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Level: HL IB in Biology
Subject: Biology
Topic: IB HL Biology
Type: Mark Scheme

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All International Baccalaureate IB Topic Questions HL Biology

BIOLOGY

HL - IB

Key skills

Answer 1

The correct answer is A; skin provides a tough physical barrier as well as chemical protection through sebum production. Mucus membranes produce mucus to trap microorganisms to prevent harm.

Option B is incorrect as hair is not considered primary defence.

Option C is incorrect as phagocytes and fever are part of the secondary defence systems

Option D is incorrect because lymphocytes produce antibodies as part of a specific immune response which could be considered the third line of defence.

Answer 2

The correct answer is A because the reduction of flights would reduce spread of the disease between humans in different countries.

Option B is incorrect as killing all birds would not prevent the spread of H5N1 as this was only given the name bird flu as it is a cross-species transmission from birds to humans

Option C is incorrect as antibiotics are not effective against avian flu, only against bacterial infections.

Option D is incorrect as the winter flu vaccination is designed for a different strain of flu which has different antigens and therefore triggers production of different antibodies.

Answer 3

The correct answer is C because one class of antibiotics (bacteriostatic antibiotics) are effective against bacteria because they disrupt the synthesis of the peptidoglycan cell wall. Viruses do not have peptidoglycan cell walls, this is why antibiotics do not affect viruses

A is incorrect as viruses need to infect a host cell in order to carry out metabolic processes, but this does not explain why antibiotics are effective against bacteria but not viruses

B & D are incorrect as while the statements are correct about viruses, they do not explain why antibiotics work on bacteria and not viruses

Answer 4

The correct answer is D because this antibiotic has the largest zone of inhibition which means greater efficacy of the antibiotic against that bacterial strain.

Options A and B are incorrect because they have smaller zones of inhibition showing that the antibiotics are less effective.

Option C is incorrect because this disc is likely to be a control and does not contain any antibiotic, there should be no inhibition of growth around a control.

Answer 5

The correct answer is B because the process is as follows:

- Endocytosis is the process of engulfing a pathogen that is either attached to the surface of the cell or marked by an antibody.
- A vacuole is formed around the bacteria.
- Digestive enzymes are released from lysosomes into the vacuole to digest the pathogen.

The whole process described above is 'phagocytosis'.

Answer 6

The correct answer is C – this statement is correct as lymphocytes produce antibodies to combat specific pathogens.

Answer A, B and D are all incorrect as they refer to phagocytes

Answer 7

The correct answer is B; Platelets are a component in the blood which are responsible for triggering the process by releasing clotting factors which stimulate thrombin to convert fibrinogen to fibrin which forms a mesh to collect further platelets and cell debris to form a scab.

Answers A, C and D are incorrect as they refer to the correct components but in the wrong order.

Answer 8

The correct answer is C; lymphocytes respond to specific antigens on the surface of pathogens to produce specific antibodies which can combat that pathogen.

Answer A is incorrect as that describes the treatment of a disease but not immunity to the disease.

Answer B is incorrect because monoclonal antibodies are produced in the lab to target certain antigens artificially.

Answer D is incorrect as phagocytosis is a non-specific immune response.

Answer 9

The correct answer is B because the development of new antibiotics should act to relieve the selection pressure caused by overuse of current antibiotics and therefore reduce the evolution of bacteria towards becoming resistant over time.

Options A, C and D are all contributing factors towards the development of resistant strains of antibiotics and are therefore incorrect.

Answer 10

The correct answer is D because recent developments in antiretroviral medication has made this even longer as they slow the progression of the disease

Options A, B and C are incorrect because many patients are asymptomatic (not showing signs of infection) for many years until the virus has reduced the levels of the immune system to a point that AIDS (Acquired Immunodeficiency Syndrome) has started. It is not possible to completely cure or remove the HIV infection from a patient.

