TIME ALLOWED FOR THIS EXAMINATION

Reading time before commencing: Ten minutes
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
Section Three Extended Answer Questions
Two Examination Answer Booklets

To be provided by the candidate
Standard items: Pens, pencils, eraser, correction fluid, ruler, and 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

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<th>Number of questions available</th>
<th>Number of questions to be answered</th>
<th>Suggested working time (minutes)</th>
<th>Marks available</th>
<th>Percentage of exam</th>
</tr>
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<td>100</td>
<td>50</td>
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<td>20</td>
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100

Instructions to candidates

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 your answers in this Question/Answer Booklet. 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.

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% (30 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 40 minutes.

1. Blood cells which destroy invading bacteria are called
   a. Erythrocytes
   b. Thrombocytes
   c. Leucocytes
   d. Platelets

2. Which of the following is NOT characteristic of arteries? Arteries
   a. have thicker walls than vein
   b. carry blood away from the heart
   c. contain valves to prevent backflow
   d. carry blood at a higher pressure than veins

3. Which statement best describes the function of the nephron?
   a. Forms urine
   b. Removes glucose from the body
   c. Collects urine from the blood
   d. Removes the waste products directly from the cells in the blood

4. Which of the following statements can be used to describe a pathogens?
   a. They are all viral
   b. They are all infectious
   c. They are all microscopic
   d. They are all macroparasites
5. Which of the following is the first to prevent the entry of pathogens into humans?
   a. Cilia
   b. Phagocytes
   c. B lymphocytes
   d. Inflammation response

6. Which of the following foods would be chemically digested to the greatest extent in the stomach?
   a. a slice of bread
   b. a piece of cake
   c. a spoon of sherbet
   d. a piece of lean meat

7. The function of the lymphatic system is to
   a. Make proteins
   b. Return excess fluid in the tissues into the blood
   c. Return excess fluid in the tissues into the urine
   d. Remove fluid from the body

8. Which of the following processes requires ATP?
   a. Osmosis
   b. Protein synthesis
   c. Facilitated diffusion
   d. Diffusion of oxygen

9. The chemical digestion of starch begins in the
   a. Mouth
   b. Stomach
   c. Duodenum
   d. Salivary glands
10. The enzyme activity of micro-organisms found in the human body was investigated over a range of temperatures. The results obtained were plotted and are shown in the following graph.

The temperature at point X is most likely to be between

a. 10°C and 20°C  
b. 30°C and 40°C  
c. 15°C and 22°C  
d. 40°C and 50°C

11. The ocular of a light microscope has a magnification of 10X and the low power objective and high power objective lenses have magnifications of 10X and 30X, respectively. If the low power field of view measures 1800 micrometers, the diameter of the high power field of view will measure:

a. 100µm  
b. 600 µm  
c. 60 µm  
d. 300 µm
The following question refers to the diagram below.

![Diagram showing ATP to ADP + P over time] outside of cell

12. What process is illustrated in the diagram above?

a. Osmosis  
b. Phagocytosis  
c. Active transport  
d. Facilitated transport

13. The diagram below shows three cells in the field of view of a microscope. The diameter of the field of view is 1.5 millimeters. What is the approximate diameter of each cell?

a. 500\(\mu\)m  
b. 250 \(\mu\)m  
c. 4500 \(\mu\)m  
d. 300 \(\mu\)m

14. The following statement is NOT true about the nasal cavity.

a. The blood capillaries in the nasal cavity warm the air  
b. The mucous in the nasal cavity moistens the air  
c. The cilia in the nasal cavity filters the air  
d. The speech receptors in the nasal cavity allow speech.
Use the following diagram to answer the question below.

15. Which of these substances is found in X but not in Y?
   a. Urea
   b. Water
   c. Glucose
   d. Red blood cells

16. The function of the mitochondria is to produce
   a. ATP and oxygen
   b. Glucose and ATP
   c. ADP and phosphate
   d. ATP, water and carbon dioxide

17. What structures increase the surface area in the lungs?
   a. The villi
   b. The alveoli
   c. The bronchi
   d. The pleural membrane
Use the following diagram to answer the question below.

18. A function of structure X is to
   a. Absorb lipids
   b. Produce insulin
   c. Chemically digest fats
   d. Produce bile

19. In which vessel is the concentration of oxyhaemoglobin the greatest?
   a. Pulmonary artery
   b. Inferior vena cava
   c. Superior vena cava
   d. Pulmonary vein

20. Which of the following causes a drop in the air pressure within the thoracic cavity?
   a. The rib cage moves upwards and outwards
   b. Air moves into the thoracic cavity
   c. The diaphragm becomes dome shaped
   d. The medulla oblongata sends fewer nerve impulses
21. Which of the following correctly compares the concentration of urea and glucose in the ureter?

