AQA exam style question 4: **Have science and technology been the main factors in the development of surgery in Britain since Medieval times? Explain your answer with reference to science and technology and other factors.** (16 marks + 4SPAG)

(PowerPoint Slide 1 is on the whiteboard)

16 mark Essay Question for AQA Paper 2: Shaping the Nation: Health and the People, 1000 A.D. to the present day

Stage Manager: (Enter Narrators. They stand at an angle, to the right of the whiteboard.)

N1: This is a **History Department Production** for:

N2: AQA Paper 2: Health and the People

(PPO selects PowerPoint Slide 2)

N3: The final question on the AQA exam is **always** an **essay** question.

N4: It covers the whole span of the course, from **1000A.D.** to the **present day**.

N1: It asks you to **evaluate** the role played by **one chosen factor**, (like **religion**, or **government**), against **other** factors in medicine and health through time.

N2: The essay question is worth **16 marks**.

N3: On top of that, there are **4 marks** for **SPAG**: spelling, punctuation and grammar.

N4: So there are **20 marks** altogether.

N1: This scripted drama is designed to help you get as **many** marks as possible on the essay question.

N2: It's all about **planning**.

N3: It's all about being **relevant**.

N4: It's all about **answering the question the examiner asked you**, and coming to a **judgement** at the end.

Director: (Enter Mary Holmes, a character from Thackray Museum's 1842 Street. She stands to the left of the whiteboard. She reads the essay question)

Mary Holmes:

Have science and technology been the main factors in the development of surgery in Britain since Medieval times? Explain your answer with reference to science and technology and other factors. (16 marks+ 4 SPAG)

Stage Manager: (Enter Thomas Sowden, John Oddy, Albert Tatlock and James Wilson from Thackray Museum's 1842 Street.)

James Wilson: 16 marks plus 4 SPAG. That is a **lot** of marks.

Albert Tatlock: It's **almost** as many as the **first three** exam questions put together.

Director: (Thomas Sowden peers at James and Albert.)

Thomas Sowden: That's why you **plan** your answer before you start writing.

John Oddy: And **highlight** the **key words** in the question.

Thomas Sowden: The examiners spent a **long time** choosing those words. They are your **clues** about what they are looking for.

(PPO selects PowerPoint Slide 3)

Mary Holmes:

Have science and technology been the main factors in the development of surgery in Britain since Medieval times? Explain your answer with reference to science and technology and other factors. (16 marks+ 4 SPAG)

Stage Manager: (Albert looks at the whiteboard)

Albert Tatlock: So I highlight '**science and technology**'.

John Oddy: Yep. They are the **chosen factors** in this essay.

James Wilson: That's why you highlight '**main factor**s' as well.

Director: (Thomas grabs a ruler and points to the highlighted words:)

Thomas Sowden: Keep focused on **science and technology**. It's what the examiners have got marks for.

John Oddy: Judge **other** factors against them.

(PPO selects PowerPoint Slide 4)

Mary Holmes:

Have science and technology been the main factors in the development of surgery in Britain since Medieval times? Explain your answer with reference to science and technology and other factors. (16 marks+ 4 SPAG)

John Oddy: Highlight '**development of surgery**' and '**since Medieval times**'. They are **key word**s in this question.

Thomas Sowden: Surgery went through **incredible** change between the **Middle Ages** and the **present day**.

John Oddy: The examiner is asking you whether science and technology were the **main** factors responsible for that change.

Stage Manager: (Thomas shoves the ruler into James' shoulder to emphasise his words)

Thomas Sowden: And plan to write about the **whole arc of time**, from **Medieval** to **Modern** - or you'll look a right fool.

(PPO selects PowerPoint Slide 5)

Mary Holmes:

Have science and technology been the main factors in the development of surgery in Britain since Medieval times? Explain your answer with reference to science and technology and other factors. (16 marks+ 4 SPAG)

John Oddy: Make sure you highlight '**Explain**'.

Thomas Sowden: 'Explain' means 'treat the examiner like an idiot who knows nothing'.

John Oddy: If you explain your answer **in detail, backing up your points with evidence**, you make certain the idiot (examiner) **understands**.

Albert Tatlock: And you give him, or her, plenty to mark.

James Wilson: And there are **20 marks** on offer, don't forget.

