



EDX.MED3 Medicine in Britain, c1900-present: War, Science and the Development of Penicillin

EDEXCEL 1HI0 · Calculators not allowed · about 65 minutes

Total Marks

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Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Write in full sentences for Questions 15, 16 and 17. You are advised to spend about 65 minutes on this pack.

- 1** Name the Scottish scientist who accidentally discovered penicillin's antibacterial properties in 1928 while working at St Mary's Hospital, London.

(Total for Question 1 is 1 mark)

- 2** Name the mould whose antibacterial properties Fleming noticed on a contaminated culture plate in 1928.

(Total for Question 2 is 1 mark)

- 3** Name the two Oxford scientists who, working with Norman Heatley, developed a method to extract, purify and test penicillin as a usable drug in the early 1940s.

(Total for Question 3 is 2 marks)

- 4** Give one reason why penicillin was mass-produced mainly by American pharmaceutical companies rather than in Britain during the Second World War.

(Total for Question 4 is 2 marks)

- 5** Name the British surgeon who pioneered plastic surgery techniques for facial injuries at a specialist hospital in Sidcup during the First World War.

(Total for Question 5 is 1 mark)

- 6** Name the skin-graft technique, keeping a strip of skin partly attached to the body to preserve its blood supply while it heals, developed during the First World War.

(Total for Question 6 is 1 mark)

- 7** Name the American army physician who set up an early blood bank on the Western Front in 1917, using a chemical to allow blood to be stored before use.

(Total for Question 7 is 1 mark)

- 8** State the chemical Robertson used to prevent stored blood from clotting so it could be kept and transported for transfusion.

(Total for Question 8 is 1 mark)

- 9** Name the two scientists who, in 1953, published the double helix structure of DNA, building on X-ray diffraction images produced by Rosalind Franklin and Maurice Wilkins.

(Total for Question 9 is 2 marks)

- 10** Give the year in which the National Health Service was launched in Britain, providing healthcare free at the point of use.

(Total for Question 10 is 1 mark)

- 11** Name the government minister, in the Labour government led by Clement Attlee, responsible for founding the NHS.

(Total for Question 11 is 1 mark)

- 12** Name the 1942 government report, written by William Beveridge, that identified disease as one of five giant problems the postwar welfare state should tackle.

(Total for Question 12 is 2 marks)

- 13** Explain two ways in which the First World War (1914-18) led to advances in medical treatment in Britain.

(Total for Question 13 is 4 marks)

- 14** Describe two ways in which the discovery and development of penicillin changed medical treatment.

(Total for Question 14 is 4 marks)

- 15** Explain why it took over a decade for penicillin to become a widely available medicine after Alexander Fleming's discovery in 1928.

(Total for Question 15 is 8 marks)

- 16** Explain why the National Health Service, launched in 1948, was a significant development in the history of medicine in Britain.

(Total for Question 16 is 8 marks)

- 17** 'Science and technology have been the most significant factor in improving medical treatment in Britain in the years c1900-present.' How far do you agree with this statement? Explain your answer.

(Total for Question 17 is 16 marks)

Mark scheme · EDX.MED3 Medicine in Britain, c1900-present: War, Science and the Development of Penicillin

Question 1

- **B1** Alexander Fleming
- **Answer: Alexander Fleming**

Question 2

- **B1** Penicillium (accept Penicillium notatum)
- **Answer: Penicillium**

Question 3

- **B1** Howard Florey
- **B1** Ernst Chain
- **Answer: Howard Florey and Ernst Chain**

Question 4

- **B1** Britain's wartime industry and resources were already heavily stretched by the war effort and at risk from bombing
- **B1** so American pharmaceutical companies, with more spare manufacturing capacity, took on large-scale production, especially to supply Allied forces for the 1944 D-Day landings
- **Answer: Britain's industry was stretched by the war effort, so American companies, with more spare capacity, took on mass production for Allied forces.**

Question 5

- **B1** Harold Gillies
- **Answer: Harold Gillies**

Question 6

- **B1** the tubed pedicle (skin) graft
- **Answer: The tubed pedicle graft**

Question 7

- **B1** Oswald Robertson
- **Answer: Oswald Robertson**

Question 8

- **B1** sodium citrate
- **Answer: Sodium citrate**

Question 9

- **B1** James Watson
- **B1** Francis Crick
- **Answer: James Watson and Francis Crick**

Question 10

- **B1** 1948
- **Answer: 1948**

Question 11

- **B1** Aneurin Bevan
- **Answer: Aneurin Bevan**

Question 12

- **B1** the Beveridge Report
- **B1** published in 1942, written by William Beveridge
- **Answer: The Beveridge Report (1942), written by William Beveridge.**

Question 13

- **B2** blood transfusion became more practical for treating injured soldiers because Oswald Robertson's use of sodium citrate (from 1917) allowed blood to be stored rather than needing a live donor on hand, enabling early blood banks near the front line
- **B2** plastic surgery techniques developed rapidly to treat severe facial injuries from trench warfare, pioneered by Harold Gillies at his specialist unit at Queen's Hospital, Sidcup, including new skin-graft methods such as the tubed pedicle graft
- **Answer: Blood storage using sodium citrate enabled earlier transfusion near the front line, and Gillies's plastic surgery unit at Sidcup developed new skin-graft techniques for facial injuries.**

