**Semester 1 Edwest Examination, 2016**

**Solutions**

**HUMAN**

**BIOLOGICAL**

**SCIENCE**

**Unit 3**

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

Class \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Teacher Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Time allowed for this paper**

Reading time before commencing work: ten mins

Working time for paper three hours

**Materials required/ recommended for this paper**

To be provided by the supervisor

**This Question/ Answer Booklet**

**Multiple- choice Answer Sheet**

***To be provided by the candidate***

Standard items: pens, pencils, eraser, correction fluid, ruler, highlighters

Special items: non-programmable calculators satisfying the conditions set by the Curriculum Council for this course

**Important note to candidates**

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non‑personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

**Structure of this paper**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Section** | **Number of questions available** | **Number of questions to be answered** | **Suggested working time**  **(minutes)** | **Marks available** | **Percentage of exam** | **Student Score** |
| **Section One:**  **Multiple-choice** | 30 | 30 | 40 | 60 | 30 |  |
| **Section Two:**  **Short answer** | 8 | 8 | 90 | 100 | 50 |  |
| **Section Three:**  **Extended answer** | 3 | 2 | 50 | 40 | 20 |  |
|  | | | | | 100 |  |

**Instructions to candidates**

1. The rules for the conduct of Western Australian external examinations are detailed in the *Year 12 Information Handbook 2016.* Sitting this examination implies that you agree to abide by these rules.

2. Answer the questions according to the following instructions.

**Section One**: Answer all questions on the separate Multiple-choice Answer Sheet provided. For each question shade the box to indicate your answer. Use only a blue or black pen to shade the boxes. If you make a mistake, place a cross through that square, do not erase or use correction fluid, and shade your new answer. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

**Sections Two and Three**: Write answers in this Question/Answer Booklet.

3. You must be careful to confine your responses to the specific questions asked and to follow any instructions that are specific to a particular question.

4. Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.

* + Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
  + Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question(s) that you are continuing to answer at the top of the page.

**Section One: Multiple-choice 30% (60 Marks)**

This section has **30** questions. Answer **all** questions on the separate Multiple-choice Answer Sheet provided. For each question shade the box to indicate your answer. Use only a blue or black pen to shade the boxes. If you make a mistake, place a cross through that square, do not erase or use correction fluid, and shade your new answer. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

Suggested working time for this section is 30 minutes.

1. The direction in which a nerve impulse travels is always
2. dendrite 🡪 cell body 🡪 axon
3. axon 🡪 cell body 🡪 dendrite
4. cell body 🡪 dendrites 🡪 axon
5. dendrites 🡪 axon 🡪 cell body
6. It is incorrect to say that a synapse is
7. a cytoplasmic connection between two types of nerve cell in a neural circuit.
8. located between an axon ending of one neuron and a dendrite of another.
9. only able to allow the transmission of a nerve impulse in one direction.
10. a region of functional contact that can be bridged chemically by a neurotransmitter.
11. Stimulation of the parasympathetic nervous system leads to an increase in
12. dilation of the bronchioles.
13. rate of perspiration.
14. pressure of blood in the aorta.
15. rate of peristalsis.
16. Following increased secretion of adrenaline, dilation would occur in the arterioles supplying blood to the
17. skin.
18. skeletal muscles.
19. small intestine.
20. kidneys.
21. Which of the following descriptions correctly refers to the corpus callosum?
22. large bundle of nerve fibres connecting cerebral hemispheres
23. region of the cerebellum that analyses and interprets information
24. largest part of the brain divided into two hemispheres
25. region of the cerebrum that receives information from the body’s receptors
26. Receptors carry messages into the central nervous system via the
27. efferent division of the nervous system.
28. afferent division of the nervous system.
29. somatic division of the nervous system.
30. autonomic division of the nervous system.
31. Information from the body’s receptors passes through the discrete areas of the cerebrum in the order
32. motor, sensory, association.
33. motor, association, sensory.
34. sensory, motor, association.
35. sensory, association, motor.
36. When a decrease in water concentration of the blood occurs, which of the following series of events brings about osmoregulation?

|  |  |  |  |
| --- | --- | --- | --- |
|  | ADH Production | Permeability of kidney tubules | Volume of urine produced |
| a | increased | increased | decreased |
| b | increases | decreased | decreased |
| c | decreased | increased | decreased |
| d | increased | increased | increased |

