, Radiography and Radio-therapeutics by Robert Knox 80.

All other images © Pearson Education Limited

*We are grateful to the following for permission to reproduce copyright material:*

**Figures**
Figure on page 83 from *Edexcel GCSE History B: Schools History Project – Medicine and Surgery* (Bushnell,N. and Warren,C. 2009) p.133, Pearson Education Ltd; Figure on page 103 from *Edexcel GCSE History B: Schools History Project – Medicine and Surgery* (Bushnell,N. and Warren,C. 2009) p.46, Pearson Education Ltd.

**Text**
Extract on page 50 from *The Illustrated History of Surgery*, Bell Publishing (Haegar,K. 1988) Routledge 9780517665749, The illustrated history of surgery by CALNE, SIR ROY Reproduced with permission of ROUTLEDGE PUBLISHING INC in the format Book via Copyright Clearance Center.

Select glossary terms have been taken from *The Longman Dictionary of Contemporary English Online*.

**Disclaimer**
All maps in this book are drawn to support the key learning points. They are illustrative in style and are not exact representations.

**Endorsement Statement**
In order to ensure that this resource offers high-quality support for the associated Pearson qualification, it has been through a review process by the awarding body. This process confirms that this resource fully covers the teaching and learning content of the specification or part of a specification at which it is aimed. It also confirms that it demonstrates an appropriate balance between the development of subject skills, knowledge and understanding, in addition to preparation for assessment.

Endorsement does not cover any guidance on assessment activities or processes (e.g. practice questions or advice on how to answer assessment questions), included in the resource nor does it prescribe any particular approach to the teaching or delivery of a related course.

While the publishers have made every attempt to ensure that advice on the qualification and its assessment is accurate, the official specification and associated assessment guidance materials are the only authoritative source of information and should always be referred to for definitive guidance.

Pearson examiners have not contributed to any sections in this resource relevant to examination papers for which they have responsibility.

Examiners will not use endorsed resources as a source of material for any assessment set by Pearson. Endorsement of a resource does not mean that the resource is required to achieve this Pearson qualification, nor does it mean that it is the only suitable material available to support the qualification, and any resource lists produced by the awarding body shall include this and other appropriate resources.

# 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:

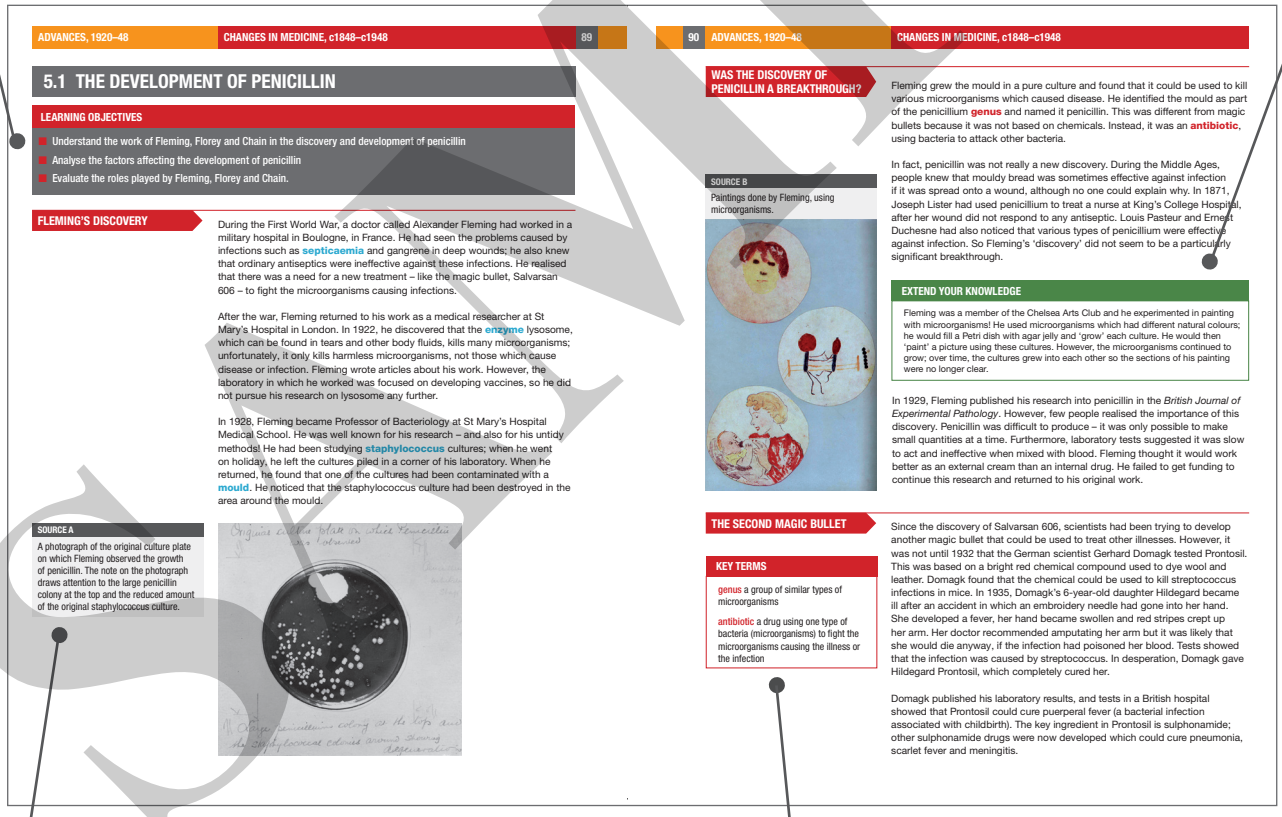
- Progress in the mid-19th century; Nightingale, Chadwick, Snow and Simpson
- Discovery and development, 1860–75; Lister and Pasteur
- Accelerating change, 1875–1905; Ehrlich, Koch and chemistry
- Government action and war, 1905–20
- Advances in medicine, surgery and public health 1920–48; the NHS

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.

**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.



ADVANCES, 1920–48 | CHANGES IN MEDICINE, c1848–c1948 | 89

## 5.1 THE DEVELOPMENT OF PENICILLIN

**LEARNING OBJECTIVES**

- Understand the work of Fleming, Florey and Chain in the discovery and development of penicillin
- Analyse the factors affecting the development of penicillin
- Evaluate the roles played by Fleming, Florey and Chain.