(PPO selects PowerPoint Slide 6)

Mary Holmes:

Have science and technology been the main factors in the development of surgery in Britain since Medieval times? Explain your answer with reference to science and technology and other factors. (16 marks+ 4 SPAG)

John Oddy: Finally highlight '**science and technology**' again…

Thomas Sowden: Just so you remember the focus of the question.

John Oddy: And highlight '**other factors**'.

James Wilson: Because **other factors** are what you judge '**science and technology**' against.

Thomas Sowden: Correct.

AQA exam style question 4: **Have science and technology been the main factors in the development of surgery in Britain since Medieval times? Explain your answer with reference to science and technology and other factors.** (16 marks + 4SPAG)

(PPO selects PowerPoint Slide 7)

Have science and technology been the main factors in the development of surgery in Britain since Medieval times? Explain your answer with reference to science and technology and other factors. (16 marks+ 4 SPAG)

N1: Highlighting the key words in the question **focuses** your mind and keeps your answer **relevant**.

N2: Think and **plan** before you start writing.

N3: Give the examiner what he or she asked for.

N4: And think **big** in this question. Think: '**long arc of time**'.

N1: This next scene is based around an AQA essay question on factors.

N2: It explores the arguments about whether science and technology, or other factors, were the **main** reasons for the development of surgery since Medieval times.

Director: (James, Albert, Thomas and John exit)

AQA exam style question 4: **Have science and technology been the main factors in the development of surgery in Britain since Medieval times? Explain your answer with reference to science and technology and other factors.** (16 marks + 4SPAG)

The Long Arc of Time

N3: Scene 1: The Long Arc of Time

Stage Manager: (Mr & Mrs Beecham, Mr & Mrs O'Bryan and Mary Holmes stand in front of the whiteboard. They are in the 19th century. Through the classroom window, they have a good view of the 20th and 21st centuries.)

Director: (Mr & Mrs Watson, Mrs Ingham and Alice Finch stand against the classroom wall, ready to enter on Page 12.)

Stage Manager: (Mr & Mrs Bolder, Mr & Mrs Sowerby, Mr &Mrs Finch, Mr York, James Wilson and Albert Tatlock sit in their seats in the middle of the room. They are in the Renaissance.)

Director: (Reverend Holdforth, Mrs O'Flaherty, Mrs York, Thomas Sowden and John Oddy, sit at the back of the classroom. They are in the Middle Ages.)

Stage Manager: (The classroom should look like this)

Classroom

Mr & Mrs Watson, Mrs Ingham and Alice Finch stand here.

The Middle Ages
Surgery stands still

Reverend Holdforth, Mrs O'Flaherty, Mrs York, Thomas Sowden, John Oddy, sit here.

The Renaissance
The beginnings of Change

Mr & Mrs Bolder, Mr & Mrs Sowerby, Mr & Mrs Finch, Mr York, James Wilson and Albert Tatlock sit here.

19th century
Revolution in Surgery

Mr & Mrs Beecham, Mr & Mrs O'Bryan and Mary Holmes stand here.

N1
N2
N3
N4

Whiteboard

20th & 21st century
Modern Surgery

Director: (Mrs O'Bryan peers back across history: past the Renaissance, to the Middle Ages)

Mrs O'Bryan: If you look back through time, you can **see** that **science and technology** have been the **main** factors in the development of surgery.

Mrs Beecham: Before the 19th century, surgery involved terrible **pain**; it often led to **infection** and **death**.

Mary Holmes: Patients waiting for an operation felt like 'condemned criminals waiting for execution'. [1]

Stage Manager: (Mrs O'Bryan speaks enthusiastically)

Mrs O'Bryan: But science and technology **changed** all that. In the 21st century, plastic surgery, keyhole surgery, microsurgery and transplant surgery have become **commonplace** and **safe** procedures.

Mr Watson: Never mind science and technology. The **main** factor in the development of surgery has been the role of **individuals**.

Alice Finch: I agree. All the breakthroughs in the development of surgery were made by **individuals** like **Paré** , **Lister** and **Dr Christiaan Barnard**. [2]

Mrs Finch: Excuse me; not **one** of those individuals could have shared their discoveries without the **printing pres**s.

Mr Finch: In our opinion, the **main** factor in the development of surgery has been **communication**.

Director: (Mr Sowerby snorts with derision)

Mr Sowerby: Rubbish. **War** has been the main factor in the development of surgery. War **accelerated** surgical change.