1. The initial stages of a marathon are fuelled largely by glucose released from glycogen stored in the
2. liver and skeletal muscles.
3. skeletal muscles and adipose tissue.
4. adipose tissue and bone marrow.
5. bone marrow and liver.
6. The adrenal medulla releases
7. cortisol.
8. glucagon.
9. insulin.
10. adrenaline.
11. Which element causes vesicles to release neurotransmitters into the synaptic cleft?
12. magnesium
13. potassium
14. sodium
15. calcium
16. Which of the following statements is correct?
17. an antibody stimulates the body to produce antigens
18. an antibody is always composed of a polysaccharide
19. an antigen stimulates white blood cells to produce antibodies
20. an antigen is always composed of viral proteins
21. Compared with the secondary response, antibody formation during the primary response is normally found to
22. reach a higher level.
23. be maintained for a longer time.
24. occur at a much more rapid rate.
25. be unable to prevent the disease.
26. An autoimmune disorder results from the boy’s failure to recognise its
27. ‘self’ antibody signature.
28. ‘self’ antigen signature.
29. ‘non-self’ antibody signature.
30. ‘non-self’ antigen signature.
31. The human body is defended against viral invasion by
32. T-lymphocytes functioning as phagocytes which engulf pathogens.
33. macrophage producing cell-bound antibodies which act against viruses.
34. B-lymphocytes producing antibodies which act against the virus.
35. monocytes functioning as phagocytes which produce antibodies.
36. A deficiency in which neurotransmitter is commonly linked to Alzheimer’s disease?
37. acetylcholine
38. serotonin
39. adrenaline
40. dopamine
41. Penicillin is a widely used in the treatment of certain types of infection. Which of the following types of infection would penicillin be an effective treatment?
42. viral
43. bacterial
44. fungal
45. parasites
46. Which of the following is a typical behavioural response to a rise in body temperature?
47. vasodilation of skin arterioles
48. taking a cold drink
49. increasing the room temperature
50. adding layers of clothing
51. Which of the following hormones is secreted as a response to long term stress?
52. adrenaline
53. cortisol
54. noradrenaline
55. glucagon
56. Which line correctly identifies the components of the stimulus response model?
57. stimulus 🡪 receptor 🡪 effector 🡪 modulator 🡪 response
58. receptor 🡪 stimulus 🡪 modulator 🡪 effector 🡪 response
59. stimulus 🡪 receptor 🡪 modulator 🡪 effector 🡪 response
60. receptor 🡪 modulator 🡪 effector 🡪 stimulus 🡪 response
61. Which of the following is a property of most bacteria but not a virus?
62. contains both DNA and RNA
63. contains no DNA or RNA
64. contains only DNA
65. contains only RNA
66. Aldosterone is release by
67. adrenal medulla.
68. adrenal cortex.
69. posterior pituitary gland.
70. anterior pituitary gland
71. Which of the following receptors detects changes to blood gas concentrations?
72. osmoreceptors
73. thermoreceptors
74. chemoreceptors
75. nociceptor
76. Lyme disease is spread by ticks. This is an example of
77. airborne transmission.
78. transmission by vector.
79. transmission by body fluids.
80. transmission by ingestion.
81. An antigen is
82. any substance capable of causing disease.
83. any substance capable of bringing on a fever.
84. any substance capable of causing a specific immune response.
85. any substance capable of causing a non-specific immune response.
86. Sleep is regulated by the
87. thymus gland.
88. thyroid gland.
89. pineal gland.
90. adrenal gland.
91. An investigation was carried out into the effect of increasing the concentration of carbon dioxide in the air on a person’s breathing.