**FLEMING'S DISCOVERY**

During the First World War, a doctor called Alexander Fleming had worked in a military hospital in Boulogne, in France. He had seen the problems caused by infections such as **septicaemia** and gangrene in deep wounds; he also knew that ordinary antiseptics were ineffective against these infections. He realised that there was a need for a new treatment – like the magic bullet, Salvarsan 606 – to fight the microorganisms causing infections.

After the war, Fleming returned to his work as a medical researcher at St Mary's Hospital in London. In 1922, he discovered that the **enzyme** lysosome, which can be found in tears and other body fluids, kills many microorganisms; unfortunately, it only kills harmless microorganisms, not those which cause disease or infection. Fleming wrote articles about his work. However, the laboratory in which he worked was focused on developing vaccines, so he did not pursue his research on lysosome any further.

In 1928, Fleming became Professor of Bacteriology at St Mary's Hospital Medical School. He was well known for his research – and also for his untidy methods! He had been studying **staphylococcus** cultures; when he went on holiday, he left the cultures piled in a corner of his laboratory. When he returned, he found that one of the cultures had been contaminated with a **mould**. He noticed that the staphylococcus culture had been destroyed in the area around the mould.

**SOURCE A**
A photograph of the original culture plate on which Fleming observed the growth of penicillin. The note on the photograph draws attention to the large penicillin colony at the top and the reduced amount of the original staphylococcus culture.

90 | ADVANCES, 1920–48 | CHANGES IN MEDICINE, c1848–c1948

**WAS THE DISCOVERY OF PENICILLIN A BREAKTHROUGH?**

Fleming grew the mould in a pure culture and found that it could be used to kill various microorganisms which caused disease. He identified the mould as part of the penicillium **genus** and named it penicillin. This was different from magic bullets because it was not based on chemicals. Instead, it was an **antibiotic**, using bacteria to attack other bacteria.

In fact, penicillin was not really a new discovery. During the Middle Ages, people knew that mouldy bread was sometimes effective against infection if it was spread onto a wound, although no one could explain why. In 1871, Joseph Lister had used penicillium to treat a nurse at King's College Hospital, after her wound did not respond to any antiseptic. Louis Pasteur and Ernest Duchesne had also noticed that various types of penicillium were effective against infection. So Fleming's 'discovery' did not seem to be a particularly significant breakthrough.

**SOURCE B**
Paintings done by Fleming, using microorganisms.

**EXTEND YOUR KNOWLEDGE**
Fleming was a member of the Chelsea Arts Club and he experimented in painting with microorganisms! He used microorganisms which had different natural colours; he would fill a Petri dish with agar jelly and 'grow' each culture. He would then 'paint' a picture using these cultures. However, the microorganisms continued to grow; over time, the cultures grew into each other so the sections of his painting were no longer clear.

In 1929, Fleming published his research into penicillin 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 slow 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.

**THE SECOND MAGIC BULLET**

Since the discovery of Salvarsan 606, scientists had been trying to develop another magic bullet that could be used to treat other illnesses. However, it was not until 1932 that the German scientist Gerhard Domagk tested Prontosil. This was based on a bright red chemical compound used to dye wool and leather. Domagk found that the chemical could be used to kill streptococcus infections in mice. In 1935, 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 stripes crept up her arm. Her doctor recommended amputating her arm but it was likely that she would die anyway, if the infection had poisoned her blood. Tests showed that the infection was caused by streptococcus. In desperation, Domagk gave Hildegard Prontosil, which completely cured her.

Domagk published his laboratory results, and tests in a British hospital showed that Prontosil could cure puerperal fever (a bacterial infection associated with childbirth). The key ingredient in Prontosil is sulphonamide; other sulphonamide drugs were now developed which could cure pneumonia, scarlet fever and meningitis.

**KEY TERMS**
genus a group of similar types of microorganisms
antibiotic a drug using one type of bacteria (microorganisms) to fight the microorganisms causing the illness or the infection

**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.

**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.

**Activity**
Each chapter includes activities to help check and embed knowledge and understanding.

**Recap**
At the end of each chapter, you will find a page designed to help you consolidate and reflect on the chapter as a whole.

**Recall quiz**
This quick quiz is ideal for checking your knowledge or for revision.

**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 further study and the workplace.

**Hint**
All exam-style questions are accompanied by a hint to help you get started on an answer.

**Checkpoint**
Checkpoints help you to check and reflect on your learning. The Strengthen section helps you to consolidate knowledge and understanding, and check that you have grasped the basic ideas and skills. The Challenge questions push you to go beyond just understanding the information, and into evaluation and analysis of what you have studied.

**Summary**
The main points of each chapter are summarised in a series of bullet points. These are great for embedding core knowledge and handy for revision.

**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.

**Student answers**
Exemplar student answers are used to show what an answer to the exam question may look like. There are often two levels of answers so you can see what you need to do to write better responses.

**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 their strengths and weaknesses and show how they can be improved.

30 DISCOVERY AND DEVELOPMENT | CHANGES IN MEDICINE, c1848–c1948

ACTIVITY

1 Copy and complete the table below about change and continuity in surgery.

| | DEVELOPMENTS 1848–60 | DEVELOPMENTS 1860–75 | CHANGE OR CONTINUITY? |
|---|---|---|---|
| Ideas about the cause of infection | | | |
| Problems in surgery | | | |
| Dealing with pain | | | |
| Dealing with infection | | | |
| Dealing with blood loss | | | |

2 In groups of three, discuss one of the following lists of people and factors responsible for progress in surgery between 1848 and 1875. Arrange the items from your list in order of importance, making sure you can justify your choice.
a Key individuals: James Simpson; Louis Pasteur; Joseph Lister
b Scientific understanding (the study of gases and the study of infection); technology (equipment); communication (e.g. publishing ideas in medical journals and meeting other scientists and doctors at conferences)
c The attitudes of doctors and surgeons towards new ideas; the attitudes of ordinary people towards new ideas; the process of scientific enquiry (trial of a new idea, recording results, repeating the experiment, reporting results).
Now form new groups of three, containing one person who looked at each list. In your new groups, discuss whether individuals or factors were more responsible for this progress in surgery.
3 Working in pairs or small groups, model yourselves into 'living statues' where you freeze into positions showing a key moment in the development of surgery in the years 1846–75. See if the other groups can guess which event you are showing.

