

Health, disease and the development of medicines practice questions

28 questions • 80 marks • mark scheme at the back

For Edexcel GCSE Biology 1BI0 and Combined Science 1SC0. **Triple only** is not in Combined Science. **Higher tier** is only on the Higher paper.

Name

Total / 80

Health and disease Spec 5.1-5.3

1 Which statement matches the World Health Organization (WHO) definition of health? [1 mark]

- A. ☐ The absence of disease or infirmity
- B. ☐ A state of complete physical, mental and social well-being
- C. ☐ Being physically fit and able to exercise
- D. ☐ Having a healthy diet and not smoking

2 Describe the difference between a communicable disease and a non-communicable disease. [2 marks]

3 People with HIV are more likely to develop tuberculosis (TB). Explain why. [3 marks]

4 A study of 500 people found that those with a long-term skin condition had more infections than those without. A student says that the skin condition causes the infections. Give one reason why the student may be right and one reason why the conclusion cannot be certain. [2 marks]

Pathogens and infections Spec 5.4–5.8

5 Which disease is caused by a protist? [1 mark]

- A. ☐ Cholera
- B. ☐ Malaria
- C. ☐ Tuberculosis
- D. ☐ Chalara ash dieback

6 Cholera is caused by bacteria. Explain how cholera is spread and how its spread can be reduced. [3 marks]

7 Triple only Which disease is caused by a virus and spread by contact with infected body fluids? [1 mark]

- A. ☐ Ebola
- B. ☐ Stomach ulcers caused by *Helicobacter*
- C. ☐ Malaria
- D. ☐ Cholera

8 Triple only Describe what happens in the lysogenic pathway of a virus. [3 marks]

9 Chlamydia is a sexually transmitted infection (STI). Explain how its spread can be reduced. [3 marks]

- 10** Chalara ash dieback is a disease of ash trees caused by a fungus. (a) State two effects of the disease on an ash tree. (2) (b) Describe how the disease spreads and give one way of reducing its spread. (2) **[4 marks]**

Plant defences and plant disease **Spec 5.9B–5.11B** **Triple only**

- 11** **Triple only** **[2 marks]**
Describe two physical barriers that help to protect plants from pathogens.

- 12** **Triple only** **[2 marks]**
Some plants make chemicals as a defence against attack. State one way these chemicals protect the plant and one way they can be used by humans.

- 13** **Triple only** **Higher tier** **[4 marks]**
A farmer notices spots on the leaves of some of her tomato plants. Describe how the cause of the spots could be found.

Human defences and immunity

14 Describe how the nose and airways help to prevent pathogens reaching the lungs. **[3 marks]**

[illegible]

15 A child has chickenpox once and does not usually become ill with it again. Explain why the child does not become ill if they are infected with the chickenpox virus a second time. **[3 marks]**

[illegible]

16 Explain how the immune system responds when a pathogen enters the body for the first time, and how immunisation can prevent illness when the same pathogen enters the body again. **[6 marks]**

[illegible]

17 Triple only

[4 marks]

Discuss the advantages and disadvantages of immunisation, including the idea of herd immunity.

Antibiotics, culturing microorganisms and new medicines Spec 5.16–5.22B

18 Why can antibiotics not be used to treat a viral disease?

[1 mark]

- A. ☐ Viruses are too large to be affected
- B. ☐ Viruses reproduce too quickly for antibiotics to act
- C. ☐ Viruses live inside host cells and do not have the bacterial cell processes that antibiotics inhibit
- D. ☐ Viruses have a cell wall that antibiotics cannot pass through

19 Triple only

[3 marks]

A student transfers bacteria to an agar plate. Describe three aseptic techniques the student should use.

20 Triple only

[3 marks]

A student investigated the effect of three antiseptics on bacteria. Paper discs soaked in each antiseptic were placed on a plate of agar covered in bacteria. A fourth disc was soaked in sterile water. The plate was incubated. (a) Suggest why the disc soaked in sterile water was used. (1) (b) Give two variables that should be controlled. (2)

A clear zone around an antibiotic disc has a diameter of 18 mm. Calculate the area of the clear zone. Use $\pi = 3.14$. Give the unit.

Answer =

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Describe the stages in the development of a new antibiotic, in the correct order.

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Describe how hybridoma cells are made and why they are used to produce monoclonal antibodies.

