**SOUTHERN RIVER COLLEGE**

**Human Biological Science**

**Unit 3**

**TASK 5 – Test 2**

**Homeostasis & Immunity**

**Time: 55 mins**

Multiple Choice: 15 marks

Short Answer: 20 marks

Extended Answer: 20 marks

TOTAL 55 MARKS

**Weighting: 5%**

**Do not write on this question booklet**

**Do not turn page until instructed to do so**

**Section A: Multiple Choice (15 Marks)**

Answer all questions by placing an X through the most correct answer on the multiple choice answer sheet.

1. The concentration of the mumps antibody in the blood of a person was measured over a period of 90 days. The results are shown on the graph below.

Concentration

of antibodies

(arbitrary units)

0 30 60 90

Time (days)

30

A

It is reasonable to conclude that the graph represents the concentration of the mumps antibodies in:

1. a newborn baby whose mother had been vaccinated against mumps.
2. a newborn baby whose mother had a mumps antibody injection before becoming pregnant.
3. an adult who became infected with mumps at time A on the graph.
4. a child who had been vaccinated against mumps at time A on the graph.
5. During exercise, the heart rate increases:
6. due to decreased carbon dioxide in the blood.
7. to increase the supply of blood to alimentary organs.
8. and the blood vessels in the muscles dilate.
9. due to high oxygen levels in the blood.
10. Suffocation victims are usually given a mixture of 95% oxygen and 5% carbon dioxide rather than pure oxygen, because the carbon dioxide:
11. decreases the danger of choking by dilating bronchiole tubes.
12. increases the speed with which gases pass through the alveoli of the lungs.
13. directly stimulates the diaphragm to produce the breathing action.
14. acts on the respiratory centre to stimulate breathing.
15. Which of the physiological responses below occur when core temperature increases above 37.5 0C?
16. Blood circulation to the skin increases
17. Sebaceous gland activity increases
18. Radiation of heat increases
19. Blood circulation to the brain decreases
20. Superficial blood vessels dilate
21. Sweat gland activity increases
22. i, ii, iii, v
23. i, iv, v, vi
24. i, ii, iv, vi
25. i, iii, v, vi

**The following information relates to Questions 5 and 6.**  
  
Measles is an infectious disease caused by a virus. Symptoms usually appear 6–10 days after exposure to the virus and include a rash, headache and fever. In a proportion of cases the patient is affected by secondary bacterial infections, especially of the lungs. Antibiotics are often prescribed.

1. Antibiotics are likely to:
2. decrease the rate of DNA synthesis by the measles virus.
3. reduce fever by resetting the body’s thermostat.
4. disrupt the synthesis of new bacterial cell components.
5. do all of the above.
6. When suffering from measles and a secondary bacterial lung infection, antibodies are produced by the patient’s immune cells. Which of the following statements is true of these antibodies?
7. The same antibody is capable of attacking the measles virus and the bacteria infecting the lung.
8. The antibodies which attack the virus are produced by helper T cells, whereas the antibodies which attack the bacteria are produced by B cells.
9. Viral antibodies and bacterial antibodies are produced by the same plasma cells.
10. Large quantities of antibodies specific to the measles virus remain in the circulation for a short time.
11. Steady state control systems involve a flow of information through a cycle in which there is five separate functional components. When the pituitary gland secretes hormones to control other endocrine glands it is acting as:
12. A receptor
13. A modulator
14. An effector
15. A stimulus
16. Insulin controls the metabolism of
17. Fats
18. Proteins
19. Carbohydrates/ Sugars
20. Hormones
21. The process of converting glycogen to glucose is called:
    1. Glycogenolysis
    2. Lipogenesis
    3. Glucagon
    4. Glycogenesis
22. ADH is released by the pituitary to:
    1. Regulate water content in the kidneys.
    2. Control calcium and phosphate levels in the blood.
    3. Control the production and release of hormones from the adrenal cortex.
    4. Promote normal metabolism and resistance to stress.
23. After the removal of gland X, a patient was unable to regulate body temperature effectively. Gland X was the:
24. Thyroid
25. Pancreas
26. Thymus
27. Adrenal Glands
28. If osmotic pressure in the blood increases, then:
    1. the water content of the blood has increased.
    2. the ADH levels in the blood is the same.
    3. the water content of the blood has decreased.
    4. the ADH levels in the blood have reduced.
29. Homeostatic control of water content of blood occurs in the nephron when the filtrate reaches the:
    1. Proximal convoluted tubule
    2. Loop of Henle
    3. Distal convoluted tubule
    4. Glomerulus
30. Substances that stimulate the production of antibodies are called:
    1. Antipathogens
    2. Antitoxins
    3. Antigens
    4. Antibacterials
31. Immunity to disease that is acquired by an infant from its mother’s breast milk is an example of what type of immunity?
    1. Natural active immunity
    2. Natural passive immunity
    3. Artificial passive immunity
    4. Artificial active immunity

