



Defence against disease: practice questions

8 questions • 27 marks • mark scheme at the back

For IB Diploma Biology, Standard Level and Higher Level (first assessment 2025). **HL only** is additional higher level content, for HL students only.

Name

Total / 27

1 PAPER 1A STYLE [1 mark]

What is the role of thrombin in blood clotting?

- A. ☐ It is released from platelets to start the clotting cascade
- B. ☐ It converts fibrinogen into fibrin
- C. ☐ It binds erythrocytes together directly
- D. ☐ It converts fibrin into fibrinogen

2 PAPER 1A STYLE [1 mark]

Which of the following is a zoonosis transmitted to humans by the bite of a mosquito?

- A. ☐ Rabies
- B. ☐ Tuberculosis
- C. ☐ Japanese encephalitis
- D. ☐ AIDS

3 PAPER 1A STYLE [1 mark]

Why are antibiotics not effective against viral infections?

- A. ☐ Viruses are too small to absorb antibiotics
- B. ☐ Viruses have no metabolism of their own for antibiotics to block
- C. ☐ Viruses have cell walls made of a different material from bacteria
- D. ☐ Antibiotics are broken down by the host's immune system

4 PAPER 2A STYLE [4 marks]

Outline how antibodies against a specific antigen are produced.

5 PAPER 1B STYLE

[7 marks]

The table shows weekly COVID-19 cases per 100 000 adults in one region, in vaccinated and unvaccinated adults. The data are for practice. (a) Calculate the percentage change in cases among unvaccinated adults from week 1 to week 8. [2] (b) Calculate the percentage difference between the case rates of unvaccinated and vaccinated adults in week 8. [2] (c) Suggest one reason, other than vaccination, why cases fell in both groups between week 4 and week 8. [1] (d) Evaluate the claim that these data prove that vaccination reduces infection. [2]

Weekly COVID-19 cases per 100 000 adults (practice data)		
Week	Unvaccinated adults	Vaccinated adults
1	420	150
4	610	190
8	280	70

Answer =

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6 PAPER 2A STYLE

[3 marks]

Explain why a person infected with HIV for several years is likely to develop opportunistic infections.

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PAPER 2B STYLE

Explain how strains of pathogenic bacteria resistant to several antibiotics evolve, and why careful use of antibiotics is needed.

[illegible]

PAPER 2A STYLE

Outline how vaccination of a large proportion of a population can prevent an epidemic.

[illegible]

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. [1]

C C [1]

3. [1]

B B [1]

4. [4]

- antigen (glycoprotein / protein) on surface of pathogen [1]
- specific B-cell binds / interacts directly with the antigen [1]
- helper T-cell activated by the same antigen [1]
- contact with activated helper T-cell activates the B-cell [1]
- activated B-cell divides by mitosis [1]
- forms a clone of plasma cells [1]
- plasma cells secrete the (same) specific antibody [1]
- [max 4]

5. [7]

- (a) $(280 - 420) \div 420 \times 100$ [1]
- (a) = -33.3% / a decrease of 33% [1]
- (b) mean of the two rates = $(280 + 70) \div 2 = 175$ [1]
- (b) $|280 - 70| \div 175 \times 100 = 120\%$ [1]
- (b) Accept $(280 - 70) \div 280 \times 100 = 75\%$ (lower in vaccinated adults) for [1] max only if unvaccinated adults are clearly stated as the reference value
- (c) social distancing / lockdown / mask wearing / more people immune after infection / seasonal change / less testing OWTTE [1]
- (d) supports: vaccinated adults had fewer cases than unvaccinated in every week [1]
- (d) but correlation does not prove causation / data are from one region only [1]
- (d) groups may differ in age / behaviour / testing rate / only three weeks shown / no statistical test [1]
- [max 7]

6. [3]

- HIV infects and kills (certain types of) lymphocytes / helper T-cells [1]
- number of helper T-cells falls over time [1]
- fewer B-cells activated, so fewer antibodies produced [1]
- immune system cannot fight pathogens normally controlled / this is AIDS [1]
- [max 3]

7. [6]

- variation in the bacterial population [1]
- resistance arises by random mutation / gene for resistance [1]
- resistance genes can be transferred between bacteria on plasmids [1]
- antibiotic kills susceptible bacteria [1]
- resistant bacteria survive: natural selection [1]
- resistant bacteria reproduce rapidly / binary fission, passing on resistance gene [1]
- proportion of resistant bacteria in the population increases [1]
- exposure to several antibiotics selects multiresistant strains [1]
- careful use slows the emergence of multiresistant bacteria [1]
- eg prescribe only for bacterial infections / not for viral infections [1]
- eg complete the course / avoid routine use in livestock / hospital hygiene [1]
- [max 6]

8. [4]

- vaccine contains antigens / DNA or RNA coding for antigens [1]
- stimulates a primary immune response without causing the disease [1]
- memory cells produced / retained, giving immunity [1]
- on infection, memory cells give a rapid secondary response, eliminating the pathogen [1]
- if a sufficient percentage is immune, transmission is greatly impeded: herd immunity [1]
- protects people who cannot be vaccinated / are not immune [1]
- [max 4]