

ROBERT CLACK SCHOOL
GCSE HISTORY

Paper 3 – Revision Booklet

Name _____

Teacher _____

**Development Study –
Health & Medicine 1345 onwards**

This unit looks at the developments in medical knowledge and prevention/treatment of diseases in...

- a) The Middle Ages**
- b) The Renaissance**
- c) The Nineteenth Century**
- d) The Twentieth Century**

Section A - Checklist



What were the main factors governing the expansion of medical knowledge over time?

How did people combat and treat disease in the middle ages?

- Beliefs about the cause of disease – supernatural and natural
- How were medieval doctors trained?
- Diagnosis in the middle ages – four humours, leechbook, urine charts
- Treatment in the middle ages – rebalancing the humours, bleeding, purging.
- Surgeons in the middle ages
 - Barber surgeons
 - Professional surgeons
 - Operations which could be performed
 - Problems with surgery
- Developments in surgery
 - John of Ardenne
 - Theodoric of Lucca
- How did the church help or hinder progress?
 - Education, hospitals, monasteries
 - Galen, healing through prayer, bans on dissection

What did people believe caused disease?

- In the Middle Ages most people believed disease was a **punishment from God or the work of the devil**. For example when the Black Death broke out in 1348 the most common way people reacted was to pray.
- **The theory of the four humours** - was also popular, and medieval doctors used this to diagnose and cure people.
- **Astrology** – people blamed the movement of the planets.
- **Common sense reasons** – Although germ theory had not yet been discovered people could make the logical link between bad smells and disease.
- **Fear** – people could not explain disease and often reacted in fear. In 1348 Jews were burnt in Germany for apparently causing the plague by poisoning wells.

How would a medieval doctor be trained?

- Medical universities were set up after 900.
- The first was at **Salerno** in 900.
- By 1200 the most famous was **Montpellier** in France.
- Doctors were called **physicians**.
- Trainees read medical books from ancient writers - e.g. Galen and Hippocrates.
- They also read Arabic texts – Avicenna and Rhazes
- Guy de Chauliac a 14th century French doctor explains in his book that he also learnt through **dissection**.
- This was forbidden by the Catholic Church but at Montpellier after 1340 one body was allowed to be dissected per year. Even then, this was performed by a teaching assistant, not a student.
- **Women** – could become surgeons and doctors, but were usually midwives and wise women.



How would doctors diagnose you in the middle ages?

- **Bald's Leechbook** – was an Anglo Saxon text which explained that worms caused disease and could be found in human faeces.
- **Theory of the four humours**- your humours would be checked for balance. One popular method was to use a **urine chart**. This allowed doctors to compare the colour, smell and taste of your urine to the chart to diagnose you.
- **Astrology** – physicians may check the position of the moon and planets to understand a disease.
- **A Vademecum** – was a handbook used by many doctors. It contained several ways to diagnose patients including tables of planets, a urine chart and a set of rules for bleeding patients.



How would doctors treat you in the middle ages?

- **Bleeding** – this was the most common treatment used to balance the humours. Patients were cut on the arm and bled often into a bleeding bowl.
- Monastery records show monks were bled between 7 and 12 times a year.
- **Leeches** – these were used to suck out patients blood (and still are today)
- **Purging** – the patient would be forced to vomit or take laxatives to re-balance the humours.
- **BUT ...**only the very wealthy could afford physicians and doctors most people relied on local wise women and family remedies to cure them.



- 1. Explain the five factors which medieval people believed caused disease:**
 - 1.
 - 2.
 - 3.
 - 4.
 - 5.
- 2. Are any of these still seen as causes of disease today?**
- 3. Which of these are natural and which are magical or supernatural?**
- 4. Name the first medical university and the year in which it was set up.**
- 5. Which ancient writers did medieval doctors study?**
- 6. Which Arabic writers did they study?**
- 7. When were medieval doctors allowed to perform dissections?**
- 8. Would the dissections have been very useful?**
- 9. What was Bald's leechbook?**
- 10. What did a vademecum contain?**
- 11. How was astrology used?**
- 12. Why did doctors bleed patients?**
- 13. How were leeches used?**
- 14. How else did doctors try to re-balance the humours?**
- 15. Were physicians available to everyone?**

How did you become a surgeon?

In the Middle Ages there were two types of surgeons:

1. **Professional surgeons** – trained, licensed and well paid. These were known as master surgeons.
2. **Barber surgeons** – these surgeons would bleed people, pull out teeth and cut your hair!
 - **People were very unlikely to survive surgery.**
 - There were **no anaesthetics** – to dull the pain or “knock” you out.
 - **No antiseptics** – to prevent infection
 - **Limited anatomical knowledge** – surgeons did not really know what the inside of the body looked like.
 - **No way of limiting blood loss** – blood transfusions were not possible and patients often died of this.

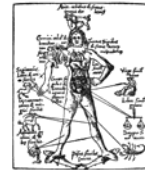


What sort of surgery could be performed? Minor Surgery

- **External surgery e.g. treating cataracts, removing superficial tumours.**
- **Amputations** – removal of limbs
- **Caesareans operations** – although the mother often died.
- **Broken or fractured limbs** – could be set.
- **Removal of gall stones** – using a hook inserted into the rectum

How did surgeons decide where to operate?

- **Zodiac man** – this was a chart showing which parts of the body were affected by which planet. If you were a certain star sign particular parts of your body could not be cut e.g. Pisces = feet
- **Wound man** – was also a chart used by war surgeons to recognise particular injuries.



What improvements were made in surgery during the Middle Ages?

War was a factor which did accelerate surgical improvement.

Surgeons were able to see the human body and practice their operations during campaigns.

1. **John of Arderne** - served in the English army in the 1300's and then lectured on surgery. He was a specialist in operations on the rectum and some of his methods are still used today.
2. **Hugh and Theodoric of Lucca (1200's)** – (father and son) used wine to treat pus filled wounds. Before them pus was seen as “praiseworthy”
3. **Hemlock and opium** – were used as anaesthetics but were often unsuccessful as dosage was not controlled.
4. **Removal of arrows, cauterisation (burning) of wounds to stop blood loss, development of new instruments.**



What limited surgical progress?

- Surgeons did not understand the anatomy of the body. They were rarely allowed to dissect due to the Catholic church and had to follow Galen's ideas about the skeleton, organs etc.
- Some surgeons stole bodies or used the bodies of executed criminals but.....
- If they challenged Galen's ideas they could be accused of **heresy** by the church. This was punishable by death.
- The ideas of John of Arderne etc. were slow to spread as the printing press had not been invented and so his book was not widely **disseminated** (spread) and most people were illiterate (could not read).
- Operations had to be fast to avoid the patient dying from pain or blood loss. This meant it was hard to perfect techniques.

1. What were professional surgeons?
2. What were barber surgeons?
3. Give four reasons that surgery was usually unsuccessful.
 - 1.
 - 2.
 - 3.
 - 4.
4. Give five examples of surgery which could be performed in the middle ages.
 - 1.
 - 2.
 - 3.
 - 4.
 - 5.
5. What did surgeons use Zodiac Man for?
6. How was wound man used?
7. Why did war help to improve surgery?
8. In a sentence explain the importance of:
 - (i) John of Arderne
 - (ii) Hugh and Theodoric of Lucca
 - (iii) War inflicted injuries
9. What were opium and hemlock used as? Why were they unsuccessful?
10. How did the church prevent surgery from improving? (refer to Galen, dissection and heresy)
11. What does dissemination mean?
12. Was there any improvement in surgery in the Middle Ages?

Did the church help or hinder medical progress in the Middle Ages?

Fill in the following diagram:



I believe the church has helped medicine to progress because....



I believe the church has hindered medical progress because....



There are other factors that hindered progress in the Middle Ages...



As there are other factors which helped medical progress....

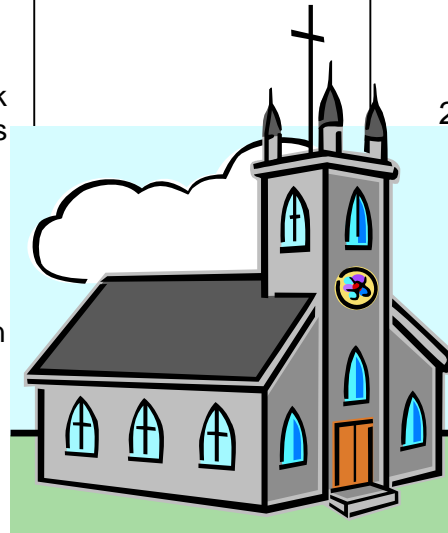
Did the church help or hinder medical progress in the Middle Ages?