EXAM-STYLE QUESTION

How far were the problems of surgery solved in the years c1848–75?

You may use the following information to help you with your answer:
- ether
- blood loss.

(16 marks)

A01 A02

SKILLS PROBLEM SOLVING, REASONING, DECISION MAKING

HINT
The question asks you about the problems of surgery being solved so you will need to identify several problems and say what had been done to solve them. This is assessing your knowledge, understanding and recall of this topic.

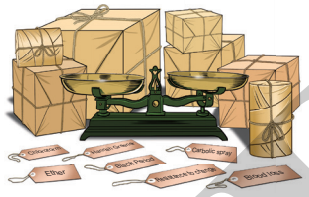



Figure 3.4 Problems in surgery

DISCOVERY AND DEVELOPMENT, 1860–75 | CHANGES IN MEDICINE, c1848–c1948 | 43

RECAP

RECALL QUIZ
1 Name three different liquids investigated by Pasteur.
2 What did Pasteur say was the cause of decay?
3 Why did Lister think about using carbolic acid in surgery?
4 Why did many surgeons not use Lister's carbolic spray?
5 What does 'laissez-faire' mean?
6 Why was public health in London improved by Bazalgette's work on sewers?
7 What were the terms of the 1875 Public Health Act?
8 How did Elizabeth Garret qualify as a doctor?
9 Why did medical schools and universities not want to accept female medical students?
10 How did Garrett, Hoggan, Jex-Blake and Pechey gain their medical degrees?

CHECKPOINT

STRENGTHEN
S1 Explain how Pasteur's work showed that the theory of spontaneous generation was wrong.
S2 Explain the importance of Lister's use of antiseptic techniques.
S3 Explain how the position of women in medicine changed in the years 1860–75.

CHALLENGE
C1 In which aspect of medicine had there been most improvement between 1860 and 1875?
C2 Why were surgeons slow to accept Lister's antiseptic techniques?
C3 How far did the position of women in medicine change in the years 1860–75?

SUMMARY
- Pasteur's germ theory showed that previous ideas about the cause of disease were wrong.
- Surgical operations were still very dangerous because hygiene remained poor and wounds often became infected.
- Joseph Lister used carbolic acid to kill microorganisms and prevent infection.
- Lister's ideas, and especially his spray, were not immediately accepted by many doctors.
- Joseph Bazalgette created a new sewer system for London which greatly improved hygiene within the city.
- The Public Health Act 1875 made it compulsory for local authorities to provide access to clean water, deal with sewage, remove rubbish and improve housing.
- Florence Nightingale set up a training school for nurses and wrote a number of books about nursing.
- Nightingale also stressed the importance of cleanliness and ventilation in hospital design.
- Elizabeth Garrett faced a great deal of unfair treatment because she was a woman but trained as a doctor and was accepted by the Society of Apothecaries.
- Several other women also wanted to train as doctors but had to go abroad if they wanted a university degree. This was changed by an Act of Parliament in 1876.

ACCELERATING CHANGE, 1875–1905 | CHANGES IN MEDICINE, c1848–c1948 | 63

EXAM GUIDANCE: PART (C) QUESTIONS

A01 A02

Question to be answered: How far was Lister responsible for the improvements in surgery in the years 1860–1905?

You may use the following in your answer:
- carbolic spray
- X-rays.

You must also use information of your own. (6 marks)

1 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 improvements in surgery in the years 1860–1905 and how Lister's work influenced these improvements.

You also have to explain, analyse and make judgements about historical events and periods; here, you need to give an explanation and reach a judgement about the role of various factors in bringing about changes.

2 Analysis Question 2: What do I have to do to answer the question well?
- You have been given two topics on which to write. You don't have to use them and can provide your own topics. (But it seems sensible to do so!)
- You must not simply give information. Think about what improvements these developments caused.
- You are also asked 'how far' Lister was responsible for the improvements in surgery. When discussing these developments, you need to consider whether Lister's work caused each change. The stimulus points for a question like this will usually include one hint that supports the statement and one hint that suggests an alternative.
- The question says you must use information of your own. You should include at least one extra factor, beyond the two topics you have been given. For example, you could talk about the development of aseptic surgery. Alternatively, you could say that Lister's work depended on Pasteur's germ theory and, in fact, Pasteur should get credit for the improvements.

3 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 a 16-mark question and you need to make sure you give a substantial answer. You will be working against the clock so you may wish to use the following techniques to help you succeed.
- Don't write a lengthy introduction. Give a brief introduction which answers the question immediately and shows what your paragraphs are going to be about.
- Make sure you stay focused and avoid just writing narrative. To help with this, try to use the words of the question at the beginning of each paragraph.
- Remember this question asks about causation. As with question (b), you must make sure your answer explains why each point means that Lister was (or was not) responsible for the improvements in surgery.

64 ACCELERATING CHANGE, 1875–1905 | CHANGES IN MEDICINE, c1848–c1948

Answer
The period 1860–1905 was one where there were some major developments in surgery which greatly improved the survival rate. The use of anaesthetics had actually increased the death rate because they hadn't solved the problem of infection, so Lister's work developing antiseptic techniques in the 1860s was a major improvement. However, to some extent, Lister's work was based on Pasteur's germ theory and later developments were based on new technology, so Lister cannot be given all the credit for the improvements.

*Good introduction*

Lister read about Pasteur's germ theory and made the link to infection in surgery. He also knew about the use of carbolic acid to deal with sewage and experimented with the use of carbolic acid to fight infection in surgery. He developed antiseptic techniques to keep the instruments clean, to spray the wound and the surgeon's hands while operating, and to keep the bandages clean. As a result, deaths from infection were dramatically reduced. Even though his work depended on Pasteur's germ theory, it was Lister who made the connection to surgery and Lister who experimented and publicised antiseptic techniques, so he deserves the credit for the development of antiseptic surgery.

*Nice paragraph. Answers the question, gives contextual knowledge and links improvements in surgery to the work of Lister.*

There were many developments in surgery in the period 1875–1905. New techniques were developed to sterilise the instruments by using steam and the surgeon wore gloves and a face mask to prevent any microorganisms being transferred during the operation. There was also new technology such as X-rays which helped surgeons by showing where bones were broken or if something was inside the wound.