The table below shows how increasing the percentage of carbon dioxide in the air affects the volume of air inhaled each minute.

|  |  |
| --- | --- |
| **Carbon Dioxide Concentration in the air (%)** | **Volume of air inhaled (litres/ minute)** |
| 1 | 9 |
| 2 | 10.5 |
| 3 | 11 |
| 4 | 12.5 |
| 5 | 19 |
| 6 | 22 |
| 7 | 40 |

The concentration of carbon dioxide is

1. control variable.
2. dependent variable.
3. independent variable.
4. none of the above.
5. During which of the following activities would it be most important for humans to have voluntary control over their breathing?
6. watching a scary movie
7. running a marathon
8. singing in a choir
9. playing tennis
10. The respiratory centre is found in which part of the brain?
11. cerebrum
12. cerebellum
13. hypothalamus
14. medulla oblongata
15. A minor increase in which of the following gases would bring about a significant increase in the breathing rate?
16. hydrogen
17. oxygen
18. nitrogen
19. carbon dioxide

**End of Section One**

|  |  |
| --- | --- |
| 1 | A |
| 2 | A |
| 3 | D |
| 4 | B |
| 5 | A |
| 6 | B |
| 7 | D |
| 8 | A |
| 9 | A |
| 10 | D |
| 11 | D |
| 12 | C |
| 13 | D |
| 14 | B |
| 15 | C |
| 16 | A |
| 17 | B |
| 18 | B |
| 19 | B |
| 20 | C |
| 21 | A |
| 22 | B |
| 23 | C |
| 24 | B |
| 25 | C |
| 26 | C |
| 27 | C |
| 28 | C |
| 29 | D |
| 30 | D |

**Section Two: Short answer 50% (100 Marks)**

This section has **eight** (**8)** questions. Answer **all** questions. Write your answers in the space provided.

Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.

* Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
* Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question(s) that you are continuing to answer at the top of the page.

**Suggested working time for this section is 90 minutes.**

**Question 31 (15 marks)**

The diagram outlines some of the divisions of the nervous system.

The Nervous System

Peripheral Nervous System

Central Nervous System- Brain and Spinal Cord

Efferent Division

(Motor)

Afferent Division

(\_\_\_Sensory\_\_\_\_)

Autonomic

(Involuntary)

Somatic

(Voluntary)

Parasympathetic

(Quiet Conditions)

Sympathetic

(Fight or Flight)

1. Complete the above diagram above. (5 marks)
2. Name and describe three (3) ways in which the nervous system is protected. (6 marks)

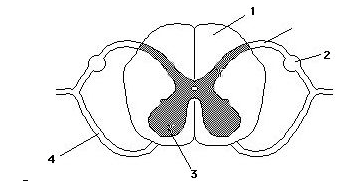
Bone (1)- cranium and vertebrae (must state both for mark), tough outermost protective layer (1)

Meninges (1) -3 layers- a thick layer attached to the skull, a layer of mesh and a delicate inner layer that contains blood vessels (1)

CSF (1)- shock absorber, cushions brain and spinal cord (1)

ANY 4

The diagram below shows a cross section of the spinal cord



1. (i) Identify the structures labelled 2 & 4 (2 marks)

2 dorsal root ganglion (1)

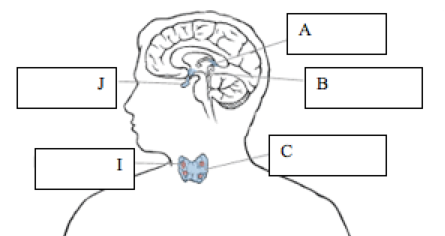
4 ventral root (1)

(ii) The diagram shows areas of grey and white matter found within the spinal cord. These sections are labelled 1 & 3 in the above diagram. Outline the difference between grey and white matter. (2 marks)

Grey matter- made up of nerve cell bodies (1)

White matter- made up of mylinated fibres/ mylinated axons (1)

**Question 32 (10 marks)**



1. Use the above diagram to complete the table below. You must identify the name of the gland, a hormone produced by the gland and the effect of the hormone. (6 marks)

|  |  |  |  |
| --- | --- | --- | --- |
| **Gland** | **Name of Gland** | **Example of hormone produced** | **Effect of Hormone** |
| C | Thyroid | Thyroxine | Controls cell metabolism |
| I | Parathyroid | Parathyroid hormone | Controls calcium levels |

As we grow older, it is common for gland C to no longer function normally.