Evidence the church improved medical knowledge and surgery..

1. **Education** - Universities and medical schools were set up all over Europe by the church e.g. Salerno, Paris, Oxford and Cambridge.
2. Medical knowledge did increase due to these universities. E.g. John of Gaddesden an English physician (1280-1361) wrote the *Rose Anglica* a book of new drugs, diet ideas, cures and injuries. This was based on his study of Galen and Arabic writers and his own observations.
3. **Hospitals** were founded by the church. They were often attached to monasteries. They did not offer medical treatment but rest, relaxation, prayer, care herbal remedies and a balanced diet. St Leonard's in York had over 200 beds and in Stamford a hospital was set up for the deaf, dumb and mute.
4. The church set up systems for **fresh water** in its monasteries improving public health.
5. The teaching of the Christian church includes the sick. Caring for people is part of the churches **tradition**.

Other reasons knowledge developed....

1. **War** - The Hundred Years War (1337-1453) gave surgeons more practice.
2. **Pharmacies** – were set up selling medicines and herbs. This idea was copied from Arab countries.



Evidence the church hindered the understanding of the body and surgery.

1. The church valued **supernatural healing** through prayer and pilgrimage. It saw disease as the work of God as a punishment or as the work of the devil. This stopped people from looking for natural causes and scientific cures.
2. **Dissection** – according to Christianity people will need their entire bodies when the end of the world comes, and so can not be dissected at all. Until the 14th century no dissections were allowed and then only one annually after 1340. This stopped any development in understanding the human body. Doctors who dissected illegally could not safely share their findings.
3. **Galen** – the church would not tolerate any teaching which went against Galen's ideas. This was seen as heresy. When Roger Bacon a 13th century priest said doctors should do original research he was put into prison.

Other reasons knowledge was hindered...

1. **Astrology** – remained popular as did other superstitions not necessarily based on Catholicism.
2. **Medicine was only for the wealthy**
3. **Bleeding** – was always the most common remedy and tradition is hard to break.

Section B - Checklist

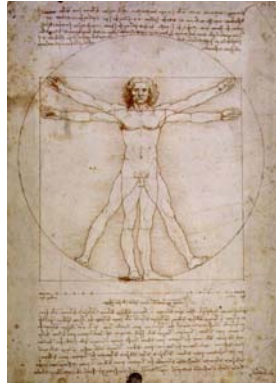


How did the Renaissance influence medical knowledge?

- Factors which encouraged medical progress during the renaissance
 - Art
 - Scientific revolution
 - War
 - Education
 - Printing
 - Technology
- How did Vesalius improve medical knowledge?
- How did Pare improve medical knowledge?
- How did Harvey improve medical knowledge?

Factor 1: Art

In the middle ages people were not drawn accurately. This changed in the renaissance and the human body was drawn in proportion. Artists like Da Vinci wanted to, and did, dissect to portray the body accurately. This inspired medical men like **Vesalius** to look at the body in detail and made dissection more acceptable.



Factor 2: Challenges to old ideas: The Scientific revolution

The church was starting to become less influential and less controlling. It had been challenged in many ways especially by science...

Martin Luther – argued against many of the teachings of the Catholic church and set up the Protestant church.

Galileo and Copernicus – both proved (although they were forced to take it back) that the church was wrong about the earth being the centre of the universe

Descartes a French scientist, taught people only to believe what they could prove.

Newton discovered the law of gravity

The church was being challenged and doctors now felt more confident in challenging Galen.

Factor 3: Technology and machinery

New machines like the water pump showed that for objects to work several small parts were needed.

This later inspired **Harvey** to look for valves in the heart.

Robert Hooke invented a more powerful microscope and by 1661 an Italian scientist was able to discover capillaries. For the first time people realised there were some things that the naked eye could not see.

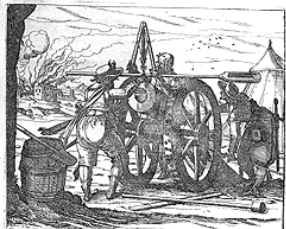


Why was the Renaissance a time for medical progress? (1400-1750)



Factor 4: Wars

These still provided a way for doctors to practice and perfect techniques. New weapons like muskets etc. meant new treatments had to be found. War helped **Pare** to discover new ways of treating wounds.



Factor 5: Education

The renaissance saw a return to the value of ancient Rome and Greece and education became increasingly important. Boys from rich families attended school. More universities were set up. Societies were set up across countries for doctors to share their ideas and discuss theories. In England the Royal society was established.



Factor 6: Printing

The invention of the printing press by Gutenberg was hugely significant. Books could be mass produced and this meant that doctors ideas could be disseminated widely (spread) and that people could read, critique and work on them. The most influential book of this time was **Vesalius**' "Fabric of the Human Body" 1543



Why was the Renaissance a time for medical progress?

Write a paragraph to explain how each of the following factors helped medical knowledge progress:

1. Art

2. The Scientific Revolution

3. Martin Luther's challenge

4. New technology

5. War

6. Education

7. Communication – printing press

Describe how the work of Vesalius improved medical knowledge.

Biography

- Andreas Vesalius (1514-1564)
- Studied medicine in Italy and Paris where he met artists who were dissecting the human body to make their paintings realistic.
- He was an **anatomist**



How was he able to do this?

Vesalius was able to capitalise on (take advantage of) the Renaissance.

Dissection had become more acceptable.

Artists inspired by people like Da Vinci and Michelangelo were experts at drawing muscles, bones, organs etc.

He was able to have his work published. This was crucial as it allowed his ideas to spread.



He was an individual genius.

Publication

Published "*The Fabric of the Human Body*" in 1543. This was a book full of accurate **anatomical** illustrations of all parts of the human body. This was the first book of its kind and as a result many believe Vesalius is the founder of modern medicine.

Why was Vesalius important?

1. **He was an innovator who challenged old ideas** - He was the first person to ever fully and accurately record the human body. Doctors and surgeons could base their ideas on his work.
2. **He made dissection more acceptable** – Vesalius proved that dissection was necessary to understand the body, breaking away from the church. He inspired others and gave them confidence. He also performed public dissections to attract the public and encourage them to donate money to medical research.



3. He proved Galen wrong –

This is hugely important. No one ever dared challenge Galen but Vesalius **proved** he was wrong in two ways. Galen had dissected animals not people.

1. Galen had said that your jaw is made up of two bones which join together at your chin – because he had seen this in animals. Vesalius discovered that your jaw is made up of just one bone!

2. Galen had discovered that your heart is made up of different parts – two of them are the right ventricle and the left ventricle. Galen said that blood passed through a membrane called the septum. Vesalius showed that this was impossible because there were no holes or gaps in the real septum – he did this by looking at real human hearts.

4. **Inspiration** – his publication and his challenge of Galen inspired others. William Harvey discovered the circulation of the blood partly because Vesalius inspired him.

Describe how the work of Vesalius improved medical knowledge.

1. When was Vesalius born and when did he die?
2. What was the name of his book?
3. When was it published?
4. What did it contain?
5. Explain two renaissance factors which helped him to make his discoveries.
 - 1.
 - 2.
6. Why was Vesalius important.....
 1. He challenged old ideas and the church by
 2. He made dissection more acceptable by
 3. He challenged Galen....
 4. He inspired others.....
7. What did people understand about the body before Vesalius?
8. What did they understand after him?

