

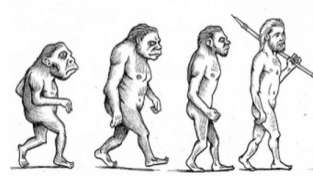
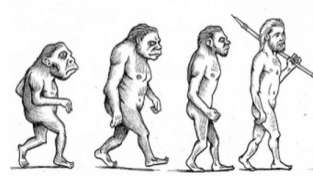
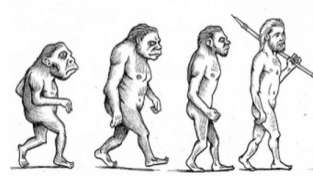
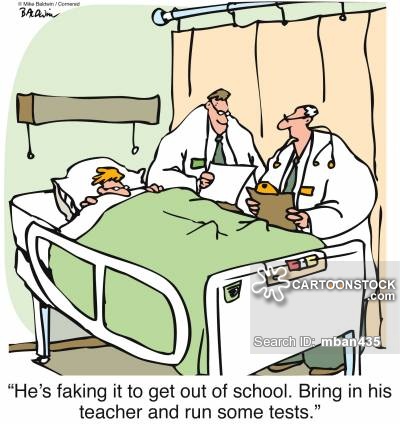
**Year 12 Human Biology**

**Test: Immune Response**

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| --- |
| Name: |
| Teacher: |

|  |  |  |
| --- | --- | --- |
|  | Marks Received | Marks Available |
| Multiple Choice |  | 13 |
| Short Answer |  | 32 |
| Extended Answer |  | 10 |
| Total |  | 55 |

Weighting: 5%



**PART A: Multiple Choice Section [Total: 13 marks]**

1. Macrophages are large white blood cells that

(a) divide to produce B lymphocytes.

(b) engulf bacteria and destroy them.

(c) produce antibodies against specific antigens.

(d) secrete bacterial-destroying enzymes into the blood.

2. Which of the following differentiates correctly between antibiotics and vaccines?

(a) Antibiotics treat for an invading bacterium, while many vaccines involve the introduction of an inactivated pathogen into the bloodstream.

(b) Antibiotics provide long-lasting immunity due to the production of memory cells, while vaccines only provide short-term immunity.

(c) Antibiotics provide artificial, active immunity, while vaccines provide artificial, passive immunity.

(d) Antibiotics are often injected into the bloodstream, while vaccines are normally ingested in pill form.

3. Antibiotics are often ineffective against viruses because viruses

(a) keep changing their external protein coat.

(b) are able to disguise themselves in the host cell membrane.

(c) are not true living cells, so their metabolism is not affected by antibiotics.

(d) can destroy or inhibit the actions of antibiotics in living cells.

4. A typical characteristic of a virus is that it

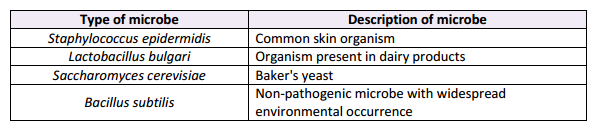
(a) is destroyed by antibiotics.

(b) releases toxins into the body of the host.

(c) evades detection by the host's immune system.

(d) manipulates the host cell's DNA to produce copies of itself.

5. The table lists the types of microbes identified in a cheeseburger prepared at an outdoor market.



Would it be safe to eat this cheeseburger?

Choose the best answer from the following.

(a) Yes, food should be completely free of microbes

(b) No, Lactobacillus and Saccharomyces are highly pathogenic

(c) Yes, organisms that grow in or on the human body do not cause disease

(d) No, most of the food we eat is contaminated by different microbes

6. An example of specific immunity is the

(a) action of mucus to remove bacteria from the respiratory tract.

(b) presence of 'natural flora’ bacteria in different areas of the body.

(c) presence of antibacterial agents, such as enzymes, in saliva.

(d) action of memory cells when an individual is subjected to a second infection of measles.

7. After contact with the polio virus, a child developed polio and recovered. Twelve months later, the child came in contact with the polio virus again but did not show any symptoms of the disease. This happened because, shortly after the first infection, the child

(a) had an injection of polio antibodies.

(b) grew memory B cells specific to polio.

(c) grew memory B cells that could respond to any virus.

(d) developed T cells that consumed the new polio virus particles.

8. Penicillin is an example of an

(a) antibiotic.

(b) antibody.

(c) antigen.