1. Name one (1) dysfunction of gland C and briefly outline a possible cause, symptom and treatment for this condition. (4 marks)

Hypothyroidism (1) cause- autoimmune response (1) symptom- fatigue/ weight gain/ slow heart rate/ goitre/ intolerance to cold (1) treatment- thyroid medication/ increase iodine intake (1)

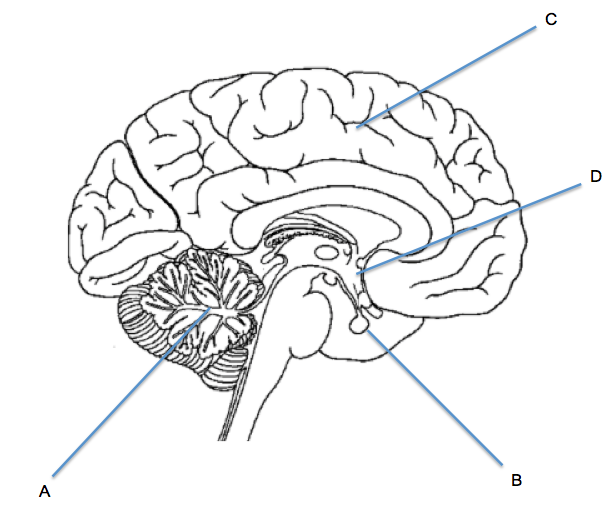
OR

Hyperthyroidism (1) cause- autoimmune response (1) symptom- rapid heartbeat/ weight loss/ fatigue/ sweating/ anxiety (1) treatment- medication to block uptake of iodine by thyroid/ patient drinks radioactive iodine to destroy thyroid cells/ surgical removal of thyroid (1)

Do not accept ‘medication’ alone

**Question 33 (11 marks)**

Use the diagram below to answer the following questions.



1. Complete the table below by filling in the name of each structure and briefly describing the function of each. (4 marks)

|  |  |  |
| --- | --- | --- |
| Letter | Name of structure | Function of Structure |
| A | Cerebellum | Balance and coordination |
| B | Pituitary gland | Produces and releases a large number of hormones |

1. Describe the relationship between structures B and D. (4 marks)

Pituitary gland attached to hypothalamus by infundibulum (1)

Hypothalamus detects deviation from homeostasis (1)

Hypothalamus sends releasing factors/ inhibiting factors to APG (1)

Hypothalamus connected to APG via capillary network (1)

Hypothalamus connected to PPG via nerve fibres (1)

Hypothalamus produces hormones which are stored in the PPG (1)

1. A patient is in a coma in hospital. They have sustained a brain injury to the area labelled C in the diagram and are currently unconscious. Despite this injury, their breathing rate is normal.

Briefly explain why their breathing rate remains normal even though they have a brain injury. (3 marks)

C is the cerebrum and C does not control breathing rate (1)

Respiratory centre within medulla oblongata (1)

Medulla is not damaged therefore breathing normal (1)

**Question 34 (10 marks)**

Insulin is a protein hormone and aldosterone is a steroid hormone.

1. Outline how each of these types of hormone brings about changes to their specific target cell. (4 marks)

Protein/ amine hormones-attach to receptor on cell membrane (1) secondary messenger diffuse through cell activates specific enzymes (1)

Steroids hormones- pass directly through the cell membrane (1) combine with a receptor inside the cell (1)

1. The nervous and endocrine systems both deliver messages within the body. Complete the table below to outline differences between the action of the nervous system and endocrine system. (6 marks)

|  |  |  |
| --- | --- | --- |
|  | ***Nervous System*** | ***Endocrine System*** |
| ***Speed*** | Fast | Slow |
| ***Duration*** | Short | Long |
| ***Transmission*** | Neurons | Blood |
| ***Nature*** | Electrical | Chemical/ hormones |
| ***Cells affected*** | Muscles and glands | All body cells |
| ***Type of response*** | Specific/ local | General |

1 mark per line

**Question 35 (15 marks)**

Janet is in her mid 40’s. She has always led a healthy, active lifestyle. She recently injured her knee and is currently fasting in preparation for a surgical procedure to repair her knee. She has not eaten for several hours and feels very hungry. Her doctor has assured her that her blood glucose levels are stable.

1. Describe the homeostatic mechanism that will allow her blood glucose to remain stable throughout this time of fasting. (7 marks)

BG low (1)

Detected by pancreatic islets (1)

Alpha cells (1) release hormone glucagon (1)

Glucagon stimulates glycogenolysis/ breakdown of glycogen into glucose (1)

Stimulates gluconeogenesis/ production of glucose from fats and amino acids (1)

BG increase (1)

During her hospital stay, Janet chats to two women her age. One of the women suffers from type 1 diabetes while the other has type 2 diabetes.