*This is good detail, but you only imply that these developments have nothing to do with Lister. You need to explicitly link the information here to the question about how far Lister was responsible for improvements in surgery.*

There were also developments in blood transfusions because Landsteiner showed there were different blood groups in 1901. People realised that the blood group had to be matched to make transfusions work.

*This is a very disappointing paragraph. Landsteiner's discovery did not have much impact on surgery within the timescale of the question. In addition, the answer does not link this to the question, it's just a statement that is vaguely about surgery.*

Although Lister could not have developed antiseptic techniques without Pasteur's work, Lister does deserve credit for many improvements in surgery in the 1860s and 1870s. The later improvements, such as aseptic surgery, built on his work. However, he cannot be given credit for all the improvements in surgery because new technology such as X-rays had nothing to do with Lister.

*Good concise finish; this makes a clear judgement about how far Lister was responsible for the improvements in surgery.*

What are the strengths and weaknesses of this answer?
*The teacher comments show strengths and weaknesses. Notice that the weaker second half of the answer has lots of detail but this is not used to answer the question. If there had been three paragraphs like the one on Lister and antiseptic techniques, this would have been a very good answer.*

Work with a friend
Discuss with a friend how you would rewrite the weaker paragraphs in this answer so that the whole answer could get very high marks.

Challenge a friend
Use the Student Book to set a similar part (c) question for a friend. Then look at the answer. Does it do the following things?
- ☐ Identify improvements
- ☐ Provide detailed information about the improvements
- ☐ Show how the stated factor was responsible for the improvements
- ☐ Consider examples that challenge the statement
- ☐ Provide a factor other than the two given in the question
- ☐ Address 'how far?'

## TIMELINE – CHANGES IN MEDICINE, c1848–c1948

**1846** Robert Liston uses ether as an anaesthetic

**1847** James Simpson discovers chloroform as anaesthetic

**1848** Public Health Act

**1854** Cholera epidemic John Snow and the Broad St pump

**1858** Great Stink

**1859** Florence Nightingale publishes *Notes on Hospitals* and *Notes on Nursing*

**1860** Nightingale School for the training of nurses established

**1861** Pasteur's germ theory

**1865** Lister's first use of carbolic acid in surgery Elizabeth Garrett Anderson officially qualifies to practise medicine

**1875** Public Health Act Artisans' Dwellings Act

**1876** Medical Act allows women to study medicine and qualify as doctors

**1878** Pasteur publishes *Germ Theory and its Applications To Medicine*

**1882** Koch identifies microorganism causing tuberculosis

**1883** Koch identifies microorganism causing cholera

**1889** Infectious Disease (Notification) Act

**1895** Röntgen discovers X-rays

**1901** Landsteiner identifies different blood groups

**1907** School Medical Service introduced

**1909** Ehrlich develops Salvarsan 606

**1910** Marie Curie develops use of radiotherapy in cancer treatment

1846 1860 1880 1900

**1848** Gold rush in California Marx writes 'Communist Manifesto'

**1861** Kingdom of Italy formed Abraham Lincoln becomes US President

**1863** US civil war begins

**1869** Suez Canal opens

**1871** German Empire formed

**1878** British defeat Zulus

**1881** Tsar Nicholas of Russia assassinated Triple Alliance formed between Austria-Hungary, Germany and Russia

**1898** Outbreak of bubonic plague which kills 3 million people

**1899** Boer War starts

**1901** Queen Victoria dies

**1905** Revolution in Russia

**1911** Revolution in China

**1914** Outbreak of First World War

## TIMELINE – WORLD

**1917**
Gillies set up a plastic surgery unit at the Queen's Hospital in Sidcup, Kent

**1914–18**
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

**1928**
Fleming discovers penicillin

**1939–45**
Second World War: developments in plastic surgery, blood transfusions, brain and heart surgery

**1942**
Beveridge Report

**1939**
Florey and Chain begin work on penicillin

**1946**
National Health Service Act

**1948**
National Health Service begins

**1920** **1930** **1940** **1950**

**1916**
Battle of the Somme

**1917**
Two revolutions in Russia
Balfour Declaration

**1918**
End of First World War

**1919**
Versailles Peace Treaty

**1920**
League of Nations founded

**1923**
Munich Putsch

**1924**
Lenin dies

**1929**
Wall St Crash
St Valentine's Day Massacre

**1933**
Hitler becomes German chancellor
Roosevelt introduces New Deal

**1934**
Long March in China

**1939**
Outbreak of Second World War

**1940**
Trotsky murdered

**1941**
Germany invades Soviet Union

**1944**
Bomb plot against Hitler

**1945**
End of Second World War
United Nations founded

**1947**
Truman Doctrine
India and Pakistan become independent countries

**1948**
Israel founded
British leave Palestine

# 1. PROGRESS IN THE MID-19TH CENTURY

## LEARNING OBJECTIVES

- Understand the range of barriers to progress in medicine and in surgery
- Understand the importance of key individuals: Nightingale, Chadwick, Snow and Simpson
- Evaluate the standard of medicine in the mid-19th century.

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.