Question 14

- **B2** Fleming's accidental discovery in 1928 that the mould *Penicillium* killed bacteria opened up the idea of using it as a treatment for bacterial infection
- **B2** Florey and Chain's work in the early 1940s to purify and mass-produce penicillin turned it into a usable, widely available drug, which then saved many lives from bacterial infection, especially during and after the Second World War
- **Answer: Fleming's 1928 discovery identified penicillin's antibacterial effect, and Florey and Chain's early-1940s work turned it into a mass-produced, life-saving drug.**

Question 15

- **Level 1** (1-2): Identifies one or two general reasons for the delay, with little or no supporting detail or explanation.
- **Level 2** (3-4): Identifies and begins to explain one reason, supported by accurate detail.
- **Level 3** (5-6): Explains two reasons for the delay, each supported by accurate and relevant detail.
- **Level 4** (7-8): Explains two or more reasons in a well-developed, logically structured way, supported throughout by precise and accurate detail, showing how the reasons connect.
- **Indicative content:**
 - Fleming discovered penicillin's antibacterial effect in 1928 by chance, but he lacked the chemistry expertise and resources to extract and purify it into a stable, usable drug, and did not fully follow up his own findings.
 - Producing enough pure penicillin was extremely difficult and expensive; it took the specialist chemistry and biological research of Howard Florey and Ernst Chain, and the practical laboratory skills of Norman Heatley, at Oxford in the late 1930s and early 1940s, to work out a method of extracting and purifying usable quantities.
 - Testing and scaling up production safely took further time and resources, and Britain's wartime economy, under pressure from the war effort, could not divert enough industrial capacity to mass production, so American pharmaceutical companies took on large-scale manufacture from 1943.
 - Government and military priorities during the Second World War, especially the urgent need to treat infected wounds among Allied soldiers before the 1944 D-Day landings, provided the funding and urgency that finally accelerated penicillin from a laboratory discovery into a mass-produced medicine.

Question 16

- **Level 1** (1-2): Identifies one or two general reasons for the NHS's significance, with little or no supporting detail or explanation.
- **Level 2** (3-4): Identifies and begins to explain one reason, supported by accurate detail.
- **Level 3** (5-6): Explains two reasons for the NHS's significance, each supported by accurate and relevant detail.
- **Level 4** (7-8): Explains two or more reasons in a well-developed, logically structured way, supported throughout by precise and accurate detail, showing how the reasons connect.
- **Indicative content:**
 - Before 1948, many people could not afford to see a doctor or pay for hospital treatment, so ability to pay, not medical need, often determined whether someone received care; the NHS provided healthcare free at the point of use for the first time, funded through taxation.
 - It followed the 1942 Beveridge Report, which identified disease as one of five giant problems facing postwar Britain, and was created under Health Minister Aneurin Bevan as part of a wider postwar welfare state, showing a new role for government in guaranteeing access to medical care.
 - It brought together, for the first time, hospitals, GPs, dentists and other services into one coordinated national system, rather than a patchwork of charity hospitals, private doctors and limited local authority provision.
 - It changed who could access modern medical advances such as penicillin, vaccination programmes and surgery; previously these depended heavily on a patient's income, whereas after 1948 they were, in principle, available to everyone.

Question 17

- **Level 1** (1-4): Shows limited relevant knowledge of medical developments in this period, and offers only a simple, unsupported opinion on the statement.
- **Level 2** (5-8): Shows some relevant knowledge and identifies relevant factors, but the argument is only partly supported and lacks a developed judgement on how far the statement is accurate.
- **Level 3** (9-12): Shows good relevant knowledge and explains a range of factors, reaching a supported judgement on how far the statement is accurate, with some links made between factors.
- **Level 4** (13-16): Shows precise, well-selected knowledge and explains a range of factors in a balanced way, reaching a fully supported and sustained judgement on how far the statement is accurate, with clear analytical links between factors and consistently accurate use of specialist historical terminology.
- **Indicative content:**
 - Supporting the statement: the discovery and mass production of penicillin (Fleming, 1928; Florey and Chain, early 1940s) gave doctors, for the first time, an effective treatment against many bacterial infections that had previously often been fatal.
 - Supporting the statement: advances such as blood storage and transfusion techniques developed during the First World War, and later the discovery of the structure of DNA by Watson and Crick in 1953, building on the X-ray diffraction work of Rosalind Franklin and Maurice Wilkins, opened the way to a genetic understanding of disease.
 - Against the statement: government action was also crucial, most obviously the creation of the NHS in 1948, which changed who could access treatment regardless of the scientific advances available, showing that access, not only invention, determines a treatment's real-world impact.
 - Against the statement: war acted as a major spur to medical progress in its own right, for example the urgent wartime need driving the mass production of penicillin and battlefield necessity driving advances in blood transfusion and plastic surgery, so the circumstances that funded and demanded these discoveries mattered as much as the science itself.
 - Against the statement: the role of individuals, such as Fleming's chance observation or Bevan's political drive to establish the NHS, also shaped exactly when and how these developments happened, showing that no single factor acted alone.
 - A balanced judgement might conclude that scientific and technological discoveries provided the essential medical breakthroughs, but that their impact ultimately depended on other factors, especially government funding and organisation and the pressures of war, working together with the science.