1.17 Communicable Diseases and Pathogens: Test Pack

AQA 8464 · Calculator allowed · about 45 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Pathogens are organisms that cause communicable disease.

(a) Name one type of pathogen. **(1)**

(Total for Question 1 is 1 mark)

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2 The immune system responds to pathogens. A vaccination programme aims to produce immunity in a population.

(a) Explain, in terms of antibodies and memory cells, how a vaccine protects a person from a future infection by the same pathogen. **(3)**

(Total for Question 2 is 3 marks)

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3 A communicable disease is caused by a pathogen and can spread from one organism to another.

(a) Define the term 'pathogen'. **(1)**

(b) Define the term 'communicable disease'. **(1)**

(c) Name the four types of pathogen that can cause communicable disease. **(4)**

(Total for Question 3 is 6 marks)

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4 Salmonella is a bacterium that can cause food poisoning in humans. In the UK, poultry (chickens) are routinely vaccinated against Salmonella.

(a) State the type of pathogen that causes salmonella food poisoning. **(1)**

(b) Give two symptoms of salmonella food poisoning. **(2)**

(c) Explain how vaccinating poultry against Salmonella reduces the number of cases of salmonella food poisoning in humans. **(3)**

(d) State two things a person preparing chicken at home can do to reduce the risk of salmonella food poisoning. **(2)**

(Total for Question 4 is 8 marks)

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5 A simple test for antibodies in blood gives a positive result if antibodies are present.

(a) Evaluate how reliable a positive antibody test result is for determining current infection. Include one limitation and one strength. **(3)**

(Total for Question 5 is 3 marks)

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6 A crop researcher sampled 250 wheat plants in a large field and found that 35 of them showed symptoms of a fungal leaf disease.

(a) Calculate the percentage of sampled plants showing symptoms of the disease. **(2)**

(b) The field contains 12000 wheat plants in total. Assuming the same percentage of plants is infected across the whole field, calculate the total number of infected plants in the field. **(2)**

(c) The researcher could recommend removing (roguing) all infected plants, or treating the whole field with a fungicide. Suggest one advantage and one disadvantage of removing the infected plants instead of treating the whole field with fungicide. **(2)**

(Total for Question 6 is 6 marks)

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7 A student used a light microscope to examine a prepared slide of leaf tissue from a rose plant showing symptoms of rose black spot, as part of an investigation to confirm the cause of the disease.

(a) The microscope was fitted with a x10 eyepiece lens and a x40 objective lens. Calculate the total magnification used to view the slide. **(1)**

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(b) The student made a scale drawing of a fungal hypha seen on the slide, using a total magnification of x300. In the drawing, the hypha measured 15 mm long. Calculate the actual length of the hypha, in micrometres (µm). Show your working. **(3)**

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(c) Suggest one reason why a farmer might want to use microscopy to confirm rose black spot, rather than relying on the plant's visible symptoms alone. **(2)**

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(d) State one technique the student should use when preparing the leaf sample slide, to avoid damaging the sample. **(1)**

(Total for Question 7 is 7 marks)

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Mark scheme · 1.17 Communicable Diseases and Pathogens: Test Pack

Question 1

(a) one of: virus, bacterium, fungus, protozoan, or helminth (parasitic worm), oe **B1**

(a) Answer: Virus (or bacterium, fungus, protozoan, helminth).

Question 2

(a) vaccine contains antigen from pathogen that stimulates immune response leading to production of specific antibodies **M1**

(a) development of memory B cells specific to that antigen **M1**

(a) on later exposure the memory cells produce antibodies rapidly preventing disease cao **A1**

(a) Answer: Vaccine antigens stimulate production of specific antibodies and memory B cells; on later exposure memory cells produce antibodies rapidly, preventing disease.

Question 3

(a) a microorganism that causes disease, oe **B1**

(a) Answer: A microorganism that causes disease.

(b) a disease caused by a pathogen that can be passed (spread) from one organism/person to another, oe **B1**

(b) Answer: A disease caused by a pathogen that can be spread from one organism (or person) to another.