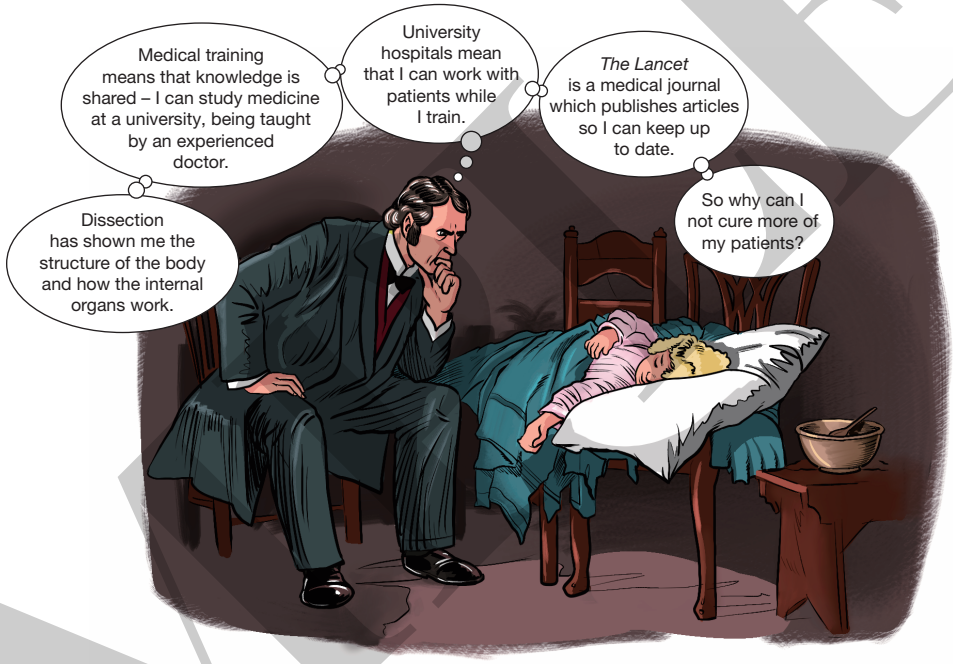
People's reluctance to go through an operation was understandable. Surgery consisted of basic operations which had to be carried out as quickly as possible because there was no pain relief. Even if the patient survived the operation itself, there was a high death rate afterwards because of infection. 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.




▲ **Figure 1.1** The doctor's dilemma

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.

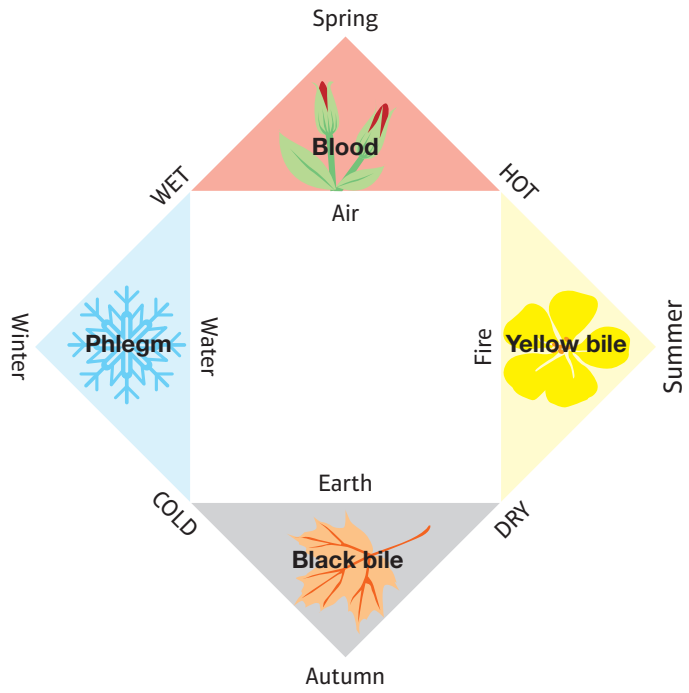
## FOUR HUMOURS

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).

### 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




▲ **Figure 1.2** The Four Humours


▲ **Figure 1.3** Examples of the Theory of Opposites

## MIASMA

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.

## SPONTANEOUS GENERATION

**SOURCE A**

From a description of a poor area in London written in 1852.

The water of the huge ditch in front of the houses is covered with a scum. Along the banks are heaps of indescribable filth. The air has literally the smell of a graveyard.

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.

## DOCTORS' KNOWLEDGE

**KEY TERM**

microorganisms single-celled living organisms which are too small to be seen without a microscope; they may also be called microbes or bacteria; microorganisms associated with disease are often called germs

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**.

**SOURCE B**

'The Dissecting Room', an illustration from c1780.

**EXTEND YOUR KNOWLEDGE**

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.

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.

## FACTORS AFFECTING PROGRESS

- 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.

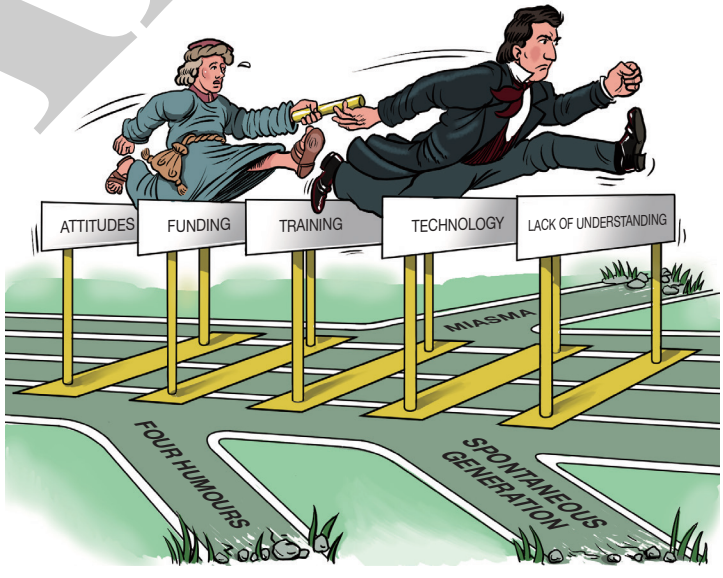



**Figure 1.4** Barriers to progress

### 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.

## 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.

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.

### CONDITIONS AT SCUTARI

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.

- 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.

### 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?

### EXAM-STYLE QUESTION

AO1 AO2

SKILLS ADAPTIVE LEARNING

Explain **two** ways in which the situation at Scutari in 1856 was different from the situation when Nightingale arrived. **(8 marks)**

**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.

**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.

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.

## THE USE OF ETHER

**SOURCE G**

From the diary of a 19th-century surgeon.

1 May 1847

Went to Bartholomew's Hospital and witnessed two operations under the influence of Ether: the first I have seen. The loss of feeling on both occasions was complete: the patient had no consciousness of the operation. But the effect on the patient afterwards was appalling, although brief.

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!

## SIMPSON AND THE USE OF CHLOROFORM

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.

**SOURCE H**

A drawing c1850, of Simpson and his friends waking up after using chloroform.

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.