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Monoclonal antibodies can be used to treat cancer. (a) Explain how a monoclonal antibody can be used to treat cancer. (2) (b) Give one advantage of this treatment compared with radiotherapy. (1) (c) Give one other use of monoclonal antibodies. (1)

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Spec 5.23-5.25

[1 mark]

- A. ☐ They are caused by a single factor
- B. ☐ They are often caused by the interaction of a number of factors
- C. ☐ They are spread by vectors
- D. ☐ They are caused by pathogens

The table shows some measurements for a man. (a) Calculate his body mass index (BMI). [3 marks]
Use the equation: $\text{BMI} = \text{mass (kg)} \div \text{height (m)}^2$. Give your answer to 1 decimal place. (2)
(b) Calculate his waist : hip ratio. Give your answer to 2 decimal places. (1)

Measurements for one man	
Measurement	Value
Mass	85 kg
Height	1.70 m
Waist circumference	98 cm
Hip circumference	104 cm

Answer =

[illegible]

(a) Describe how smoking increases the risk of cardiovascular disease. (2) (b) State one disease caused by drinking too much alcohol. (1) **[3 marks]**

[illegible]

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Doctors can treat cardiovascular disease with life-long medication, with surgical procedures, or by advising lifestyle changes. Evaluate these three treatments.

[6 marks]

Mark scheme

One mark for each point unless a maximum is given. Words in brackets are not needed for the mark.

1. [1]

B B (1)

2. [2]

- a communicable disease can be passed from one organism to another / is caused by a pathogen (1)
allow infectious
- a non-communicable disease cannot be passed on / is not caused by a pathogen (1)

3. [3]

- HIV destroys white blood cells (1)
- so the immune system is weakened / fewer antibodies are made (1)
- so the bacteria that cause TB are not destroyed / the body cannot fight the infection (1)

4. [2]

- the damaged skin is a weaker barrier / allows pathogens to enter (1)
- a correlation does not prove cause / another factor could explain both / the sample may not be representative (1)

5. [1]

B B (1)

6. [3]

- bacteria are in water contaminated with sewage / faeces (1)
- people become infected by drinking the contaminated water (1)
- provide clean / treated drinking water or treat sewage (1) allow handwashing / thorough cooking of food

7. [1] Triple only

A A (1)

8. [3] Triple only

- the viral genetic material enters the host cell (1)
- it becomes part of the host cell's DNA / is integrated into the host DNA (1)
- the virus is inactive / dormant, and is copied when the host cell divides (1) allow no new viruses are made until it is triggered

9. [3]

- use a condom (1)
- which acts as a barrier / stops the bacteria passing between partners (1)
- regular screening / testing and treating infected people with antibiotics (1)
- limit the number of sexual partners / inform partners so they can be tested (1) allow abstaining from sex
- Max 3

10. [4]

- (a) leaf loss (1)
- bark lesions (1)
- (b) spores are carried in the air / by the wind (1)
- destroy infected trees / restrict the movement or import of ash plants (1)

11. [2] Triple only

- leaf cuticle: a waxy layer that pathogens cannot easily pass through (1)
- cell wall: a strong layer around the cell that pathogens must get past (1) allow made of cellulose

12. [2] Triple only

- kill / slow the growth of microorganisms, or poison pests (1) allow deter pests from eating the plant
- used as medicines to treat disease or relieve symptoms (1) allow a named example such as aspirin from willow

13. [4] Triple only Higher tier

- eliminate environmental causes, for example check soil nutrients, water supply or temperature (1)
- record where the affected plants are / distribution analysis, for example clusters around one point suggest a spreading pathogen (1)
- observe the visible symptoms and compare them with known diseases (1)
- diagnostic tests in a laboratory to identify the pathogen (1)

14. [3]

- mucus traps pathogens (1)
- cilia (hairs) on the cells lining the airways (1)
- move the mucus away from the lungs / up to the throat (1)

15. [3]

- memory lymphocytes were made during the first infection (1)
- they recognise the antigens and respond faster (1)
- more antibodies are made quickly so the pathogen is destroyed before symptoms develop (1)

16. [6]

Level 3 5-6	A clear, well-structured explanation covering both the first response (antigens, antibodies, memory lymphocytes) and how immunisation leads to a faster, larger secondary response. Scientific terms are used accurately and links between ideas are clear.
Level 2 3-4	Explains most of the first response or immunisation, with some correct links. There may be gaps, such as not linking memory lymphocytes to the secondary response.
Level 1 1-2	Some correct statements about antibodies or immunisation, but little explanation and few links between ideas.