1. Outline three (3) differences between type 1 and type 2 diabetes. (6 marks)

Type 1 caused by autoimmune response on beta cells in pancreas (1)

Type 2 caused by lifestyle factors e.g. overweight, lack of exercise (1)

Type 1 does not produce insulin but cells respond to insulin (1)

Type 2 does produce insulin but cells do not respond (1)

Type 1 require regular injections of insulin to manage condition (1)

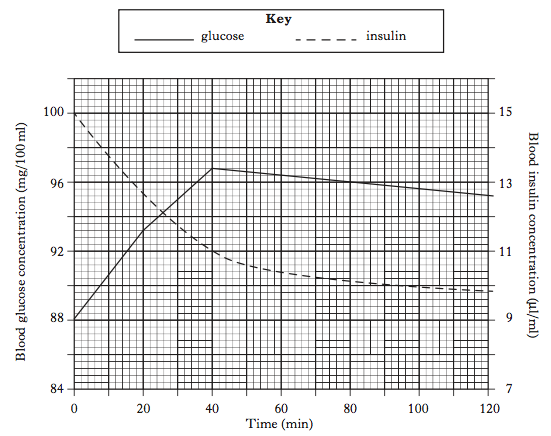
Type 2 require management of diet, increase activity etc. to manage (1)

Type 1 normally begins in childhood/ early in life (1)

Type 2 normally onset in 40s/ mid-life (1)

ANY 3 DIFFERENCES

The graph below shows the blood glucose and insulin concentration of an athlete running in a marathon.



During the marathon, adrenaline is released into the athlete’s blood.

1. Explain the importance of adrenaline to the runner during the marathon. (2 marks)

Adrenaline inhibits the production of insulin (1)

More glucose available for the athlete during time of intense exercise (1)

**Question 36 (15 marks)**

The body has several lines of defence that prevent pathogens from entering and thus causing disease. As part of the 1st line of defence, external defences and protective reflexes work to stop the majority of pathogens entering the body.

1. Outline four (4) external defences, describing the role they play in protecting the body from disease. (8 marks)

Skin- prevents entry of pathogens if unbroken (1), bacteria on skin prevents growth of pathogens (1), sebum (oily substance on skin) can kill bacteria (1), sweat is slightly acidic and can prevent growth of bacteria (1)

Mucous membrane- secrete mucus preventing entry of pathogens (1)

Hair- in nose and ears trap majority of pathogens and prevent entry into body (1)

Cilia- tiny hair like projections that ‘beat’. Particles trapped in mucus are moved out of the body by this beating action thus preventing disease (1)

Acids- stomach acid kills pathogens (1). Acidic condition of the vagina can reduce numbers of microbes and prevent disease (1).

Lysosymes- enzyme found in tears, sweat, saliva can kill pathogens (1)

Cerumen (ear wax)- traps pathogens and is slightly acidic protecting outer ear from infection (1)

Body fluids flushing action- urinary system, tears, sweat & saliva all contribute to removing large numbers of pathogenic microbes from the body and therefore prevent disease (1)

**NO MARKS GIVEN FOR SIMPLY NAMING EXTERNAL DEFENCE MECHANISM, MUST STATE ROLE IN PREVENTING DISEASE**

1. Over the course of an illness such as the flu, a person may develop a fever. Describe what happens to a person’s body when a fever develops.

(6 marks)

Hypothalamus sets a higher ‘normal’ temperature due to infection (1) person feels cold causing vasoconstriction (1) and shivering (1) body temperature rises to meet increased normal body temperature (1). Fever breaks and normal body temperature re-established, person now feels hot (1) skin is red due to vasodilation (1), person beings sweating in response to high temperature (1).