### EXTEND YOUR KNOWLEDGE

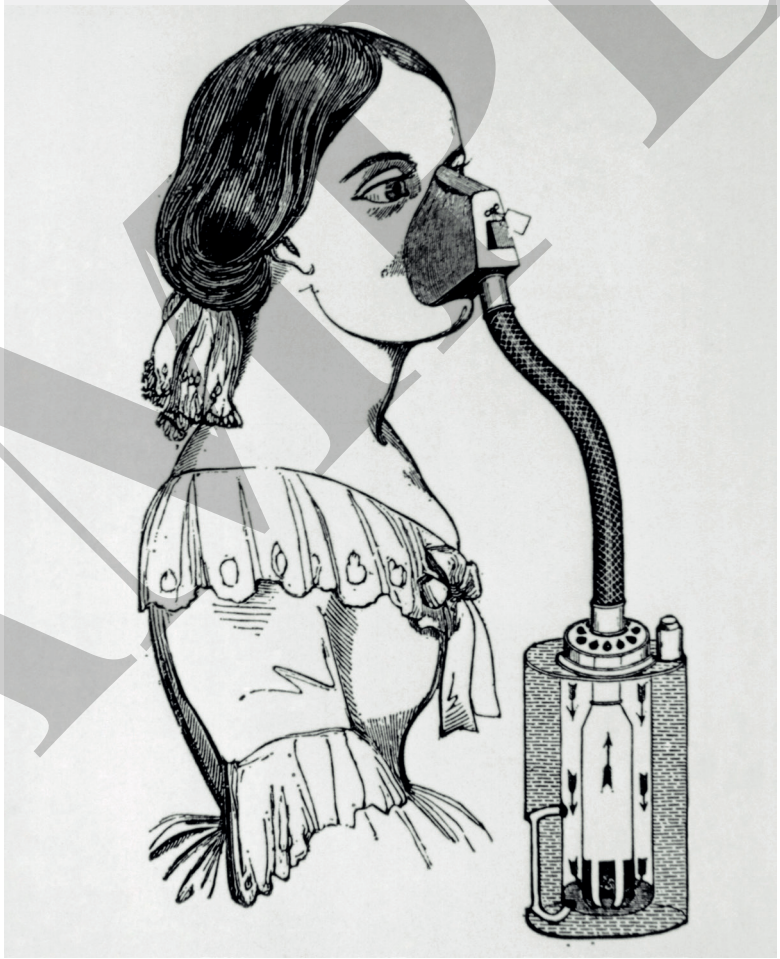
The problem of getting the dose right was seen in the death of Hannah Greener in 1848. She was a 14-year-old girl who was having an ingrowing toenail removed; this was a minor but painful operation, so she was given chloroform. However, she died almost immediately.

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.

## THE PROBLEM OF INFECTION

### KEY TERMS

**gangrene** the cells in the body need oxygen; when the blood supply carrying oxygen does not reach cells, they begin to decay and the flesh rots; this can happen if the blood supply is cut off for too long during an operation, or if infection gets into an open wound

**sepsis** if the body is fighting an infection, the blood supply to the organs such as the brain, heart, liver and kidneys can be reduced, causing the organs to fail and the patient to die; this is also known as blood poisoning

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

AO1 AO2

SKILLS ADAPTIVE LEARNING

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.

## ACTIVITY

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.

▼ Problems and solutions in surgery

| ▼ PROBLEM | ▼ SOLUTION | ▼ EVALUATION |
|---|---|---|
| Pain | Ether solved the problem of pain but had side effects.<br>Chloroform solved the problem of pain and appeared to have fewer side effects, especially once the inhaler meant that dosage could be controlled. | 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.<br>Surgeons were now encouraged to try more complex operations. |
| Infection | This had not been solved. | The death rate actually rose because there was more risk of infection in more complex operations. |
| 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. | This meant that surgeons still could not do lengthy operations. |

# 1.4 PROBLEMS AND IMPROVEMENT IN PUBLIC HEALTH

## LEARNING OBJECTIVES

- Understand the problems of public health in 1848
- Analyse the role of Edwin Chadwick and of government in improving living conditions
- Evaluate the extent to which public health had improved by 1860.

▼ The growth in urban population 1801–51

| ▼ POPULATION | ▼ 1801 (thousands) | ▼ 1851 (thousands) |
|---|---|---|
| Glasgow | 77 | 329 |
| Liverpool | 82 | 376 |
| Birmingham | 71 | 233 |
| Manchester | 70 | 303 |
| Leeds | 53 | 172 |
| London | 957 | 2,362 |

**KEY TERM**

**Industrial Revolution** a period in the early 19th century when the use of power to run machines led to major changes in the way people worked and the growth of industrial towns

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.

## KILLER DISEASES

**KEY TERMS**

**typhus** this disease is spread by body lice; the symptoms include fever, sudden chills, headaches and the patient becoming delirious

**typhoid fever** a disease spread through contaminated water; the symptoms include headaches and nosebleeds, fever which can last up to 3 weeks, a rash and mental confusion

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.

**Figure 1.5** A typical court

## DEALING WITH CHOLERA

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.