**END OF SECTION A**

Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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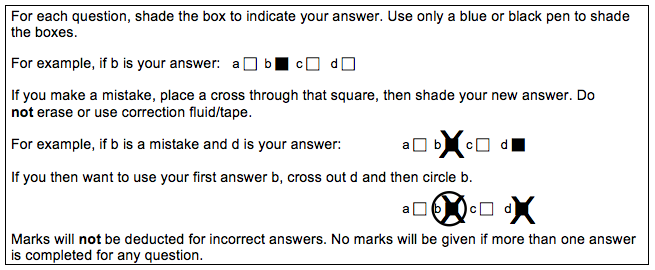
**SOUTHERN RIVER COLLEGE**

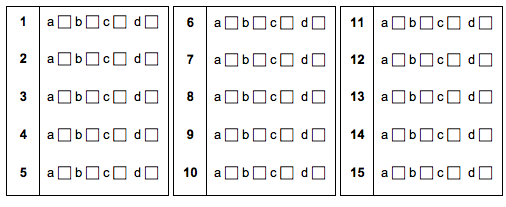
**Human Biological Science Unit 3**

**TASK 5 – Test 2 Homeostasis & Immunity**

TOTAL 55 MARKS

**Multiple choice & answer booklet**





**Section B: Short Answer (20 Marks)**

Answer all questions in the spaces provided.

**Question 1 (4 Marks)**

Question 1 refers to the graph below, showing the immune response of a person injected with two doses of an antigen.

1. Name and describe the type of cell that directly results in the response which occurs between day 0 and 10 on the graph above. (2 marks)

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1. Explain how and why the shape of the graph is different after the second injection of antigen compared with the first exposure. (2 marks)

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**Question 2 (6 Marks)**

The balance of gas concentrations within the body are controlled by a stimulus response mechanism.

1. Name the receptor/s of low oxygen concentration. (1 marks)

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1. Explain the relationship between carbon dioxide, hydrogen ion concentration and pH levels in the blood. (3 marks)

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1. Which one - carbon dioxide, oxygen or pH levels in the blood, results in the most immediate response by the peripheral chemoreceptors? (1 mark)

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1. What is the mode of transmission to relay the information to the respiratory centre? (1 mark)

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**Question 3 (6 marks)**

To investigate the effects that air temperature has on body temperature, a naked subject stood in a room especially designed for controlling air temperature. The subject was exposed to 480C to monitor the body’s response to dry heat. After a rest period, the same subject was then exposed to 50C to monitor the body’s response to dry cold. The data recorded are shown on the graphs below. Use the graphs to answer the following.



1. List two physiological adjustments the body is making to cope with the situation at point A in the graph, and explain how these may be of benefit.

(4 marks)

|  |  |  |
| --- | --- | --- |
|  | Physiological Adjustment | Benefit |
| (i) |  |  |
| (ii) |  |  |

1. Using the information in the graphs alone, did the most efficient temperature regulation occur when the subject was exposed to heat or cold? Give one reason for your answer.

(2 marks)

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**Question 4 (4 marks)**

Meningococcal disease is caused by the bacterium *Neisseria meningitides. N. meningitides* are found in the throat and nasal passages of about 10% of the population. These carriers of *N. meningitides* suffer no disease symptoms. In susceptible individuals, however, the bacteria can pass into the bloodstream and cause disease.

1. Outline **two specific** external defence mechanisms which have failed to stop this bacterium from entering the body. (2 marks)

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The disease may take the form of:

• Meningitis (an infection of the membranes covering the brain and spinal cord)

• Septicaemia (a blood infection).

There are many strains of meningococci, but the strains that cause almost all disease in Victoria are called serogroup B and serogroup C.

Children and young adults are now routinely vaccinated against one strain of *N. meningitides*. Meningococcal C vaccine is effective in providing protection against bacteria of serogroup C. An effective vaccine against serogroup B has not yet been produced. In serogroup B bacteria, the key polysaccharide is identical to polysaccharides found in the body and so is recognised as self by the body’s immune system.

1. Explain two ways in which routine immunisation for meningococcal C may cause a decrease in the incidence of the disease in Victoria.(2 marks)

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**END OF SECTION B**

**Section C: Extended Answer (20 Marks)**

Answer all parts of ALL questions on the lines provided.

**Question 1**

In 1960, Australian Sir Frank MacFarlane Burnet (a Virologist) was awarded the Nobel Prize for medicine for correctly predicting how the body’s immune system responds to infection. He investigated the “Bundaberg Distaster”, in which twelve children in Queensland were given a diphtheria vaccine contaminated with *Staphylococcus aureus* bacteria (Golden Staph).

1. Describe the children’s humoral immune response when faced with the invading Staphylococcus pathogen. (6 marks)
2. Describe 3 ways in which antibodies can act on the pathogens to help fight infection. (3 marks)
3. Give four differences between humoral and cell-mediated immunity.

(4 marks)

**Question 2**

Louise is a 43-year old female who has type 1 diabetes.

1. Describe how her body responds after eating a meal high in carbohydrates. (4 marks)
2. What does Louise have to do in order to manage her condition and how does her body respond to this. (3 marks)

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