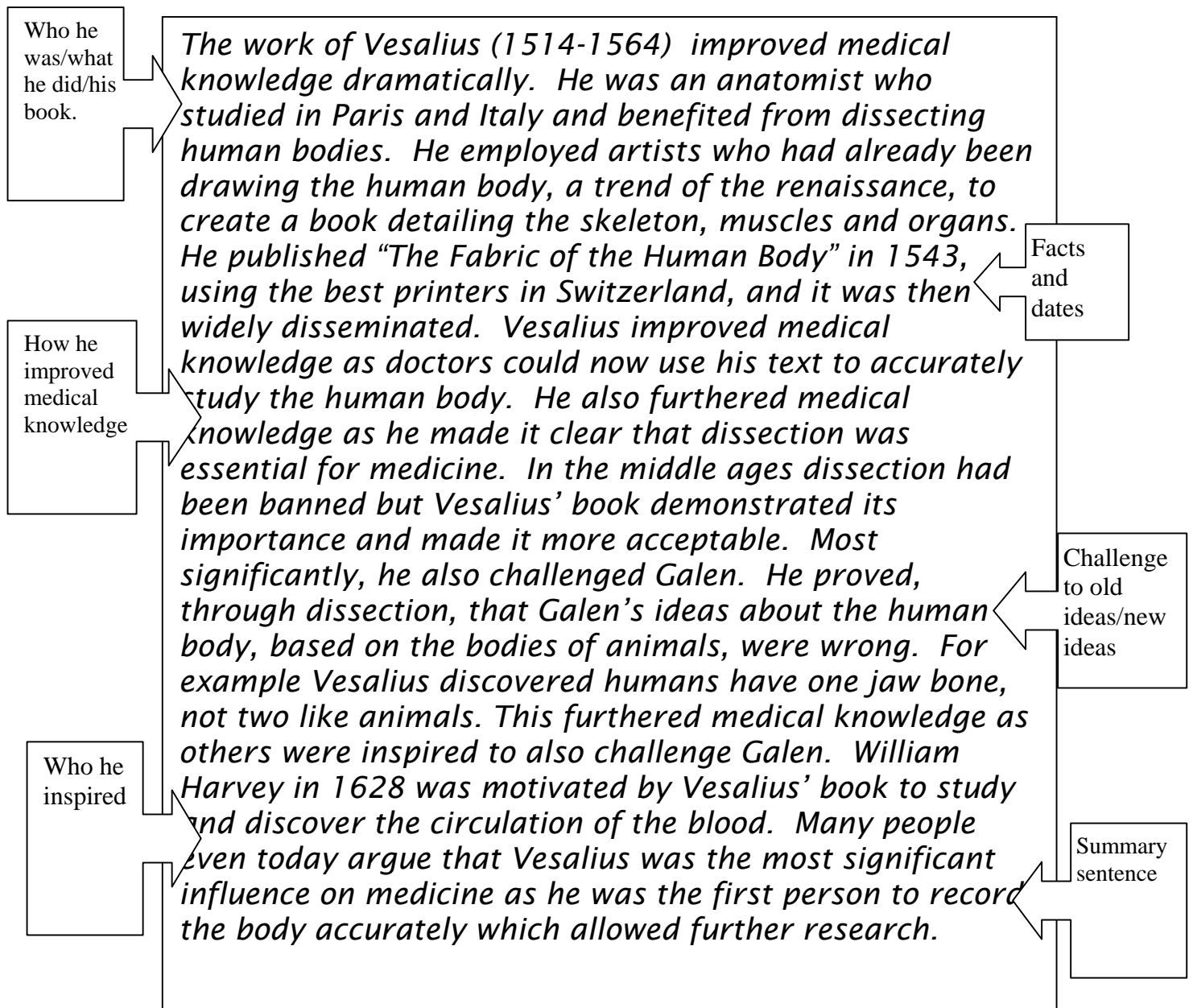
Describe how the work of Vesalius improved medical knowledge. (4 marks)

This could be the second question you are asked on the medical knowledge paper. It could be on Vesalius, Pare or Harvey. Below is an A grade answer.

It is crucial that you do not just describe his work.

You must clearly show why he was important

- **What ideas did he challenge?**
- **How could others build on his work?**
- **Who did he inspire?**



Describe the work of Ambroise Pare.

Biography

- Ambroise Pare was born in 1510, he was an apprentice to his brother who was a barber surgeon, and then became an **army surgeon** himself studying at the Hotel Dieu in Paris.
- Spent 20 yrs treating sword and gunshot wounds and died in 1590.



Publication

He published "Works on surgery" in 1575 in **French not in Latin**. This made the book widely accessible, and it encouraged surgeons to take a common sense approach to surgery, to observe and not rely on theory alone.

Advance 1: Gunshot wounds

Before Pare **Wound man** was used to identify wounds and treat them with boiling oil based on Jean de Vigo who wrote "**Of Wounds in General**". Vigo said that gun shot wounds were poisonous and the only way to stop infection was to apply boiling oil and kill the poison. Using **Cauterisation**, burning the wound shut with oil. This usually caused massive infection.

One day Pare's oil ran out. Pare used instead an **ointment** made of egg yolks, oil of roses and turpentine.

Pare knew this was used by Roman doctors to cure wounds. Over night, the oil patients died or suffered in agony, the ointment patients lived and began to heal.



Advance 2: Ligatures

After **amputation** (cutting off an arm of lea) surgeons would press a **cautery** onto a limb, red hot iron, to stop bleeding.

Based on his previous experience Pare used **ligatures**, or silk threads to tie together the blood vessels (at the siege of Metz) Most surgeons disagreed with his methods, they felt it was too risky and went against tradition. The ligatures were not entirely effective as they carried germs. If Pare had had access to **antiseptics** his ideas would have been successful but these were not invented for another 300 years.



Why was Pare so important?

- He invented new ways of treating gun shot wounds that saved many lives.
- He pioneered observation of patients and human bodies.
- He encouraged others to try new ideas.
- He refused to take back his new methods even though he was attacked by many doctors.
- He published his work in French to make it accessible to as many doctors as possible.
- He displayed individual genius and later became a lecturer inspiring others.

Describe the work of Ambroise Pare.

1. What was Pare's speciality?
2. When was he born? When did he die?
3. How did he gain his medical experience?
4. What was the name of his book and when was it published?
5. How were gunshot wounds traditionally treated?
6. Why was cauterisation unsuccessful?
7. What alternative did Pare come up with (be specific)?
8. What were ligatures?
9. Why were they less successful?
10. Give four reasons Pare was important to the progress of surgery.
 - 1.
 - 2.
 - 3.
 - 4.
11. What role did the following factors play in his discovery..
 - (a) Chance
 - (b) Individual genius
 - (c) War
 - (d) Communication

Describe how the work of William Harvey improved medical knowledge.

| | |
|--|---|
| <div data-bbox="236 271 363 434" data-label="Image"> </div> <div data-bbox="379 271 528 309" data-label="Section-Header"> <h3>Biography</h3> </div> <div data-bbox="379 349 686 430" data-label="Text"> <p>Born 1578 studied at Cambridge and Padua.</p> </div> <div data-bbox="236 432 783 551" data-label="Text"> <p>He was a doctor and later a lecturer who discovered the circulation of the blood.</p> </div> <div data-bbox="236 593 783 757" data-label="Text"> <p>Before Harvey Galen had taught that the blood was burnt up by the body and replaced by the liver. Harvey proved this theory wrong.</p> </div> <div data-bbox="236 797 392 835" data-label="Section-Header"> <h3>Publication</h3> </div> <div data-bbox="236 878 751 1081" data-label="Text"> <p>1628 published "<i>An Anatomical Account of the Motion of the Heart and Blood in Animals</i>" this showed doctors and anatomists exactly how the heart, veins and arteries worked.</p> </div> | <div data-bbox="805 271 1209 309" data-label="Section-Header"> <h3>How was he able to do this?</h3> </div> <div data-bbox="805 331 1289 405" data-label="Section-Header"> <h4>Experimentation, observation and recording.</h4> </div> <div data-bbox="853 432 1353 1137" data-label="List-Group"> <ul style="list-style-type: none"> ▪ Harvey dissected cold blooded animals whose hearts pump slowly. This meant he could watch them carefully. ▪ He dissected human bodies to build up a detailed knowledge of the heart. ▪ He proved the blood moved in a one-way system around the body. He did this by trying to pump liquid through the veins and pushing thin rods down them. ▪ He measured the blood and worked out the exact amount in the human body. ▪ Whenever anyone disagreed with him and defended Galen he gave them careful proof that he was correct. </div> <div data-bbox="1150 645 1321 763" data-label="Image"> </div> |
| <div data-bbox="236 1144 643 1182" data-label="Section-Header"> <h3>Why was Harvey important?</h3> </div> <div data-bbox="236 1216 783 1951" data-label="List-Group"> <ol style="list-style-type: none"> 1. Harvey was the first doctor to clearly understand and record accurately the way that the heart worked. He proved that the heart is a muscle which pumps the blood around the body through the circulatory system. Without him people may have continued to believe that Galen was right and the liver replaced the blood. 2. He published his findings in a book and continued to lecture educating other doctors. 3. Harvey set a good example. He underlined how important it was for doctors and anatomists to use accurate experiments, observations and recordings to prove their discoveries. </div> <div data-bbox="624 1816 751 1995" data-label="Image"> </div> | <div data-bbox="805 1144 1353 2022" data-label="List-Group"> <ol style="list-style-type: none"> 4. Harvey helped give other doctors the confidence to again challenge Galen's ideas and look for new ways to view the body and treat disease. 5. Harvey inspired others and opened the way for more research on the heart and circulatory system. E.g. <ul style="list-style-type: none"> ▪ Although he could not see capillaries he knew they existed. In 1600 when microscopes were developed other doctors used these and Harvey's ideas to find them. ▪ Harvey's discovery was of little use at first as without anaesthetics and antiseptics operations on the heart could not be carried out. Without his work in the 1600's however doctors may not understand the heart today. Due in part to Harvey the first heart transplant was performed in 1964. </div> |