### KEY TERM

**local authorities** town councils, who make decisions and pass regulations affecting their local area

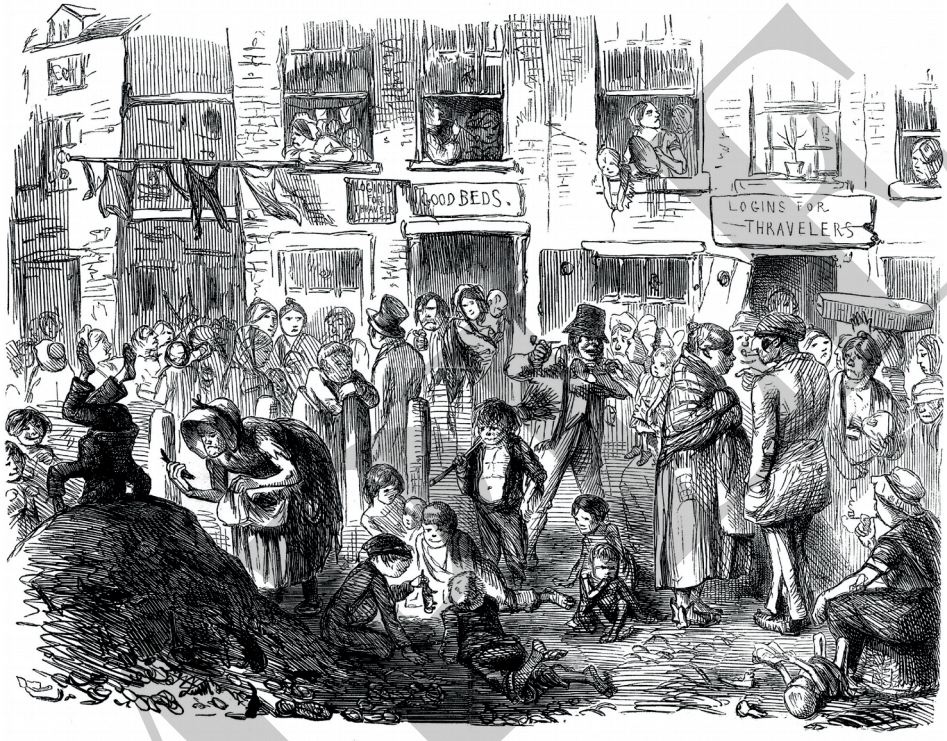
### EXTEND YOUR KNOWLEDGE

Many people also believed that smoking tobacco could protect you from bad air.

- **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**

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




A COURT FOR KING CHOLERA.

**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 AND THE 1848 PUBLIC HEALTH ACT

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

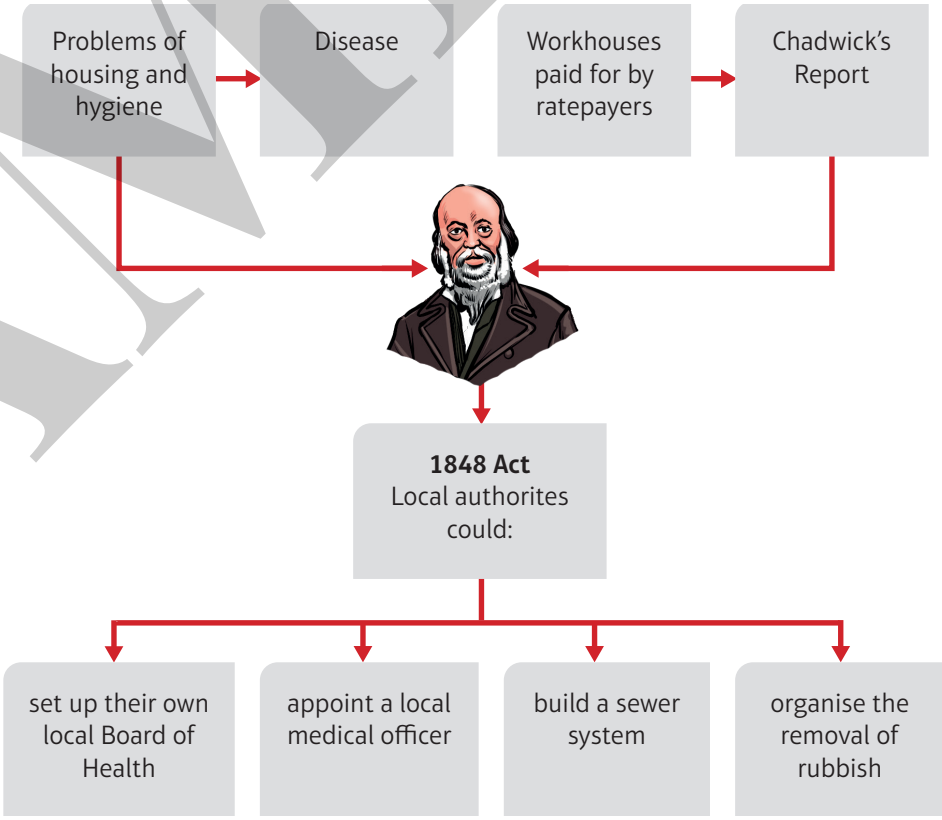
and had to be supported in a workhouse. His recommendations had included providing clean water and removing rubbish and **sewage**.

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.