1. Explain why a fever may be beneficial. (1 mark)

Reduces growth of pathogens (1)

**Question 37 (11 marks)**

The table below shows the decline of Helper T cells in a person with HIV.

|  |  |
| --- | --- |
| ***Table of Helper T cells in a Person with HIV*** | |
| **Time (Years)** | **Helper T Cells (cells/ mm3)** |
| 0 (Infection) | 1000 |
| 1 | 950 |
| 2 | 900 |
| 3 | 800 |
| 4 | 760 |
| 5 | 720 |
| 6 | 410 |
| 7 | 400 |
| 8 | 300 |
| 9 | 180 |
| 10 | 100 |
| 11 | 120 |
| 12 | 75 |
| 13 | 40 |
| 14 | 25 |

1. Plot the data from the table onto the graph below. (Additional graph paper can be found at the end of this question/ answer paper). (5 marks)

Labelled axis (1), units (1), appropriate scale (1), plotting (1) title (1)

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1. Helper T Cells play a crucial role in the specific immune responses of the body.
2. Briefly outline the role of Helper T Cells. (2 marks)

Sensitise lymphocytes (1)

Attract macrophage to site of infection (1)

Intensify phagocytic activity (1)

1. Explain why people infected with HIV commonly die from other infections (e.g. influenza and pneumonia) rather than HIV. (2 marks)

reduction ability to launch an immune response (1) due to decline in helper T cells (1) therefore pathogens more likely to take advantage of weak immune system (1)

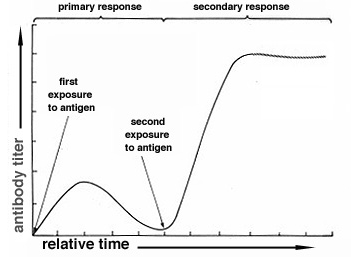
1. At what points on this graph may the person be at risk of developing a secondary infection. (2 mark)

Between 5 & 6 years and between 8 & 9 years

**Question 38 (13 marks)**

The Zika virus is the most recent viral epidemic to be featured in media reports. The Zika virus is spread by mosquitos. An infected mosquito will pass the virus on via its bite.

The following graph represents the primary and secondary response of a person who had been exposed to the Zika virus on two separate occasions.



1. Explain the shape of the above graph and the difference between the primary and secondary exposure on the person involved. (6 marks)

Upon first exposure, antibodies produced to fight disease (1), low concentration of antibodies (1) person develops disease (1) antibody level declines (due to suppressor T cells) (1) memory cells remain (1). Second exposure = much faster (1) higher concentration of antibodies produced (1) person does not develop the disease (1)

1. Vaccines are produced in several different ways. Name three (3) types of traditional vaccine and give a brief description of these vaccines. (6 marks)

Sub unit (1) only part of the microbe use to initiate an immune response (1)

Toxoid (1) inactivated toxins from the microbe are used (1)

Dead (1) whole, dead microorganisms (1)

Attenuated (1) microbe with reduced virulence (1)

1. A person has been vaccinated against the flu and yet they have now developed the flu. Explain why this is possible. (1 marks)

The flu virus can quickly mutate therefore specific antigen is not recognised. (1)

**End of Section Two**

**Section Three: Extended answer 20% (40 Marks)**

This section contains three (3) questions. You must answer **two (2)** questions. Write your answers in the space provided.

Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.

* Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
* Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question(s) that you are continuing to answer at the top of the page.

Responses could include clearly labelled diagrams with explanatory notes; lists of points with linking sentences; clearly labelled tables and graphs; and annotated flow diagrams with introductory notes.

Suggested working time: 50 minutes.

Answer any **two (2)** questions from Questions

**End of Questions**

**Question 39 (20 marks)**

Two runners are training for an upcoming marathon. After training for several hours they are both red, hot and sweaty.

1. Outline all of the mechanisms that would allow them to maintain homeostasis.

(14 marks)

Increase in body temperature (1)

detected by thermoreceptors (1) in hypothalamus (1)

Vasodilation of skin arterioles (1)

increase radiation of heat form body (1) decrease in body temp (1)

sweat glands increase production of sweat (1)

sweat evaporates from the surface of the skin via evaporation (1)

increased cooling effect on the body (1)

osmoreceptors (1) in hypothalamus detect increased osmotic pressure due to excessive sweating (1)

increased production of ADH (1)

posterior lobe of pituitary releases ADH (1)

increased permeability of kidney tubule (1)

increased reabsorption of water into blood (1)

decrease in osmotic pressure (1)

1. One of the runners begins to hyperventilate. He removes a paper bag from his backpack and starts breathing into it. After a few minutes, his breathing rate returns to normal.