Describe how the work of William Harvey improved medical knowledge.

1. When was Harvey born?
2. What was his discovery?
3. Before this, whose theory did most doctors believe?
4. Explain this theory.
5. What was the name of Harvey's publication and when was it published?
6. Give two examples of Harvey using dissection.
7. Give an example of Harvey experimenting?
8. How did Harvey use measurements?
9. How did Harvey react to those who said he was wrong ?
10. Why was Harvey so important to medical progress (give at least three examples)
11. Why was Harvey's discovery not immediately useful?
12. How does his influence still survive today?

Section C - Checklist



How did nineteenth century developments influence medical knowledge?

How were vaccines developed?

- Factors which encouraged medical progress in the eighteenth and nineteenth centuries:
 - Urbanisation
 - Improved communication
 - War
 - New understanding of the cause of disease
 - The Industrial Revolution
 - Entrepreneurs
 - New technology
- How did the work of Edward Jenner help to prevent disease?
 - Vaccines
 - Long-term impact
- Explain why medical knowledge was improved by the work of Louis Pasteur and Robert Koch:
 - Germ theory
 - Competition
 - Discovery of specific causes of disease
 - Discovery of cures and vaccines
 - Long-term impact
- Surgical operations in 1800:
 - Dangers
 - Pain control, infection control, control of blood loss
- Why did surgical operations improve after 1800?
 - Control of pain, anaesthetics
 - James Simpson
 - Control of infection, antiseptics
 - Lister
 - Aseptic surgery
 - Existing limitations

Developments and discoveries in the nineteenth century



1798 Edward Jenner developed a Vaccine for smallpox. A way of preventing infectious diseases had now been discovered.



1847 James Simpson discovered anaesthetics. Patients could now sleep while operations went on. They no longer suffered terrible agony.



1850 Florence Nightingale developed new attitudes towards cleanliness and health. Hospital patients were more likely to survive as wards were kept clean and nurses were better trained.



1854 Edwin Chadwick and John Snow realised there was a link between dirt and disease. Filthy slums were now cleaned up, people had clean drinking water, sewers were built underground.











1861 Louis Pasteur discovered germs. At long last people realised that evil spirits, bad humours or bad smells did not cause disease.



1867 Joseph Lister discovered antiseptics. Doctors were able to keep wounds clean and free from infection.

How did factors in the 18th and 19th century help medical progress?

| | | | |
|--|--|---|--|
| <p>New understanding of the body</p> <p>In 1543 Vesalius' "Fabric of the Human Body" had started a massive change for doctors. They looked at the body in a new way and gradually moved away from Galen altogether.</p>  | <p>New technology</p> <p>Microscopes were further developed (helped by the glass industry), in 1831 Lister developed one which could magnify up to 1000x, Stronger steel made it possible to make syringes.</p>  | <p>Scientific medicine</p> <p>Science helped medicine. Scientists discovered the link between germs and disease. Chemists experimenting found chemicals which were useful to doctors e.g. a dye could be used as an anaesthetic.</p>  | <p>New explanations for disease</p> <p>Although many ordinary people still believed in religion as the answer to disease doctors looked for scientific explanations. To begin with people believed "miasma" or bad smells caused disease but by the 1870s germs had been discovered and recognised as the cause of disease.</p>  |
|  <p>Urbanisation</p> <p>The growth of towns caused many new health problems. This made doctors determined to find cures, and the government were forced to fund medicine and by 1900 take public health seriously.</p> | <p>Improved communication</p> <p>Faster trains allowed scientists and doctors to meet at conferences and share research. Newspapers meant that discoveries could be reported quickly across Europe.</p>  | <p>Entrepreneurs</p> <p>Medicine became big business. Some people were able to make millions from their cures. Drugs companies were willing to fund research if they could sell the drugs created.</p>  | <p>War</p> <p>Major wars were fought in this period and this pushed for better hospital care and nursing e.g. Crimean War</p>  |

How did factors in the 18th and 19th centuries help medical progress?

1. How did Vesalius influence 18th and 19th century doctors?
 2. How did new glass technology developed in factories help medicine?
 3. How powerful was Lister's microscope?
 4. Why was it possible for doctors to use good quality syringes?
 5. How did science and medicine work together?
 6. What was miasma?
 7. After 1870 what did scientists know caused disease?
 8. What does urbanisation mean?
 9. How did this help medicine to progress?
 10. In what ways did communication advance medicine?
 11. Why did drugs companies begin to fund research?
 12. How did war improve medicine?
 13. Which of these factors do you think was the most important for medical progress? Explain why.
-
14. Do you think any of the factors are connected?

Describe how the work of Edward Jenner led to improvements in the prevention of disease.



Who was Jenner?

Jenner was a doctor from Gloucestershire who discovered a small pox vaccine and published his work in 1798.

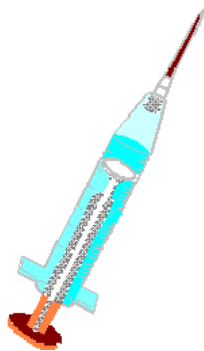
Before Jenner

There were no vaccinations or inoculations. Smallpox was a fatal disease and if the patient survived they were often left with horrendous scarring.

How did Jenner improve disease prevention?

Jenner realised dairy maids who were in contact with cowpox rarely if ever caught smallpox.

He used James Phipps, an eight year old boy to experiment with. He put cowpox scabs into a cut on the boy's arm until he was infected. He then infected him with small pox. Phipps survived. Jenner repeated this 23 times



He published his findings in 1798 in "An enquiry into the causes and effects of the Variola Vaccinae" (cowpox) and was given a grant of £30,000 by the government.

He named his discovery a vaccination after the Latin word for cow "vacca".

To begin with people were resistant to his ideas. Some women feared if they had the vaccine they would give birth to babies with cow's heads!

However by 1852 the government made his vaccination compulsory.

Long term impact

Jenner was the first doctor to **inoculate** against disease. However, he could not explain how this worked. By the 1920s there were less than 5 deaths per million from small pox, and today the disease has been entirely eradicated in Britain.

Thanks to Jenner's discovery scientists further investigated the vaccine and discovered that a vaccine boosts immunity to a virus by creating anti-bodies. From this they were able to create countless other vaccines. For example

- Pasteur was inspired to combine his own germ theory with Jenner's discovery to uncover the vaccine for chicken cholera in 1879.
- Robert Koch used Jenner's ideas to discover a cholera vaccine in 1883.
- New vaccines, using Jenner's methods, are still being discovered today.
- **Be careful** – he only discovered one vaccine and could not even fully explain this. Without the work of others would his discovery be so important?

Describe how the work of Edward Jenner led to improvements in the prevention of disease.



1. What was Jenner's profession?
2. What did he suspect about cowpox?
3. How did he set about proving this?
4. How many times did he repeat the experiment?
5. How much money did Jenner receive to further his work?
6. What did he name his discovery and why?
7. What did the government do in 1852?
8. Did everyone react positively?