Stage Manager: (Mrs O'Bryan holds up her hands to quell the discussion.)

Mrs O'Bryan: I agree that **other factors**, like the role of **individuals**, **communication** and **war** were **important** factors in the development of surgery, but I would argue that the **main factors** were **science and technology**.

Look at the **evidence**, if you don't believe me.

[1] Quotation from a letter sent to James Simpson, cited in AQA Surgery and Health through Time, Dawson and Banham
[2] Dr Barnard performed the first heart transplant in 1967

The case for Science and Technology

N4: Scene 2: The case for Science and Technology

Mary Holmes: Science and technology have **transformed** surgery since Medieval times.

(PPO selects PowerPoint Slide 8)

Mrs O'Flaherty: In the Middle Ages, you had a **50/50** chance of surviving a surgical

operation.

Mrs York: There were no effective **anaesthetics**, so the patient felt every cut of the knife.

Rev Holdforth: There were no **antiseptics**, so open wounds got **infected** with **septicaemia** and **gangrene**.

Mr York: Surgery was not **much** better in the Renaissance.

Mr Bolder: Vesalius had given doctors a better understanding of **anatomy**.

Mrs Bolder: William Harvey improved their understanding of **physiology**, when he proved that **blood circulates** around the body and is **not** generated in the liver, as **Galen** believed.

Mrs Sowerby: Ambroise Paré demonstrated that **rose oil, turpentine, egg yolk** and **ligatures** were better treatments for gunshot wounds than **cauterising** them with boiling oil.

Mr Sowerby: But surgery remained **terrifying** and **dangerous**.

Mrs O'Bryan: Science and technology changed all that.

(PPO selects PowerPoint Slide 9)

Mrs Beecham: In the 1840s, chemical **anaesthetics** like **nitrous oxide** and **ether** meant that patients no longer felt **pain** during surgery.

Mary Holmes: James Simpson used **chloroform** to help women in childbirth.

Mr Beecham: Queen Victoria called it '**that blessed chloroform**' when she used it during the birth of her eighth child.

Mr O'Bryan: Surgeons began to use anaesthetics for **all** surgical procedures and the

operating theatre became a calmer, quieter place.

Mrs Beecham: Anaesthetics have become increasingly **sophisticated**. Nowadays, major operations, like **hip replacements**, can be done under **local** anaesthetic.

Mr Beecham: The patient is **conscious**, but **pain-free** throughout.

Mrs O'Bryan: Science not only removed the **pain** of surgery, it also tackled the dangers of **infection**.

Mary Holmes: In 1861, the scientist, **Louis Pasteur** proved that **germs** cause **disease**.

(PPO selects PowerPoint Slide 10)

Mrs O'Bryan: Surgeon, **Joseph Lister**, read Pasteur's article and realised that the **blood poisoning** that killed almost **46%** of his patients was caused by **microscopic germs**.

Mr Beecham: Lister soaked his patients' wounds in **carbolic acid**, which is an antiseptic.

Mrs Beecham: He invented a **spray** to saturate the **operating table**, his **surgical instruments** and the **hands** of surgeons and assistants.

Mrs O'Bryan: Lister reported that deaths after surgery plummeted from 46% to **15%**.

Mary Holmes: Gradually, as **antiseptic surgery** was adopted, operations became **safer**, as well as **pain free**.

Mrs Beecham: The germ that causes septicaemia was finally identified by **Robert Koch** in 1878.

(PPO selects PowerPoint Slide 11)

Mr Beecham: It had been too small to be seen under a microscope.

Mr O'Bryan: But Koch discovered that a **chemical dye** called methyl violet, **stained** septicaemia germs and made them visible.

Mary Holmes: He **stained** the germs, **photographed** them and began searching for a way to **destroy** them, without damaging the infected patient.

Mrs O'Bryan: Using new, powerful **electron microscopes**[3], **Gerhardt Domag**k discovered that a red **sulphonamide dye**, called **Prontosil**, killed septicaemia germs.

[3] In use by 1931

Mrs Beecham: Prontosil was the world's **second magic bullet**.[4]

Mary Holmes: Domagk used it to save his own daughter, who got blood poisoning from an infected needle.

Mr O'Bryan: Scientists, **Fleming, Florey** and **Chain** developed **penicillin**, the world's first **antibiotic**.