▲ **Figure 1.6** Causes and consequences of the 1848 Public Health Act

## 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?

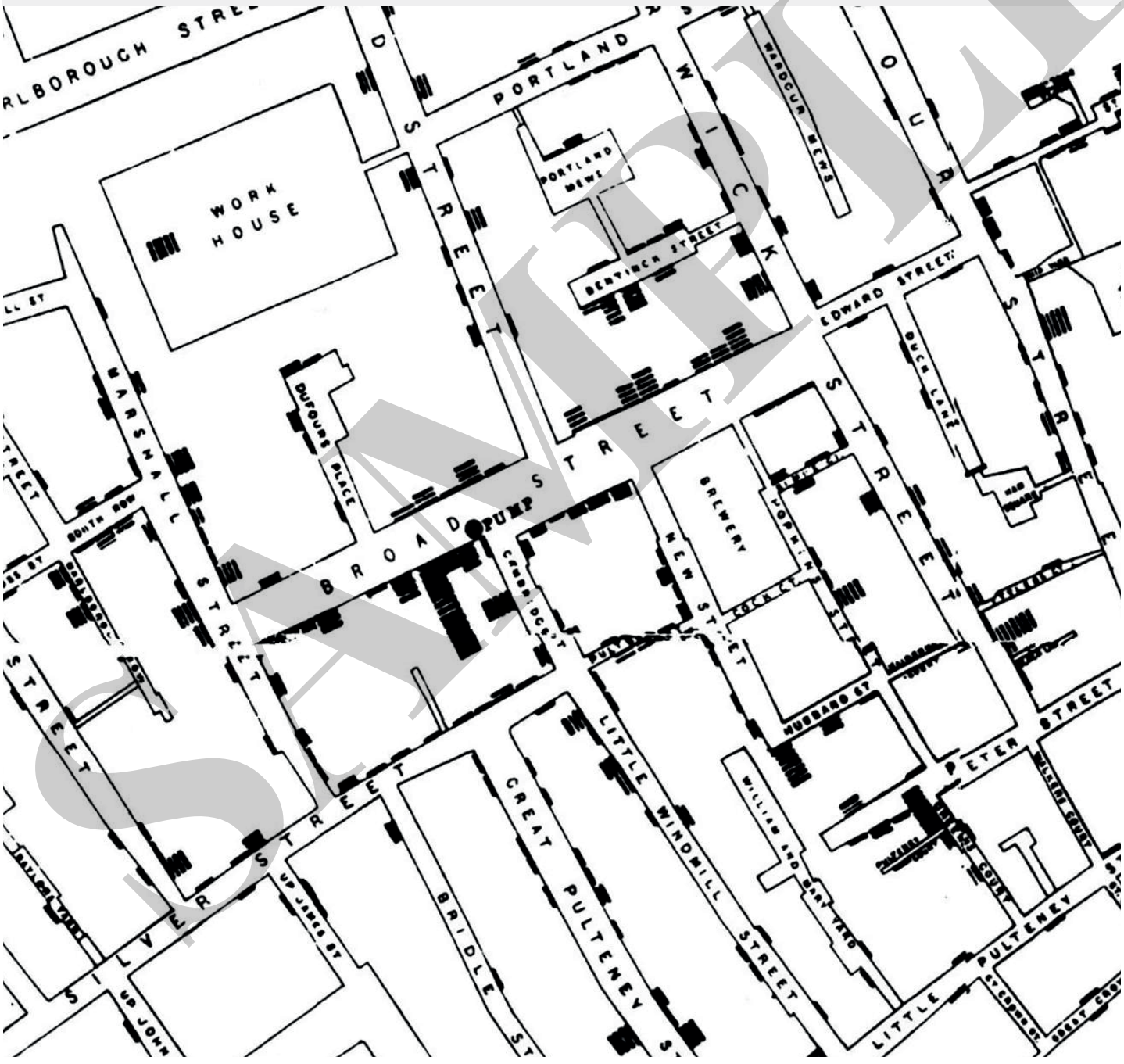
## JOHN SNOW AND THE BROAD STREET PUMP

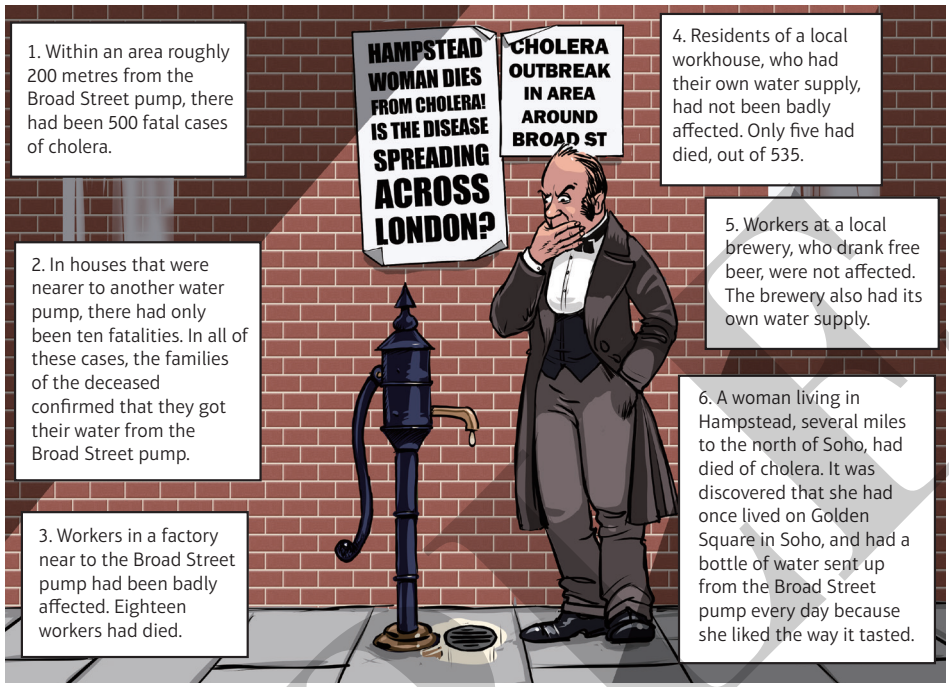
Another epidemic in 1854 helped to change people's attitudes. Dr John Snow had suggested in 1849 that cholera was being spread by polluted water. He now conducted research that proved his idea was correct.

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.

**SOURCE M**

John Snow's map of the cholera outbreak in Soho.






▶ **Figure 1.7** John Snow's research

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.

Although the link between cholera and polluted water was now clear, very little was done to improve public health until 1858. The hot summer in this year meant that rivers began to dry up. As the level of the River Thames in London began to drop, the rubbish and excrement that was taken to the river by the sewers was exposed along the river banks. The 'Great Stink' was so bad that MPs in parliament actually discussed whether their meetings should be held in another building, away from the river. Realising that this would not solve the problem for the people of London, MPs then passed an act (in the short space of 18 days) to provide the money for a new sewer system; Joseph Bazalgette was chosen as the engineer to design it. However, the most significant improvements in public health did not happen until after Pasteur developed his germ theory in 1861.

## EXTEND YOUR KNOWLEDGE

In 1857, John Snow wrote about a small cholera outbreak that he investigated in east London near West Ham. He noted that cases of cholera were reduced when people refused to drink foul-smelling water.

## ACTIVITY

1. Which part of Snow's evidence do you find the most convincing in demonstrating the link between infected water and cholera?
2. Why do you think parliament did not immediately pass laws to improve the supply of clean water?
3. Who played a more important role in public health: Edwin Chadwick or John Snow?

# 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.

# EXAM GUIDANCE: PART (B) QUESTIONS

AO1 AO2

SKILLS ADAPTIVE LEARNING

**Question to be answered: Explain two causes of improvements in surgery in Britain from 1848–60. (8 marks)**

1 **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.

2 **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.

3 **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.

4th

### 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.

*This answer does not clearly identify two improvements in surgery, although it implies chloroform and the inhaler made surgery better. There is little supporting detail and it lacks a focus on explaining why the improvement took place.*

*This is typical of a Level 1 answer: it is about the general topic (surgery) but it has no specific explanation of improvement. The supporting detail, although accurate, is fairly general.*

1st

### 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.

*This is an excellent answer. Each paragraph begins by stating a change and explaining why it was an improvement. The student has included specific details to show what changed and why each change was an improvement. It would be likely to receive full marks.*

*Note: this question is only about improvements in surgery. It does not ask 'how far' surgery improved, so there is no need to discuss other problems like the Black Period in surgery.*

### 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!**