9. What has Jenner's discovery done to help prevent smallpox?
10. How did Jenner's work inspire others? Give two examples.
 - 1.

 - 2.
11. Jenner did not understand how his vaccine worked,. In your own words describe how a vaccine helps prevent disease. (use the words – virus, antibody, germs, immune.)

12. Do you believe Jenner deserves all of the credit for the invention of vaccinations?

Explain why medical knowledge was improved by the work of Louis Pasteur and Robert Koch.

| | |
|---|---|
| <p>Before Pasteur and Koch what did people believe caused disease?</p> <ul style="list-style-type: none"> ▪ Miasma – this was the medical term for poisonous fumes or bad air which people wrongly believed caused disease. This was based on the common sense link between bad smells (caused by waste etc) and illness. ▪ People did not know that germs even existed! BUT the first steps towards discovery had begun... ▪ Micro-organisms had been discovered in the late 1600's by Anthony van Leeuwenhoek. He used microscopes to study everything from peppercorns to water droplets and saw the micro organisms everywhere he called them animalcules. ▪ By 1830 Joseph Lister using new glass technology was able to create a microscope that magnified 1000x without becoming fuzzy and these micro organisms could be studied. | <p>What do we now know causes disease?</p>  <ul style="list-style-type: none"> ▪ GERMS or bacteria cause disease. ▪ These are tiny microbes which enter the body and cause illness. ▪ Pasteur proved the link between germs and illness generally. ▪ Robert Koch then took on his work and  proved that particular microbes cause particular diseases. In this way the germ that causes measles for example could be singled out and treated. ▪ Many scientists were then inspired by these men to race to find microbes and cure or prevent diseases. |
| <p>Stage one: The work of Louis Pasteur...</p> <ul style="list-style-type: none"> ▪ Pasteur was a French scientist in the 1850's who was investigating why beer turned bad for a brewer. He discovered that micro-organisms in the beer were causing it to go off and called these "germs" because they were germinating or growing. By boiling them he killed them. ▪ Pasteur found the same in wine and vinegar. In 1867 he discovered that germs caused disease in silk worms. The link was made between germs and disease. He speculated (guessed) that this might be the answer to human illness. ▪ Pasteur's work was stopped by deaths in his family and a brain haemorrhage which left him paralysed on one side. ▪ He did begin work again in 1877 as he wanted to compete with Koch and discovered vaccines for chicken cholera 1880, Anthrax 1881 and rabies 1885. | <p>Stage two: Robert Koch then stepped in</p> <ul style="list-style-type: none"> ▪ Pasteur was a scientist but Koch was a German doctor. He had better medical knowledge than Pasteur. ▪ In 1875 he took the next step and linked a particular germ to a particular disease. This disease was anthrax. ▪ Koch grew germs and experimented on mice and found the germ which caused septecmia or blood poisoning. ▪ He invented a dye to stain germ so scientists could see them. ▪ He invented a lens to fit onto a microscope to photograph the germs at work to prove his theory. ▪ In 1882 he discovered the germ the caused tuberculosis and in 1883 the germ that caused cholera. |

Explain why medical knowledge was improved by the work of Louis Pasteur and Robert Koch.

How did the work of Pasteur and Koch further medical knowledge?

1. **Scientists and doctors now understood the real cause of disease in the body** and could look for genuine treatments and preventions. They no longer had to rely on religion or superstition.
2. Others were **inspired** to search for microbes. Just as Pasteur and Koch had competed against each other to make discoveries other doctors and scientists too wanted to become famous and further medicine e.g.

| Year | Microbe discovered | Scientist |
|------|--------------------|-----------|
| 1879 | Leprosy | Hansen |
| 1882 | Diphtheria | Klebs |
| 1884 | Pneumonia | Frankael |

3. Vaccines

After reading about Koch's achievements Pasteur became determined to beat him and set about using germ theory to develop Jenner's vaccine.

He was investigating chicken cholera and by accident a chicken was injected with a version of the disease which had been left uncovered and weakened by the air. The chicken survived the full disease and a method of vaccination was discovered.

Pasteur could explain why this worked, and others could copy his methods.

- Other vaccines soon followed:
- Anthrax 1881 (Pasteur)
 - Rabies 1882 (Pasteur)

4. Other cures

Once germ theory had been discovered other cures based on this theory could be developed:

Anti-toxins

Behring (one of Robert Koch's scientists) discovered that animals made **anti-toxins** which could be used as vaccinations .

Chemical drugs

Paul Ehrlich in 1899 began work on **Salvarsan 606** a mix of chemicals injected into the body to kill a particular disease.

Alexander Fleming used all of the above research to develop **penicillin** an **antibiotic** in the 1930's.

5. Cleanliness

Once germs were recognised governments had to take responsibility and clean up towns and sewers.

People could also take responsibility for themselves and basic hygiene standards could be established e.g. washing hands.

6. Surgery

Joseph Lister read and built upon Pasteur and Koch's work and in 1867 began using Carbolic acid as an **antiseptic** or **disinfectant** to stop infection during surgery.

Today we have **aseptic** surgery (no germs at all). All of this is due to germ theory.

Explain why medical knowledge was improved by the work of Louis Pasteur and Robert Koch.

1. What did people believe caused disease in the 19th century?
2. How were the first micro-organisms discovered?
3. What did Lister invent that helped the study of micro-organisms?
4. What did Pasteur and Koch prove causes disease?

Louis Pasteur

5. What was his job?
6. In which year did he begin investigating why beer turned bad?
7. What did he discover?
8. How did he link this to disease?
9. Why did his work stop?
10. Why did he begin work again?
11. Give two vaccines that he discovered.

Robert Koch

12. What nationality was Koch?
13. What was his profession? How did this give him an advantage over Pasteur?
14. How did he further Pasteur's discovery?
15. Name two diseases whose microbes he identified?
16. How did he prove his theories?
17. How did he make it easier for scientists to see germs?
18. Pasteur initially was given most of the credit for the discovery of germ theory. In a paragraph explain if you agree with this.

Explain why medical knowledge was improved by the work of Louis Pasteur and Robert Koch. Fill in the following diagram

Their discoveries disproved the theory of miasma and led to greater understanding of the body....

Surgery also developed....

Pasteur and Koch's research also showed governments that....

Medical knowledge was improved as their work inspired others to identify microbes for example...



Vaccinations could be explained and developed. Pasteur set out a method for developing them.....

Others soon followed.....

Due to the discovery of germ theory other cures soon followed....

Anti-toxins...

Chemical cures....

Explain why medical knowledge was improved by the work of Louis Pasteur and Robert Koch. (6 marks)
Example answer

Before Pasteur and Koch people believed that disease was spread by miasma (bad air.) Some individuals and scientists had made the logical link between dirt and disease e.g. Florence Nightingale, but could not prove it. Equally, Jenner had discovered an effective small pox vaccine but could not explain why it worked.

They improved medical knowledge because they discovered and proved germ theory, showing the true cause of disease. Pasteur began in the 1850s showing that micro-organisms which he named germs made beer go bad. Koch built on his work applying this to the human body. He proved through methodical experiment that bacteria caused anthrax. He also invented a method to stain germs purple so they could be recognised.

The discoveries of Pasteur and Koch led to massive improvement and further discovery. Koch had shown why Jenner's vaccine worked, and Pasteur built on this inventing vaccines for cholera in 1879, anthrax 1881 and rabies 1884.

They were also medically significant as other scientists could follow their methods and develop new cures. The microbes causing diseases could be identified, as in 1879 Hansen discovered the cause of leprosy. Also, Behring copied Koch's ideas in the 1890's and discovered anti-toxins to cure diphtheria. Finally, in the 1900's Ehrlich followed their methods and invented Salvarsan 606 a chemical drug later leading to the discovery of penicillin.

Finally their identification of germs causing disease led to improvements in cleanliness in hospitals, and to Lister inventing antiseptics in 1867 as doctors understood that wounds became infected due to germs.

Why was surgery so dangerous in the early 1800's?

- 1.No pain control.
(Anaesthetic)
- 2.No control of blood loss.
3. No control of infection.
(Antiseptic, aseptic, sterile)



Above: An eye operation
Below: An amputation

Basic operations could be performed

- Amputations
- Removal of superficial tumours
- Some eye operations
- Trepanning
- No internal surgery was possible although surgeons tried to use opium or mandrake to anaesthetise their patients.