(PPO selects PowerPoint Slide 12)

Mr Beecham: Penicillin was even **more** effective than Prontosil at killing off infections deep inside the body.

Mrs O'Bryan: But the **impact** of science and technology on surgery does not end with **anaesthetics, antiseptics** and **antibiotics**.

Mary Holmes: Many patients had died on the operating table from **loss of blood**.

(PPO selects PowerPoint Slide 13)

Mrs Sowerby: Doctors in the past, **transfused** blood directly from **person to person**.

Mrs Bolder: They even tried transfusing from an animal, like a lamb.

Mr Sowerby: Sometimes the transfusion worked. Sometimes it didn't. Nobody knew why.

Mr Beecham: Then **Karl Landsteiner** discovered the existence of **blood groups**.

Mrs Beecham: Transfusions, using the **same** blood type, improved survival rates after surgery.

Mr O'Bryan: During the **First World War**, scientists discovered that by adding **sodium citrate** to stored blood, they could stop it from **clotting**.

Mary Holmes: This meant that hospitals could **store** blood in **blood banks** for emergency use.

Mr Beecham: Survival rates after surgery **improved** even further.

Mrs O'Bryan: The impact of **science and technology on surgery** goes on and on:

(PPO selects PowerPoint Slide 14)

[4] Salvarsan 606 was the first magic bullet. It was developed by Ehrlich and Hata in 1909

Mary Holmes: X ray machines allowed surgeons to see bone fractures, bullets and shrapnel inside the body.

Mr O'Bryan: Tissue typing and **immunosuppressant[5] drugs** helped surgeons to **transplant organs** and **graft skin** onto burns victims.

Mr Beecham: Finally, **computers** and **miniaturisation** led to **keyhole** and **micro-surgery**.

Mary Holmes: An **endoscope** fitted with **fibre optic cables** and a **miniature camera** , allows a surgeon to **rejoin** nerves and blood vessels and restore function to damaged limbs.

Mrs O'Bryan: Surgery today has developed **out of all recognition** since the Medieval times, and it is **my** belief that the **main factors** responsible for this transformation were **science and technology**.

Stage Manager: (Mr & Mrs Beecham, Mr O'Bryan, and Mary Holmes applaud Mrs O'Bryan. They gather round her, convinced they have won the argument.)

Mr Beecham: That was a very **persuasive** argument.

Mrs Beecham: You made great use of **supporting evidence**.

Director: (Mr & Mrs Watson, Mrs Ingham and Alice Finch have heard enough.)

Mrs Watson: Hang on a minute. We don't fully **accept** your argument!

Stage Manager: (They move centre stage and stand in front of the whiteboard. The O'Bryans, the Beechams and Mary Holmes move out of their way.)

[5] anti-rejection drugs

The case for Other Factors

N1: Scene 3: The case for Other Factors:

N2: i) The role of the individual

Mrs Ingham: Every single scientific breakthrough and technological advance that you mentioned, was the work of at least **one** remarkable **individual**.

Alice Finch: We would argue that the **role of the individual** has been the **main factor** in the development of surgery since Medieval times.

Mrs Watson: And we'll explain why:

(PPO selects PowerPoint Slide 15)

Mr Bolder: Vesalius was a remarkable individual. He **dissected** human bodies and proved that **Galen was wrong** about certain aspects of anatomy.

Mrs Bolder: That took guts.

Mrs Finch: Vesalius **printed** illustrations of his dissections and shared his discoveries with the world.

Mr York: Which helped **surgeons**, like Ambroise **Paré**, to operate more skilfully.

Director: (Mr Finch turns to Mrs Finch.)

Mr Finch: Didn't I say that **communications** were an **important factor** in the development of surgery?

Mrs Finch: You did, dear. You were so right.

Mr Watson: Paré was another remarkable individual. He found a new way to treat **gunshot wounds** and stem **blood loss**.

Mrs Finch: Then he **published** his findings for other surgeons to read.

Mr Finch: Another example of the importance of **communications**!

Mrs Bolder: William Harvey challenged accepted views about the **circulation of the blood**.

Mrs Ingham: All three were examples of **courageous** and **remarkable** individuals whose

ground-breaking work led to the **development of surgery**.