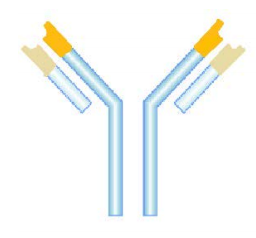
(d) antitoxin.

9. The following diagrams show the antigens on the surface of different bacteria isolated from an open wound.



Antigen 1 Antigen 2 Antigen 3 Antigen 4

An antibody was also detected. It is shown below.



This antibody is most likely to react to antigen

(a) 1.

(b) 2.

(c) 3.

(d) 4.

10. Of the different types of Leucocytes, which are involved in the formation of T-cells and B-cells?

(a) monocytes.

(b) basophils.

(c) eosiophils.

(d) lymphocytes.

11. Ig is the abbreviation for Immunoglobulins. One Ig usually contains two pairs of polypeptide chains. The ends of these chains are referred to as ‘variable portions’. What is the common name for Immunoglobulins?

(a) antibodies.

(b) cytotoxins.

(c) macrophages.

(d) antigens.

12. Which of the following is the hallmark of the humoral immune response?

(a) phagocytosis.

(b) binding of antibodies to antigens.

(c) cell lysis by T-cells.

(d) antigen presentation.

13. Inflammation in the area of a wound, like a tear in the skin, is a useful reaction to the damage because:

1. It results in more blood flow to the area.
2. It allows more seepage of plasma from the capillaries into the surrounding tissue.
3. It may enable a blood clot to form more readily in the area.
4. All of the above.

**PART B: Short Answer Section [Total 32 marks]**

14. *Light for Riley* is a community campaign created after Riley Hughes, a 3 week old infant, died from Whooping Cough in a Western Australian Hospital in 2015. Since then, Riley’s mother Catherine and her husband have promoted the protection of children from vaccine-preventable diseases through the process of immunisation.

1. Complete the following table on two of the traditional vaccines commonly used

(6 marks)

|  |  |  |  |
| --- | --- | --- | --- |
| **Vaccine type** | **Description** | **Advantage for this type of vaccine** | **Example of a disease that this vaccine is used to protect against** |
| Living attenuated micro-organisms | * Weakened virus or bacteria * Stimulates immune response * Doesn’t cause disease | * Closest to natural immunity * Long term immunity * Booster shots not required | Measles, mumps, rubella, rabies, polio, TB, yellow fever |
| Toxoids | * Contains inactivated toxins from bacteria | * Doesn’t cause disease. | Diphtheria, tetanus, rabies |

1. Traditional vaccines have shown to be very effective, but they have certain problems. Developers of modern vaccines have tried to produce vaccines that that are affective for prolonged periods but produce no side effects. Describe how modern vaccines work. (2 marks)

* Produced through recombinant DNA
* Pathogens DNA is changed to make it less virulent

1. Explain the difference between an antibody and an antigen. (2 marks)

* Antigens are substances that cause an immune response.(1)
* Antibodies are proteins produced in response to non-self antigens.(1)

1. Local health agencies in Western Australia suggest that Whooping Cough vaccinations be given at 2, 4 and 6 months of age. State the type of immunity and likely source of antibodies for newborns between the ages of 0 and 2 months. (2 marks)

* Natural Passive (1)
* enter the infant through the placenta / breast milk (1)

A newborn baby was monitored for the presence of pertussis antibodies, with none detected for the first two months of life. The baby was then given the routine vaccinations at 2, 4 and 6 months of age.

1. On the following figure, draw a graph indicating the level of pertussis antibodies you would expect in the baby from the age of 2 to 12 months. (3 marks)

Level of Pertussis Antibodies (arbitrary units)

2 4 6 8 10 12

Time (months)

Show increase in steepnesss (1 mark), height (1 mark) with each injection. Immjnity from last injection must persist (1 mark)

15.The skin and mucous membranes provide an external defence against pathogens. Describe **two** of the body’s **other** external defences against infection by pathogens. (2 marks)

* **Hairs** in nose and ears trap particles when breathing
* **Cilia** hair like projections in the mucous membranes of nose, trachea and other passages beat to move mucus and trapped organisms towards the throat.
* **Acids** in the stomach and vagina kill bacteria and reduce growth of micro-organisms
* **Lysozyme** in tears, sweat, saliva an enzyme that kills bacteria
* **Cerumen** – ear wax is acidic and contains lysozyme – kills bacteria

16. The effects of many diseases have been minimised in many countries due to the introduction of live attenuated vaccines. A live attenuated vaccine uses a weakened version of the disease-causing pathogen to stimulate an immune response in the vaccinated person. The MMR (measles, mumps and rubella) vaccination program attracts a lot of media attention, which highlights some of the risks and ethical considerations associated with the use of vaccines.