- Surgery had to be very fast. – During a battle in 1812 Napoleons surgeon amputated 200 limbs in 24 hours!
- Robert Liston a famous London surgeon amputated a mans leg in 2 ½ minutes – but he rushed so much he also cut off the mans testicles!
- It was hard under these circumstances for surgeons to develop any skills.






- Patients suffered excruciating pain during the operations and often died of shock.
- If they did survive infection often set in as germs entered the wound and caused blood poisoning. Surgeons rarely washed their hands, did not wear gloves or masks, did not clean their tools or the operating theatre.
- 50% of all patients who underwent an amputation died of infection if they survived surgery.

Why was surgery so dangerous in the early 1800's?

1. Give three reasons why surgery was so dangerous in the 1800's?
2. Give two examples of operations that could be performed.
3. How many limbs did Napoleon's surgeon amputate in 1812?
4. What mistake did Robert Liston make?
5. Why did surgery have to be so fast?
6. Why did patients die during surgery?
7. Why was infection so common?
8. What were your chances of surviving an amputation?

Explain why surgical operations had become more successful by 1900.

Stage One: Solving the problem of pain

| | |
|--|--|
| <p>Before:</p> <p>Pain could not be controlled.</p> <ul style="list-style-type: none"> ▪ Patients went through excruciating pain during operations. ▪ It was even too painful to set a serious fracture on a limb. If you broke your arm severely it was less painful to have it amputated. ▪ Early anaesthetics like opium, mandrake or whiskey were unpredictable. ▪ Some patients even tried hypnosis!  | <p>How were anaesthetics developed?</p>  <ul style="list-style-type: none"> ▪ In the 18th c chemistry was improving and different substances were being experimented with. ▪ Humphry Davy in 1799 discovered laughing gas (nitrous oxide) could be used as an anaesthetic if it was inhaled. However, not everyone is affected by it. ▪ Ether was also developed as a more reliable anaesthetic. It was first used in America in 1846 by William Morton to remove a neck tumour painlessly. ▪ Robert Liston used it in the same year to amputate a leg. The leg was on the floor after 26 seconds at which point the patient sat up and asked Liston when he was going to start. |
| <p>The work of James Simpson</p>  <ul style="list-style-type: none"> ▪ James Simpson (1811-70) was Professor of Midwifery at Edinburgh University and wanted to ease women's pain during childbirth. ▪ On 4th November 1847 he experimented with chloroform on himself and two friends and discovered it was an excellent anaesthetic. ▪ Some people objected to it believing it was too untested and that pain should be accepted particularly during childbirth. ▪ However, in 1853 Queen Victoria was given chloroform during childbirth and it became widely used. ▪ It was not used after 1900 when it was discovered it damaged the liver.  | <p>Further developments</p> <ul style="list-style-type: none"> ▪ By the end of the 19th century there were professional anaesthetists in most operations. ▪ Local anaesthetics that numb one part of the body have been developed, as well as other more effective general anaesthetics (these send the patient to sleep). ▪ Anaesthetics finally allowed surgeons to perform longer, deeper and more complex operations.  |

Explain why surgical operations had become more successful by 1900.

Stage One: Solving the problem of pain

1. How did surgeons attempt to control pain before anaesthetics?
2. How did scientific developments in chemistry help the development of anaesthetics?
3. What did Humphry Davy discover in 1799?
4. What was ether and when was it first used?
5. How did Robert Liston use ether?
6. What was Simpson's profession?
7. What was the name of his anaesthetic?
8. When and how did he discover it worked?
9. Why did some people object to its use?
10. Who made it acceptable?
11. Why was it disregarded in 1900?



Stage Two: Solving the problem of infection

Explain how the work of Joseph Lister led to improvements in surgery

His work was helped by Koch who in 1878 discovered the bacterium which caused **Septicaemia** (blood poisoning)

Also, by Simpson who had in 1847 developed the anaesthetic chloroform. Surgery was rapidly improving as the patient could now have their pain and infection controlled!

His discovery improved survival rates as

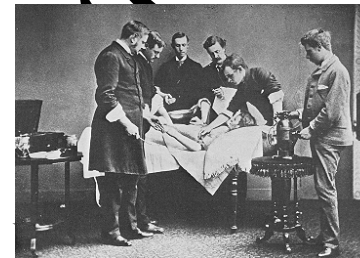
1. By the 1890's doctors practiced Aseptic (totally germ free) surgery.
2. 1887 Steam sterilisation was introduced
3. 1894 Rubber gloves were used by nurses (William Halstead a doctor, introduced rubber gloves when his girlfriend who was also one of his nurses, complained that she was allergic to carbolic spray)

In 1896 thanks to both anaesthetics and aseptic surgery the first successful operation on a stab wound to the heart was performed.



Before Lister: Pasteur did not discover germ theory until the 1860's. Surgeons were reusing bandages, they did not sterilise equipment nor did they wash their hands. Most patients died of infection

But Semmelweis an Austrian doctor in 1847 had realised that in his hospital women died of infection if their babies were delivered by medical students who had been dissecting corpses and not if someone with clean hands delivered them. People thought he was insane!



Lister had read about Pasteur's germ theory and had seen carbolic spray used to treat raw sewage. So he sprayed it was a fine mist over a patients open wound throughout operations as an **antiseptic**. He then covered the wound with a bandage. The result was a massively reduced death rate.

Before this 45.7% of his patients died. After the antiseptic 15% died.

Explain how the work of Joseph Lister led to improvements in surgery.

1. What did Semelweiss discover?
2. How did people react to him?
3. How did Pasteur inspire Lister?
4. Where had Lister seen Carbolic Spray used previously?
5. How did he use it?
6. What happened to the death rate of his patients?
7. How was he helped by Robert Koch?
8. How was surgery helped by Simpson?
9. What does aseptic surgery mean?
10. Give three examples of how this developed.
 - 1.
 - 2.
 - 3.
11. What happened in 1896?
12. Did Lister discover antiseptics alone? Who or what else aided his discovery?

Explain why surgical operations had become more successful by 1900.

| | |
|---|---|
| <p>Why was surgery so dangerous in the early 1800's?</p> <ul style="list-style-type: none"> • No anaesthetics or antiseptics. • Had to be very swift – during a battle in 1812 Napoleons surgeon amputated 200 limbs in 24 hours! • Robert Liston a famous London surgeon amputated a mans leg in 2 ½ minutes – but he rushed so much he also cut off the mans testicles! • Most patients died from infection after operations. • Old remedies to combat pain during operations included mixtures of herbs or alcohol. | <p>How did pain relief improve?</p> <ul style="list-style-type: none"> • In the past surgeons operated quickly and ignored the screams of their patients. Over time they began to research the idea of knocking patients out. • Humphry Davy in 1799 discovered laughing gas could numb pain. • Robert Liston used laughing gas in London but it was flammable, and irritated the lungs. • James Simpson experimented with chloroform with friends in 1847 and discovered it could be used as an anaesthetic. He used it to ease pain in childbirth. • BUT many people opposed it because – it was untested, people believed pain should be accepted, in 1848 Hannah Greener died from chloroform while having a toe nail removed. • However, in 1857 Queen Victoria used chloroform and it became more widely accepted. |
| <p>How did doctors manage to prevent, control and treat infection?</p> <ul style="list-style-type: none"> • Before germ theory doctors re-used bandages, did not wash their hands or sterilise equipment. • 1847 Semmelweiss – noticed that fewer women died in childbirth if they were delivered by a medical student. This is because the students had washed their hands after dissecting a corpse. He was seen as a madman by other doctors. • Joseph Lister 1867 – read Pasteur's work on germ theory. He had seen carbolic spray used to treat sewage and experimented with it on gangrene. His death rates dropped from 45.7% to just 15%. Some people opposed him. | <p>How far had surgery improved by 1900?</p> <ul style="list-style-type: none"> • In 1878 Koch discovered the bacterium which caused SEPTICAEMIA. • Lister was taken more seriously and antiseptics were used widely by 1890. • ASEPTIC surgery – removal of germs from operating theatre. • 1887 all instruments were steam sterilised. • 1894 sterilised rubber gloves used for the first time. Surgeons scrubbed their hands (some still had bacteria under their fingernails) • 1880 first successful removal of an appendix • 1896 first heart operation on a stab wound victim. • Pasteur and Lister received a joint medical award! • BUT bleeding was still a problem. Lister improved Pare's ligatures by sterilising them, but blood transfusions often failed as blood types had not been discovered. |

How did the First World War (1914-1918) lead to progress in medicine?