Explain why breathing into a paper bag would help his breathing rate return to normal. (6 marks)

Hyperventilating causes you to remove large volumes of carbon dioxide from the body (1)

Breathing into the paper bag increases the amount of carbon dioxide the person is breathing in (1)

lowers the blood pH (1)

stimulates the chemoreceptors (1) in the medulla (1) and the carotid and aortic bodies (1)

stimulates the respiratory centre (1)

increase activity of respiratory muscles (1)

**Question 40 (20 marks)**

During a cooking lesson, a student accidently touches a hot tray in the oven. She notices that she has removed her hand from the hot tray without giving it any thought.

1. Describe the mechanism that would protect her from serious injury. (5 marks)

Receptors in the skin detect stimulus (1)

Sensory neuron takes nerve impulse into/ CNS (1)

Passes to inter neuron (1)

Motor neuron take impulse away from CNS (1)

Effector carries out response/ moves hand away from hot tray (1)

1. After a few hours, the student notices a burn mark on her hand. She also notices that the area around the burn is starting to become quite red, swollen and painful. Explain what is happening around the burn on her hand. (8 marks)

Damage to skin has stimulated mast cells (1)

release histamine (1) heparin (1) and other chemicals in the area.

Histamine increases blood flow (1) causes capillaries to become more permeable (1)

Increased blood flow causes redness (1) escape of fluid causes swelling (1)

Heparin prevents blood clotting in the damaged area (1)

Pain receptors detect abnormal condition at damaged area (1) therefore pain is felt by the student (1)

1. Describe how a nerve impulse travels down the length of a neuron.

(7 marks)

Resting membrane potential of -70 mV (1)

Upon stimulation membrane depolarised (1)

Stimulus reaches threshold/ -55mV (1)

Sodium channels open & sodium moves into cell (1)

Sodium channel close (1)

Potassium channel opens & potassium moves out of the cell (1)

Membrane becomes repolarised (1)

Refractory period (1)

Resting potential re-established and maintained by sodium potassium pump (1)

**Question 41 (20 marks)**

John is in Year 1 and has recently been exposed to the chicken pox virus for the first time. He has not yet been vaccinated against chicken pox. John has a 9 year old brother who has been vaccinated against chicken pox and a 3 week old baby brother who is currently breastfeeding.

1. John has developed chicken pox and his body is now producing antibodies.

Outline the process through which John’s body will produce antibodies. (7 marks)

Chicken pox antigen is detected (1)

B cell becomes sensitised (1)

B cells enlarge and divide into clones (1)

Most clones becomes plasma cells (1)

Remainder become memory cells (1)

Plasma cell secrete specific antibodies (1)

Memory cells wait for second exposure to chicken pox antigen (1)

1. Describe three (3) actions of antibodies. (3 marks)

Inhibit the action of the pathogen (1)

Bind to surface of virus to prevent entry into cell (1)

Coat bacteria for easy phagocytosis (1)

Cause clumping/ agglutination of pathogens (1)

Make substances less soluble for easy phagocytosis (1)

ANY 3

1. John and his brothers have all gained immunity to chicken pox. Name and describe the differences between each brother’s type of immunity. (6 marks)

John- natural active immunity (1) contracted the disease and his body produced antibodies in response (1)

Older brother- artificial active immunity (1) vaccinated against the disease and produced antibodies in response (1)

Baby brother- natural passive immunity (1) received antibodies from his mother through breast milk (1)

1. Before vaccinating their children, John’s parents researched the advantages and disadvantages of vaccination. They discussed several risks and ethical issues that often surround the topic of vaccination.

Discuss two risks and two ethical issues surrounding the topic of vaccination. (4 marks)

Risks- allergic reaction to medium vaccine is cultured in (1) cross contamination of species (1)

Ethical concerns- testing on animals (1) testing on human foetal tissue (1) testing of vaccines on less educated populations who may be unaware of risks involved (1)

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Question 31 Spinal reflex Accessed 28th February 2016

<http://www2.sluh.org/bioweb/bi100/outlines/neurology.htm>

Question 32 Endocrine glands Accessed 28th February 2016

<http://geniso.dynu.com/endocrine-diagram>

Question 33 Unlabelled brain cross section Accessed 26th February 2016

<http://www.fotosearch.com/LIF147/h301027/>

Question 38 Primary/ secondary Response Graph Accessed 4th February 2016

<http://textbookofbacteriology.net/immune.html>