Discuss **one** risk and **one** ethical concern associated with the use of vaccines. (2 marks)

Risk **Any single point**

**•** Possible mild allergic reaction to the vaccine

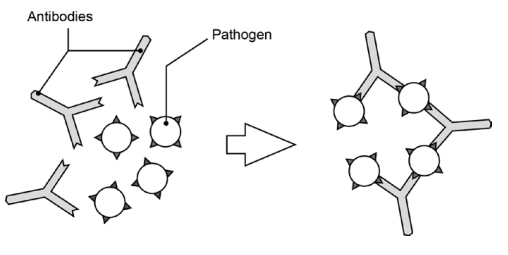
• Possible reversion of pathogen to more virulent form may make vaccine ineffective

• Can’t be given to immune-compromised patients

Ethical concern **Any single point**

* Treatment of animals in the production of the vaccine
* The use of stem cells from aborted hum foetuses
* Exploitation of people from developing countries for trials of vaccines
* Vaccination against HPV may encourage promiscuity

17. The diagram below shows one of the actions of antibodies on pathogens.



1. What action of antibodies does the diagram represent? (1 mark)

Agglutination / clumping together of pathogens

1. Describe **three** other ways in which antibodies can act on pathogens to help fight infection. (3 marks)

• Neutralise them / inactivate them / combine with foreign enzymes or bacterial toxins, or inactivate them by inhibiting reaction with other cells or compounds

• Bind to surfaces of viruses, preventing them from entering the cell

• Make soluble substance insoluble / form a precipitate

• Coat bacteria so they are more easily consumed by phagocytes / enhance phagocytosis / make them more easily consumed

• Dissolve organisms

18. Immunity can be passive or active and natural or artificial. Complete the table below describing the different types of immunity. (4 marks)

|  |  |  |
| --- | --- | --- |
|  | **Passive** | **Active** |
| **Natural** | Antibodies are received from mother to baby from breast milk (colostrum) or via placenta during pregnancy **(1 mark)** | Antibodies are produced by the body as a result of being infected by a pathogen. **(1 mark)** |
| **Artificial** | Antibodies are injected into the bloodstream. **(1 mark)** | Antibodies are produced by the body as a result of an antigen being introduced by vaccination. **(1 mark)** |

19. During a game of soccer, one of the female players is pushed and falls to the ground, as she does, she cuts her knee open on a piece of old glass. By the time she reached home her knee had become all red and swollen. Her Mum told her not to worry about that because it was all part of her body’s way of stopping the spread of pathogens that may have been on the glass. The girl’s mother was talking about the inflammatory response.

Explain, in sequence, the steps the body goes through during the inflammatory response. (5 marks)

* Mast cells in the area release histamine and heparin
* Histamine increases blood flow and permeability of the capillaries.
* This causes heat, redness and swelling
* Heparin prevents clotting which slows the spread of pathogens
* Chemicals attract phagocytes to consume pathogens

**PART C: Extended Response [Total 10 marks]**

20. A female with a defective kidney received a new kidney transplant from a non-related male. The female patient failed to take the appropriate medication and the transplant was rejected. Describe the cell-mediated immune response that resulted in the rejection of the transplanted kidney.

(10 marks)

**Max 3 marks – recognising non-self**

• Lymphocytes have antigen receptors on their surface

• Our own cells are marked with MHC proteins / antigens that allow the body to recognise it as self

• MHC = major histocompatibility complex

• Foreign kidney tissue would have different MHC proteins on its surface and would be recognised as non-self

**Max 7 marks – cell mediated response**

• Macrophages will engulf non-self cells and present the non-self antigen on its surface

• Helper T cells recognise non-self antigen

• Helper T cells release cytokines (chemical messengers)

• T cells to clone / undergo mitosis

• Cytotoxic T cells / killer T cells are produced

• Helper T cells attract macrophages / stimulate phagocytosis

• Helper T cells promote the action of cytotoxic / killer T cells

• Cytotoxic / killer T cells destroy the foreign tissue (by secreting chemicals)

• Suppressor T cells inhibit / slow down immune response when completed

• Memory T cells are produced and remain, provide faster / stronger response in future.