1. Define *pathogen*.

*“An organism or virus that causes disease.”*(1 p. 49)

1. List some examples of illness which are pathogenic and non-pathogenic.

Pathogenic:

Non-pathogenic:

1. Outline one example of an infection by each of the following types of pathogens:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *Type of pathogen* | **BACTERIA** | **VIRUS** | **FUNGI** | **PROTOZOA** |
| Example disease | Cholera |  |  |  |
| Pathogen  | *Vibrio cholerae* |  |  |  |
| Method of transmission | Contaminated drinking water or food |  |  |  |
| Symptoms | Severe diarrhea and vomiting |  |  |  |
| Treatment | Urgent oral rehydration, antibiotics |  |  |  |
| Dangers  | Death by dehydration |  |  |  |

1. Explain why antibiotics can be used to treat bacterial infections but not viruses.

*Link thought: how does overuse of antibiotics lead to antibiotic resistance?*

1. In the space below, draw and annotate two simple line graphs to distinguish between the action of *bacteriostatic* and *bacteriocidal* antibiotics:



*Link thought: how does overuse of antibiotics lead to antibiotic resistance?*

1. Outline the role of skin and mucous membranes in primary defense (acting as barriers against pathogens):

|  |  |
| --- | --- |
| Skin is a tough barrier |  |
| Hairs, e.g. nose |  |
| Mucous, such as in nose, airways |  |
| Acidic conditions (e.g. stomach and vagina) |  |
| Lysozymes |  |
| Natural organisms |  |

1. State the functions of the following components of the blood:

|  |  |
| --- | --- |
| Erythrocytes |  |
| Platelets |  |
| Plasma |  |
|  |  |
| **Leukocytes (white blood cells)** |
| **Phagocytes**  |  | **Lymphocytes** |
| Macrophages  |  |  | B-Cells |  |
|  | T-Cells |  |

1. Blood clotting is an example of a metabolic pathway.

Describe the process of blood clotting.

*
*
*
*
*
*
1. Outline how phagocytic leukocytes ingest pathogens in the blood and body tissues.

|  |  |
| --- | --- |
| Method of membrane transport: |  |
| How does it work? |  |

1. Distinguish between antibodies and antigens.

|  |  |
| --- | --- |
| Antibody | A globular protein. *(revise levels of protein structure)*Produced as part of the immune response. Specific to the antigen on the pathogen – the antigen binding site is analogous to the active site of an enzyme.  |
|  |  |



*Link thought: how is this important in ABO blood typing and how is that an example of codominance?*

1. Explain clonal selection as a basis for immunity.

|  |  |
| --- | --- |
|  | There are many different types of lymphocytes in the immune system.  |
|  |
|  |
|  |
|  |
|  |

*Link thought: antibodies are globular proteins produced by lymphocytes. Explain how the final antibody is produced from the genetic information in the lymphocyte nucleus, to a level of detail appropriate to your level of study.*

1. Briefly describe the principle of polyclonal selection.
2. State the role of memory cells following an infection.
3. Define active and passive immunity.

Active:

Passive:

1. State examples of the following types of immunity.

|  |  |
| --- | --- |
| **Active** | **Passive** |
| Natural | Artificial | Natural | Artificial |
|  |  |  |  |

1. Explain how antibodies are produced.

Use the following terms: pathogen, phagocyte, epitope (antigen), helper T-cell, B-cell, clone, plasma cell, antibody.

* Pathogen is ingested by a macrophage.
*
*
*
* 
1. Explain the principles of vaccination.
* Antigen is introduced to the body
*
*
*
*
1. Discuss the benefits and potential dangers of vaccinations.

|  |  |
| --- | --- |
| Benefits | Potential Dangers |
| Eradication of diseases, such as smallpox. |  |

Further reading: “*The Media’s MMR Hoax*” <http://www.badscience.net/2008/08/the-medias-mmr-hoax/>

In this article, Dr Ben Goldacre debunks the dangerous myth that the MMR vaccine is linked to autism. This was a case of very poor science reporting by a poor newspaper, based on poor scientific research. The resulting panic resulted in dropping MMR vaccination uptake rates.

Ethical discussion: What are the ethical considerations of enforced vaccination programs?

1. Monoclonal antibodies are produced industrially for use in medicine.
2. State three uses of monoclonal antibodies

|  |  |
| --- | --- |
| Diagnosis of condition | Pregnancy test kits, heart attack detection |
| Diagnosis of infection |  |
| Treatment |  |

1. Describe the industrial process of monoclonal antibody production.

*Refer to B-cells, tumours and hybridomas.*

* Immune response is stimulated in a lab animal
* Specific B-cells are harvested