Positive impact of the war on medicine



- Millions were wounded

giving surgeons the chance to practice new techniques e.g.

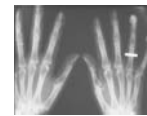
- Setting broken bones
- Skin grafts (the basis for plastic surgery)
- Head wounds/brain surgery
- Bullet wounds meant deeper infection had to be fought.
- X rays used
- Blood transfusions

But...

- Medical research slowed down
- 14000 doctors on the front
- Surgeons stretched to their limit

Improvement 1: X rays(catalyst)

- Invented in 1895 by **William Rontgen** a German scientist who noticed cathode rays went through all substances apart from bone and metal.
- Within six months of his discovery most hospitals had them and this totally transformed doctor's ability to diagnose. You could see inside a patient accurately without surgery.
- The First World War acted as a **catalyst** (sped up) for x ray use. A portable version was invented for the battlefields to help doctors find shrapnel and bullets.
- These continued to be improved and used after the war.



Improvement 2: Blood transfusions

- Blood types discovered in 1901. This explained why before 1901 they had nearly always failed.
- Before the war doctors had no way of storing blood and used on the spot donors.
- The war made this impractical as soldiers were bleeding to death on the battlefields.
- Doctors discovered that they could stop blood **coagulating** (clotting) with a saline (salt) solution and began storing blood.
- Today we have blood banks. This development would probably



have happened eventually but again the war acted as a catalyst.

Improvement 3: Fighting infection

- Surgeons no longer had an aseptic environment to operate in and found new ways of fighting infection such as cutting away tissue.

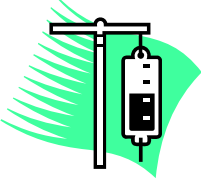







Why was progress made during the war?

1. In peacetime surgeons compete and may keep discoveries secret. During the war they work together to help their own soldiers.
2. The government give more money to medicine in times of war as they need to keep their soldiers healthy to win!
3. Surgeons work harder and can perform far more operations than usual.

How did the First World War (1914-1918) lead to progress in medicine?

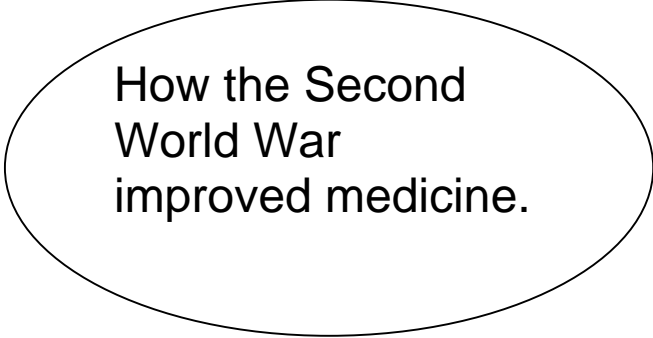
1. Give examples of five injuries doctors and surgeons had to deal with.
 - 1.
 - 2.
 - 3.
 - 4.
 - 5.
2. Who invented the X ray?
3. When was the x ray invented?
4. How long did it take for x ray machines to be in most hospitals?
5. How do doctors use x-ray machines?
6. What is a catalyst?
7. How did the First World War act as a catalyst for x rays?
8. Why did blood transfusions fail before 1901?
9. What was discovered in 1901?
10. Why could doctors not store blood?
11. How did the First World War improve this situation?
12. Give three reasons why war is often a time of medical progress.
 - 1.
 - 2.
 - 3.

How did the Second World War lead to progress in medicine?

| | |
|--|--|
| <p>Blood Transfusion –</p> <p>This further improved during the Second World War. Blood could be stored for longer. Civilians donated blood.</p>  | <p>Diet –</p> <p>Rationing improved some people's diet. Government posters encouraged healthy eating.</p>  |
| <p>Drugs –</p> <p>Penicillin was developed the first antibiotic. Florey and Chain were able to secure funding to mass produce the drug as America wanted to use it to cure their soldiers.</p>  | <p>Poverty –</p> <p>Evacuation took 1.5 million urban children out of the cities into rural areas. The experience highlighted for everyone the massive contrast between the living standards of the rich and poor. It increased the commitment of the government to fight poverty more seriously after the war.</p>  |
| <p>Surgery –</p> <p>Further advances were made during the Second World War in the use of skin grafts and the treatment of burns.</p>  | <p>Hygiene –</p> <p>Government posters educated people about basic health and hygiene. They wanted to prevent people becoming ill during war time.</p>  |
| <p>Disease –</p> <p>The government launched its national diphtheria immunisation campaign.</p>  | <p>The National Health Service – With the threat of major civilian casualties from German bombing the government reorganised health care. In 1942 a leading civil servant, William Beveridge, proposed that these changes should be preserved in a “free national health service” for all.</p>  |

How did the Second World War lead to progress in medicine?

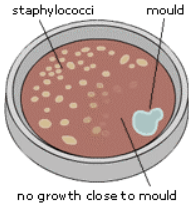
Design a spider diagram of medical improvements caused by the Second World War.



How the Second
World War
improved medicine.



**How important was the contribution of Sir Alexander Fleming to the prevention and treatment of disease?
The discovery of penicillin – the first antibiotic**



Stage 1 1928 – Fleming

Fleming was searching for a better way to treat germs. He was experimenting with staphylococci bacteria, and did not wash some of the culture dishes. A mould grew but Fleming noticed that this mould killed the germs. He published his findings in 1929, but could not make penicillin into a drug.

Factors in the development of penicillin – is it all down to Fleming?

Chance – Fleming only discovered the mould by chance. However, only someone with his genius would recognise the importance of the mould and be able to work on it.

War and governments – the war provided a catalyst for the drug to be mass produced and penicillin needed investment if it was ever to become a cure. However, Fleming was working on the mould before the second world war as were Florey and Chain.

Individuals and Teams Without the talents of Fleming, Florey and Chain the drug may not have been made **viable** (it could be used) for a long time. Florey and Chain built on Fleming's work and demonstrate how important team work now is to medicine. They worked with chemists, doctors, researchers and other scientists to achieve what Fleming could not.

However, without Pasteur and Koch none of them would even know what germs were...

Lister had used a mould to treat a patient in the 1870's and penicillin and other fungus has been part of local medicine for centuries.

Fleming, Florey and Chain were all awarded the Nobel Prize in 1945 although Florey and Chain's role was down played.

Stage Two 1938-1941 Florey and Chain

They led a group of researchers at Oxford after reading Fleming's work. On May 25th 1940 they gave eight mice streptococci, four of these were given penicillin the other four died. Using thousands of milk bottles they made enough to treat a policeman – Albert Alexander. He had blood poisoning and was dying. He got better until the penicillin ran out. They needed a way to **mass produce** the drug.

Stage Three 1941-44

In 1941 the US government entered World War Two. They realised they could keep their soldiers alive with penicillin and gave grants to companies to produce the drug. This began in 1943. By 1945 almost one sixth of all men wounded were saved by penicillin. After the war it continued to be produced.



How important was the contribution of Sir Alexander Fleming to the prevention and treatment of disease?

1. In which year did Fleming first discover penicillin?
2. Which bacteria was he experimenting with?
3. How did chance play a role in his discovery?
4. Why did he abandon his work?
5. How did Florey and Chain test the drug?
6. How did they make enough to use on a man?
7. Describe what happened to Albert Alexander.
8. How did the war speed up the production of penicillin?
9. Roughly how many soldiers were saved because of it.

Beside each of these give a mark out of ten for their level of responsibility in making penicillin a viable drug.