Indicative content

- antigens on the pathogen trigger an immune response
- the response produces antibodies that bind to the antigens and help to destroy the pathogen
- antigens also trigger production of memory lymphocytes
- immunisation uses an inactive form of the pathogen, which cannot cause the disease
- the inactive pathogen still has antigens, so antibodies and memory lymphocytes are produced
- if the live pathogen enters later, memory lymphocytes carry out a secondary response
- this is faster and produces more antibodies, so the pathogen is destroyed before the person becomes ill

17. [4] Triple only

- advantage: protects the individual from a serious disease / prevents epidemics (1)
- herd immunity: when a large proportion of the population is immune, the pathogen cannot spread easily (1)
- so people who are not immune / cannot be vaccinated, such as babies, are protected (1)
- disadvantage: some people have side effects, such as a sore arm or fever, or rarely a serious reaction (1)
- disadvantage: it does not work for everyone / boosters may be needed / new vaccines are needed if the pathogen changes (1)
- Max 4: at least one advantage and one disadvantage needed for full marks

18. [1]**C C (1)****19. [3] Triple only**

- sterilise the inoculating loop in a flame before use (1)
- use agar and petri dishes sterilised in an autoclave (1)
- keep the lid on the petri dish / only lift it briefly (1)
- tape the lid on after inoculating / wash hands / disinfect the bench (1)
- Max 3

20. [3] Triple only

- (a) to show that the water or the paper disc alone does not affect bacterial growth / so any clear zone is caused by the antiseptic (1) ignore 'fair test' unqualified
- (b) same type / volume of bacteria (1)
- same size of disc / same volume of antiseptic / same temperature / same incubation time / same agar (1)

21. [3] Triple only

- radius = $18 \div 2 = 9$ mm (1)
- area = $\pi r^2 = 3.14 \times 9^2$ / 3.14×81 (1)
- 254 mm^2 (1) allow 254.3 or 254.34 mm^2 ; unit required for this mark
- if the diameter is used instead of the radius ($3.14 \times 18^2 = 1017 \text{ mm}^2$), award 1 mark

22. [3]

- discovery of the chemical (1)
- development (1)
- preclinical testing, on cells, tissues and live animals (1)
- clinical testing on people (1)
- Max 3

23. [3] Triple only Higher tier

- a lymphocyte that makes the desired antibody (1) allow the lymphocyte cannot divide
- is fused with a tumour cell (1)
- to make a hybridoma cell, which can divide (1)
- the hybridoma cells produce the antibody as they divide, so large numbers of identical antibodies are made (1)
- Max 3

24. [4] Triple only Higher tier

- (a) a drug is attached to the monoclonal antibody (1)
- the antibody binds to an antigen on the cancer cells so the drug is delivered to them (1)
- (b) targets specific cells / fewer healthy cells are damaged / fewer side effects (1)
- (c) pregnancy testing or locating blood clots or locating cancer cells (1)

25. [1]

B B (1)

26. [3]

- (a) height² = $1.70 \times 1.70 = 2.89$ (1)
- BMI = $85 \div 2.89 = 29.4$ (1) allow 29.41; award 2 marks for the correct answer with no working
- (b) $98 \div 104 = 0.94$ (1) allow 0.942; do not accept a unit

27. [3]

- (a) chemicals in smoke damage the lining of arteries, so fatty deposits build up / arteries narrow (1)
- nicotine increases heart rate and blood pressure (1) allow any other correct effect on the heart or blood vessels
- (b) liver disease / cirrhosis / fatty liver (1)

28. [6]

Level 3 5-6	A balanced evaluation of all three treatments, with advantages and disadvantages for each, and a justified conclusion about their use.
Level 2 3-4	Advantages and/or disadvantages given for at least two treatments, with some judgement. The conclusion may be missing or not justified.
Level 1 1-2	A few correct points about one or two treatments, with no evaluation or conclusion.

Indicative content

- medication such as statins or blood pressure drugs reduces risk without an operation
- but medication must be taken for life, can have side effects and costs money
- surgery such as stents, bypass, valve replacement or transplant can quickly restore blood flow or heart function
- but surgery has risks such as infection and bleeding, needs recovery time and is expensive; a transplant needs a donor and may be rejected
- lifestyle changes such as stopping smoking, healthy diet and exercise are cheap, have no side effects and reduce risk
- but they need long-term effort, take time and may not be enough for severe disease
- conclusion, for example lifestyle changes for everyone, medication to manage disease, and surgery for severe blockages