Alice Finch: There are many **more** remarkable individuals in the 19th century:

(PPO selects PowerPoint Slide 16:)

Mr Watson: James Simpson, who was prepared to test **chloroform** on himself and his friends before using it on his patients…

Mrs Watson: **Joseph Lister**, who faced **derision** when he used **antiseptics** to kill germs that no one could yet see…

Mrs Ingham: The work of **Pasteur** and **Koch**, arguably the **most important** individuals in the history of medicine, had a **significant impact** on the development of surgery

Alice Finch: It led to the discovery of **Prontosil** and **penicillin**, drugs developed by **Domagk, Fleming, Florey** and **Chain**.

Mrs Watson: Four **more** remarkable individuals.

Mrs Watson: Then there are the **surgeons**, like **Dr Christiaan Barnard**, who carried out the first ever **heart transplant**…

Alice Finch: Or **Dr Archibald McIndoe**, who operated over **4000 times** to reconstruct the hands and faces of Allied airmen who suffered disfiguring burns during World War Two.

Mrs Ingham: So, I would argue that the **main factor** in the development of surgery has been remarkable **individuals**, like these. Even surgical technology was built by a skilful engineer or technician.

Mr York: The first microscope didn't invent itself –a remarkable **individual** called **Anthony van Leeuwenhoek** did that, in the 1600s.

Alice Finch: And in the 1800s, **another** remarkable individual, **Joseph Lister** (senior), developed a microscope that magnified **1000 times**.

Mrs Watson: Just like the modern **electron microscope**…

Mr Watson: Endoscopes…

Mrs Ingham: Fibre optic cables…

Alice Finch: Miniature cameras…

Mrs Watson: … - **all** technology is the work of **somebody** remarkable.

Stage Manager: (Mr & Mrs Bolder, Mr & Mrs Sowerby and Mr York are dissatisfied with this interpretation of events.)

Director: (They get up from their seats and take over centre stage. The Watsons, Mrs Ingham and Alice Finch sit down in the Renaissance.)

N3: ii) War

Mr Sowerby: I'll tell you which was the main factor in the development of surgery since Medieval times –**WAR!**

(PPO selects PowerPoint Slide 17)

Mrs Bolder: War was the reason **Paré** was patching up gunshot wounds…

Mrs Sowerby: He was on the battlefield when he ran out of boiling oil. He invented his rosewater concoction in **desperation**, because he still had wounded soldiers to treat.

Mr Bolder: Another factor involved there, was **chance**. It was just **chance** that the oil ran out and Paré had to improvise.

Mr York: The **problem of storing blood** was solved quickly, once the lives of **First World War soldiers** were at stake.

Mrs Bolder: And because he had seen so many of his patients die of **septicaemia** after getting wounded in the trenches, **Alexander Fleming** devoted his life to searching for a treatment - and discovered **penicillin**.

Mr Bolder: Chance was a factor in the discovery of penicillin as well – it was **chance** that a penicillin spore landed on a petri dish smeared with septicaemia germs.

Mrs Sowerby: Penicillin was difficult to grow, but the American government paid for its production, because it was vital to save American soldiers, injured in **World War Two**.

Mr Sowerby: The terrible injuries sustained in **both world** wars led to rapid improvements in **plastic surgery**.

Mr York: And modern conflicts in Iraq and Afghanistan have seen incredible advances in **battlefield dressings, pain management** and **prosthetics**.

Stage Manager: (Rev Holdforth, Mrs York and Mrs O'Flaherty have listened patiently to all the arguments. They stand up and address the assembled cast.)

(PPO selects PowerPoint Slide 18)

N4: Conclusion

Rev Holdforth: Having heard all the arguments, it is clear that **science and technology** have been **extremely** important factors in the development of surgery since Medieval times.

Mrs O'Flaherty: The role of individuals has **also** been **very** important: without them, no breakthroughs would have been possible.

Mrs York: War was a **significant** factor because it accelerated developments in surgery.

Mrs O'Flaherty: And **communications**, particularly **printing**, were important for disseminating information about new treatments and techniques.

Mrs York: Chance, however, was the **least significant** factor in the development of surgery since Medieval times.

Rev Holdforth: The most persuasive argument is that **science and technology** have been the **main** factors in the development of surgery since Medieval times.

Director: (Rev Holdforth, Mrs York and Mrs O'Flaherty sit down. All cast return to their desks and prepare to write a 16 mark essay on science and technology and their impact on the development of surgery.)