Alexander Fleming






Florey and Chain



America joining World War Two

How has medical knowledge expanded in the twentieth century?

| | |
|--|--|
| <p>Scanning and new ways to diagnose</p> <ul style="list-style-type: none"> ▪ X-rays have been used since 1895 to diagnose broken bones or locate foreign objects in the body. First chest x-ray 1900. ▪ ECG scanning to monitor heartbeats was introduced in 1906 ▪ Ultrasound scanning to look at foetuses (babies) in the womb was invented by Ian Donald in 1961. ▪ Since 1984 it has been possible to scan the entire body using CT scans and MRI scans. These give 3D images of the body.  ▪ Blood tests and urine tests are performed to diagnose diseases. ▪ Since the discovery of DNA and genetics it is possible to predict if a person is likely to develop a certain disease or condition. ▪ The older methods of observation of symptoms, checking the pulse, discussion with the patient etc are all still used. | <p>New treatments</p> <p>Drugs and therapies</p> <ul style="list-style-type: none"> ▪ Since penicillin many other antibiotics have been invented. ▪ Drugs are now available to prevent pregnancy(1951), control blood pressure, treat infections, reduce swelling, antihistamines combat allergic reactions. ▪ Chemotherapy and radiotherapy are both used to treat cancer. ▪ Laser treatment can be used to “burn out” diseased tissue  <p>Technology</p> <ul style="list-style-type: none"> ▪ Kidney dialysis machines 1944 ▪ Heart and lung machines first used in 1953 ▪ Heart Pacemaker 1960 ▪ Robotic limbs can be used to help amputees. ▪ Implants like hearing aids. |
| <p>Continuing problems</p> <ul style="list-style-type: none"> ▪ Immunity to antibiotics and Superbugs diseases are mutating and becoming immune to antibiotics as they are now overused. Many occur in hospitals such as MRSA. Tuberculosis (TB) is also developing a resistance to antibiotics and many doctors believed it had almost died out. ▪ New drugs can have side effects – Thalidomide in the early 1960's many women were given thalidomide to stop morning sickness. It harmed many babies who were born with deformed limbs. After this the government set up the Committee on Safety of Drugs to ensure all drugs were properly tested. |  <ul style="list-style-type: none"> ▪ AIDS – despite all of today's advances the HIV virus and AIDS which was first discovered in 1983 still can not be cured. <p>Alternative medicines</p> <p>These are used by many people as an alternative to or to complement mainstream medicine.</p> <ul style="list-style-type: none"> ▪ Acupuncture ▪ Homeopathy ▪ Hypnosis ▪ Spiritual healing |

How has medical knowledge expanded in the twentieth century?

1. What does an ECG do?
2. How do doctors use ultrasound?
3. In which year could the body be scanned in 3D?
4. How has diagnosis remained the same since the renaissance?
5. Give four examples of new drugs or therapies and their uses.
 - 1.
 - 2.
 - 3.
 - 4.
6. When was the kidney dialysis machine invented?
7. Give two more examples of how modern technology has improved medicine.
 - 1.
 - 2.
8. Why are some diseases becoming immune to antibiotics?
9. What was the problem with thalidomide?
10. What alternative therapies are some patients using?

How significant is the discovery of DNA?

What is DNA?

- DNA stands for Deoxyribonucleic acid
- Every cell in your body is made up of several strings of DNA which is structured as a double helix.
- It is like a long list of instructions for your body. The instructions are grouped into sets of instructions called genes.
- These genes all have a different function e.g. eye colour. Some decide if you will have a certain disease or disability.
- Each person's DNA is unique



How was DNA discovered?

- Research into genetics went on in the 1940's as **hereditary conditions** like diabetes were researched.
- **First breakthrough – 1953** **Watson and Crick** discovered the structure of DNA and that it passed information from parents to children. They worked with a huge team of experts and received government funding.
- **Second breakthrough – the Human Genome Programme 1990's** Scientists across 18 countries all took sections of the human DNA code to work out exactly what each part of a human's DNA does. It took ten years and would fill 160,000 books. It was possible because of teamwork, global communications and computer technology.



Opportunities offered by DNA



- **Prevention of disease** – if you are prone to a type of cancer or a hereditary condition like Huntington's disease this could be discovered in your DNA and either prevented or treated early on.
- **Cure** – Potentially specific genes could be targeted rather than using drugs or surgery. Currently it is possible that through stem cell research genes could be cloned in the future to replace faulty ones e.g. in a spinal cord.
- **Genetic engineering** – may even allow us to "grow" organs in a test tube to use for a transplant.

Problems connected with DNA



- **Genetic engineering** – people have moral concerns about the use of DNA.
1. It could be used to clone people as Dolly the sheep was cloned in 1997.
 2. It could be used to create designer babies. Potentially parents could choose a child's physical features and perhaps talents and personality.



How significant is the discovery of DNA?

1. What does DNA stand for?
2. What structure does DNA have?
3. What do genes do?
4. What did Watson and Crick discover?
5. Why were they able to make this discovery?
6. What was the Human Genome Program?
7. How does it show the importance of teamwork in twentieth century medicine?
- 8. What is an **hereditary disease**?**
9. How can DNA
 1. Prevent illness
 2. Cure illness
10. What problems may there be with DNA in the future?

Why has surgery developed so rapidly in recent years?

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| <p>Plastic surgery</p> <ul style="list-style-type: none"> ▪ Skin grafts were practiced in the Renaissance but infection was too much of a problem. ▪ World War One and Two forced surgeons and doctors to work on the new kinds of disfiguring injuries caused by new weapons. ▪ The inventions of anaesthetic and antibiotics to treat infection allowed this. ▪ Harold Gillies was the first plastic surgeon who set up after the First World War to treat injured soldiers. ▪ Archibald McIndoe worked with Harold Gillies and was later nicknamed the “face-builder”. ▪ Today plastic surgery can be used to bring a better quality of life to people with either injuries or birth defects. | <p>High Technology Surgery</p> <ul style="list-style-type: none"> ▪ Surgeons benefited from advances in technology such as electricity, computer technology, advanced photography etc. <p>Microsurgery</p> <ul style="list-style-type: none"> ▪ Fibre optics means it is now possible for surgeons to operate without causing major wounds. ▪ Miniature cameras called endoscopes can be inserted into the body to allow doctors to see inside patients without operating. ▪ Keyhole surgery using cameras doctors operate through a keyhole size incision.  ▪ Surgery on the brain is now also possible. The first brain tissue transplant was performed in 1987. |
| <p>Transplant surgery</p> <ul style="list-style-type: none"> ▪ Before WW2 heart surgery was almost impossible – usually the lungs collapsed and heart stopped. ▪ WW2 provided an impetus to improve this as many soldiers had shrapnel lodged in their hearts. Some improvements were made. ▪ In 1960 Blakely used an artificial fibre, Dacron, to replace diseased arteries. ▪ 3rd December 1967 Dr Chrisiaan Barnard performed the first heart transplant on Louis Washkansky (who died 18 days later) Other patients also underwent the operation but died as their bodies rejected the organs  ▪ Cyclosporine the drug which stops rejection of new organs was discovered in 1974. By 1987 90% of all transplant patients lived for more than two years. <p>Other transplants</p> <ul style="list-style-type: none"> ▪ Liver transplant 1963 ▪ Kidney transplant 1954 | <p>Why has the past 100 years been a time of rapid progress?</p> <ul style="list-style-type: none"> ▪ Building on discoveries - aseptic, anaesthetics and blood transfusions finally opened the way for complex surgery. ▪ Medicine has made use of new technology – computers, digital imaging, microchips, plastics and man made fibres etc. ▪ Global communication means that ideas and methods are instantly shared. ▪ Teamwork and specialisation – discoveries are made by teams of experts and surgeons now work in their own field and become experts in these. Some are pioneers of surgery such as Barnard. ▪ War and government – WW1 and WW2 acted as catalysts for governments to fund research and they have continued. |

Why has surgery developed so rapidly in recent years?

1. How did the two world wars further plastic surgery?
2. Who was Harold Gillies?
3. Who was the “face builder”?
4. What do fibre optics allow surgeons to do?
5. What is an endoscope?
6. What is keyhole surgery?
7. Which inventions have made these advances possible?
8. When was the first transplant of brain tissue?
9. Why was heart surgery not possible before World War Two?
10. Why is Dr Christiaan Barnard famous?
11. Why were patients frequently dying after a heart transplant?
12. How did cyclosporine help this?
13. Design a spider diagram of the factors which caused progress in the twentieth century.