Answer 11

The correct answer is A because, depending on the amino acid change, it is highly likely that the three-dimensional structure of the protein being produced will be different. If the change in shape is at or near the target region of an antibiotic molecule (i.e. the drug target site), it may prevent binding of the antibiotic so the bacteria becomes resistant.

- B is incorrect, as although mutations could result in a protein not being synthesised, this is more likely to cause harm to the bacteria, especially if it is an essential protein
- C is incorrect, as producing less of the target protein would actually make the bacterial cell more sensitive to the antibiotic
- D is incorrect, as it is not the best answer. Mutations could introduce a stop codon, which would result in a shortened non-functional polypeptide being produced, preventing antibiotic binding. However, as most antibiotics target key essential proteins a non-functional protein would cause harm to the bacteria

Answer 12

The correct answer is C

II. is not true because the symptoms of allergies are caused as a result of histamines, the antigens trigger a response which results in histamine release so the symptoms are not DIRECTLY attributable to antigens.

Answer 13

The correct answer is C

All other options would lead to coagulation as the patient receiving the blood has different antigens to the donor. The donor in part A, B and C all have A antigens which would coagulate the blood in the recipients who don't have A antigens.

Answer 14

The correct answer is B, activation of T-helper cells initiates the start of the immune response.

Option A is incorrect because phagocytosis alone would not trigger an immune response. Sometimes a specific immune response may be initiated when a T-helper cell binds to antigens presented by a phagocyte. In this scenario, the phagocyte has engulfed the pathogen as the first stage of the process, but the specific immune response is not triggered until the T-helper cell is activated. Option C is incorrect because B-cells mature in the bone marrow prior to initiation of a specific immune response. Part D occurs once the immune response has already started.

Answer 15

The correct answer is C, plasma cells do not produce memory cells, memory cells differentiate from B-cells (as do plasma cells).

Option A is a feature of plasma cells as they need the RER to produce antibodies. Option B is also true because plasma and memory cells both originate from B-cells. Plasma cells produce antibodies specific to an antigen and so option D is another true feature.

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Answer 16

The correct answer is A.

Zoonotic diseases are diseases that cross the species barrier to humans and are therefore of concern. It is thought that the COVID 19 pandemic originated from a virus that crossed the species barrier. There are four specific examples you are required to know which including tuberculosis, rabies, COVID 19 and Japanese encephalitis. Species-specific diseases are unable to cross the species barrier and are therefore less of a challenge to contain, this makes them less of a risk to humans and therefore less of a concern

Answer 17

The correct answer is B

- Antibiotics act as a selection pressure, effectively selecting resistant bacteria which then reproduce and pass on their resistant alleles. If antibiotics are not used, then there will be no advantage to having the alleles for resistance, and these alleles will be no more likely to be passed on.
- Reducing the spread of infection will reduce the need to use antibiotics.

Researching new antibiotics will provide essential alternative treatment options in the future, and while they may eventually lead to reduced reliance on current antibiotics (leading to a reduction in their use and a resulting reduction in resistance to them), this benefit will not occur until after they have been tested and approved for use. Note that bacteria will also eventually evolve resistance to these new antibiotics and alternative antibacterial technologies will be needed in the future.

Answer 18

The correct answer is A. Resistance can be seen to increase to any antibiotic that is in regular use. Cefixime resistance increases while it is recommended and then decreases again, azithromycin resistance increases while it is recommended, and ciprofloxacin and tetracycline resistance increases throughout due to their use in treating various infections.

B is incorrect; ceftriaxone resistance doesn't appear to increase in this study, but that doesn't mean that it won't evolve elsewhere, and not all antibiotics are suitable for use against all bacteria.

C is incorrect; infection X needs to be treated, and resistance rates to most antibiotics in the study appear to remain low. There may also be other antibiotic options beyond those in this study.

D is incorrect; tetracycline is frequently used against mild conditions, and is therefore not relied on for use in serious infections. The development of resistance to it is not likely to be critical to anyone's health.