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SPECA

GCSE Combined Science (AQA Trilogy) · Biology

Infection and Response · Mark Scheme

For use with the Worksheet. Marking points are indicative, not exhaustive: award equivalent correct answers.

Pathogens and how they cause disease (Q1 to 3)

1) A pathogen is a microorganism that causes infectious disease (1); the four categories are: viruses (1), bacteria (1), protists (1), fungi (1) [5]

2) Bacteria: reproduce rapidly in the body and may release toxins that damage tissue (1); viruses: reproduce inside cells and damage them directly (1) [2]

3) Any two of: direct contact, water, air (1 each, max 2) [2]

Named diseases (Q4 to 10)

4) Virus (1); fever and a red skin rash (1); controlled by childhood vaccination (1) [3]

5) Initial flu-like illness, then progressively attacks immune cells, and late-stage infection (AIDS) leaves the immune system unable to fight other infections/cancers (2); spread by sexual contact or exchange of body fluids, e.g. shared needles (1) [3]

6) Causes a mosaic pattern of discolouration on leaves (1), which reduces the rate of photosynthesis and growth (1) [2]

7) Symptoms: fever, abdominal cramps, vomiting and diarrhoea, from the bacteria and the toxins they secrete (2); controlled in the UK by vaccinating poultry (1) [3]

8) Bacterium (1); thick discharge and pain on urinating (1); controlled by antibiotic treatment or barrier contraception (1) [3]

9) Purple/black spots on leaves, leading to early yellowing and leaf loss, reducing photosynthesis (1); treated with fungicide or by removing affected leaves (1) [2]

10) Transmitted via a mosquito vector as part of the protist's life cycle (1); causes recurrent, potentially fatal fever (1); controlled by preventing mosquito breeding or using mosquito nets (1) [3]

The body's defences and the immune system (Q11 to 12)

11) Any three of: skin acts as a physical/chemical barrier; the nose's hair and mucus trap pathogens; the trachea and bronchi's mucus-and-cilia system removes pathogens; the stomach's acid kills pathogens (1 each, max 3) [3]

12) Phagocytosis: white blood cells engulf pathogens (1); antibody production: specific to the pathogen's antigens (1); antitoxin production: neutralises the toxins pathogens produce (1) [3]

Vaccination and antibiotics (Q13 to 17)

13) A small quantity of dead or inactive pathogen is introduced (1), which stimulates white blood cells to produce antibodies (1); a genuine later infection by the same pathogen triggers a fast antibody response that prevents illness (1) [3]

14) Immunising a large proportion of a population reduces how easily the pathogen can spread overall (1), so people who are not vaccinated are less likely to come into contact with it (1) [2]

15) Antibiotics kill bacteria, and specific antibiotics work on specific bacteria (1); they cannot treat viral infections because viruses reproduce inside body cells, and it is hard to develop a drug that kills the virus without damaging the body's own cells (1) [2]

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16) Bacteria can evolve resistance to antibiotics through overuse/misuse (1); resistant strains are harder or impossible to treat with existing antibiotics and can spread to other people (1) [2]

17) An antibiotic kills the pathogen (bacteria) causing the infection (1); a painkiller relieves the symptoms of the infection without killing the pathogen (1) [2]

Developing new medicines (Q18 to 20)

18) Any one drug and its correct natural source, e.g. digitalis from foxgloves; aspirin from willow bark; penicillin from Penicillium mould (1 for drug, 1 for source) [2]

19) Testing takes place in a laboratory, using cells, tissues, and live animals (1), to test for toxicity (1) and efficacy and to find a suitable dose (1) [3]

20) Clinical testing starts with very low doses given to healthy volunteers or patients (1); further trials are then carried out to find the optimum dose (1); some trials are double-blind, where some patients receive a placebo (1); this separates the drug's real effect from expectation effects, since neither patient nor researcher knows who received the placebo (1) [4]

Total: 54 marks

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