(c) bacteria (bacterium) **B1**

(c) viruses (virus) **B1**

(c) fungi (fungus) **B1**

(c) protists (protist) **B1**

(c) Answer: Bacteria, viruses, fungi and protists.

Question 4

(a) bacterium cao **B1**

(a) Answer: Bacterium.

(b) fever, oe **B1**

(b) stomach cramps, vomiting or diarrhoea, oe **B1**

(b) Answer: Any two of: fever; stomach cramps; vomiting; diarrhoea.

(c) vaccinating poultry reduces the number/proportion of birds that carry (are infected with) Salmonella bacteria, oe **B1**

(c) this reduces the contamination of chicken meat and eggs with Salmonella bacteria during production, oe **B1**

(c) so fewer bacteria are present in food reaching consumers, reducing the number of people who develop food poisoning after eating it, oe **B1**

(c) Answer: Vaccinating poultry reduces the number of birds carrying Salmonella, which reduces contamination of meat and eggs. This means fewer bacteria reach consumers in food, reducing cases of food poisoning.

(d) cook the chicken thoroughly (until it is no longer pink and juices run clear), oe **B1**

(d) avoid cross-contamination, e.g. use a separate chopping board for raw chicken and wash hands after handling it, or store chicken properly in the fridge, oe **B1**

(d) Answer: Any two of: cook the chicken thoroughly; avoid cross-contamination with other foods (e.g. use a separate chopping board and wash hands); store chicken correctly in the fridge.

Question 5

(a) states a strength such as indicates exposure to pathogen or immune response **M1**

(a) states a limitation such as antibodies can persist after infection or cross react causing false positives or does not distinguish current from past infection **M1**

(a) concludes that a positive result suggests exposure but is not definitive evidence of current infection cao **A1**

(a) Answer: Strength: a positive test shows the immune system has made antibodies to the pathogen. Limitation: antibodies may persist after infection or cross react, so a positive does not prove current infection. Conclusion: indicates exposure but not definitive for current infection.

Question 6

(a) (35 / 250) x 100, oe **M1**

(a) 14% cao **A1**

(a) Answer: 14%

(b) 12000 x 0.14 (using their percentage from (a), ft), oe **M1**

(b) 1680 (plants) cao **A1**

(b) Answer: 1680 plants

(c) advantage: no cost of buying/applying fungicide to the whole field, and no fungicide residues on the remaining crop, oe **B1**

(c) disadvantage: removing plants reduces the total number of healthy plants left to harvest (yield), or the disease may already have spread to plants that look healthy so is not fully removed, oe **B1**

(c) Answer: Advantage: no cost of fungicide for the whole field and no fungicide residue on the crop. Disadvantage: removing plants reduces the number of healthy plants left to harvest, and some already-infected plants that look healthy may be missed.

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Question 7

(a) 400 (x400) cao **B1**

(a) Answer: x400 (400 times magnification).

(b) converts image size to µm: 15 mm x 1000 = 15000 µm, oe **M1**

(b) actual size = image size / magnification = 15000 / 300, oe **M1**

(b) 50 µm cao **A1**

(b) Answer: 50 micrometres (50 µm)

(c) visible symptoms alone can look similar to those of other diseases, pests or nutrient deficiencies, oe **B1**

(c) so examining the pathogen itself (e.g. seeing fungal hyphae or spores) under the microscope confirms the specific cause, allowing the correct treatment to be chosen, oe **B1**

(c) Answer: Visible symptoms can look similar for different diseases, pests or deficiencies. Confirming the pathogen under the microscope identifies the specific cause, so the correct treatment can be used.

(d) lower the cover slip gently onto the sample at an angle (using a mounted needle), to avoid trapping air bubbles and crushing the sample, oe **B1**

(d) Answer: Lower the cover slip gently onto the sample at an angle, using a mounted needle, to avoid trapping air bubbles or crushing the sample.

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