<table>
<thead>
<tr>
<th>Urea in ureter</th>
<th>Glucose in ureter</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. lower</td>
<td>lower</td>
</tr>
<tr>
<td>B. lower</td>
<td>higher</td>
</tr>
<tr>
<td>C. higher</td>
<td>lower</td>
</tr>
<tr>
<td>D. higher</td>
<td>higher</td>
</tr>
</tbody>
</table>

a. A
b. B
c. C
d. D

22. Interphase needs to take place before cell division begins. Which of the following best describes what happens during Interphase?

a. Spindle fibres are formed
b. The centrioles move to opposite poles
c. The chromosomes line up at the equator.
d. The DNA duplicates

23. A blood clot is formed when

a. the threads of insoluble proteins contract.
b. sufficient clotting factors are present to bind the blood cells together.
c. the threads form a meshwork trapping blood cells, platelets and plasma.
d. platelets form an insoluble plug or clot on top of the affected area.
Use the following diagram to answer the question below.

![Diagram]

24. What is the structure labeled E?
   a. Product  
   b. Enzyme  
   c. Substrate  
   d. Active site

25. Deamination occurs in the
   a. Liver  
   b. Kidneys  
   c. Both the liver and kidneys  
   d. Small intestine

26. Anaerobic respiration involves the
   a. production of lactic acid in muscle cells.  
   b. use of oxygen in the mitochondria.  
   c. production of adenosine triphosphate in the mitochondria.  
   d. production of adenosine diphosphate.
Use the following diagram to answer the next two questions

27. In which of the above would the level of the solution in the tube rise the quickest when the tube is placed in a beaker of distilled water?
   
   a. W  
   b. X  
   c. Y  
   d. Z  

28. What process moves molecules from the beaker to the tube?

   a. Osmosis  
   b. Pinocytosis  
   c. Active transport  
   d. Facilitated diffusion
29. The following is a list of steps that occurs in the process of meiosis:

i) formation of four daughter cells  
ii) separation of the homologous chromosomes  
iii) duplication of chromosomes  
iv) division of the cytoplasm  
v) pairing of homologous chromosomes

Which of the following is the correct order of events in meiosis?

a. i, ii, iii, iv, v  
b. iii, v, ii, iv, i  
c. iii, iv, v, i, ii  
d. v, iv, iii, ii, i.

30. Which of the following shows the correct order of the phases of mitosis

a. Telophase, Anaphase, Metaphase, Prophase  
b. Prophase, Metaphase, Anaphase, Telophase  
c. Prophase, Metaphase, Telophase, Anaphase  
d. Metaphase, Prophase, Telophase, Anaphase

END OF SECTION ONE
Section Two: Short answer 50% (100 Marks)

This section has nine (9) 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 diagrams below show some of the structures of the excretory system.

(a)

i. Identify the parts listed below.  (2 marks)

B: ________________________

W: ________________________  13
ii. State the function of the parts listed below. (2 marks)

D: ____________________________________________

____________________________________________________________________

X: __________________________________________

____________________________________________________________________

(b) Name the functional unit of the kidney (1 mark)

____________________________________________________________________

i. Name the THREE (3) processes that occur in the functional unit of the kidney. (3 marks)

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____________________________________________________________________

(c) Name FOUR (4) components of urine. (2 marks)

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Use the following diagram to answer the questions below.

(d)

i. Identify the parts listed below. (2 marks)

X: ___________________________________

Y: ___________________________________

ii. Structures X and Z have one main difference. What is it and how does it affect the function of Y? (1 mark)

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_____________________________________________________________________
_____________________________________________________________________
iii. Name FOUR (4) substances that enter Y. (2 marks)

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**Question 32** (11 marks)

(a) Describe the difference between catabolic and anabolic reactions. (2 marks)

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_____________________________________________________________________
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(b) Cell respiration takes place in all cells. Where does this occur? (1 mark)

_____________________________________________________________________

(c) Explain how the structure of ATP relates to its function. (2 marks)

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

SEE NEXT PAGE
(d) Cell respiration can be aerobic or anaerobic. Complete the following table to show THREE (3) differences between the two. (3 marks)

<table>
<thead>
<tr>
<th></th>
<th>Aerobic</th>
<th>Anaerobic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(e)

i. What is the function of an enzyme? (1 mark)

ii. Enzymes require optimum temperatures to work at an optimum level. Name TWO (2) factors other than temperature, which affect enzyme activity. (2 marks)


Question 33  (8 marks)

(a) Anna cuts her finger while cooking. The injured area becomes swollen, red and tender.

i. What is this reaction to this injury called? (1 mark)

________________________________________________________________________

(ii) Explain the process by which Anna’s finger will eventually heal. (4 marks)

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ii. Through good hygiene the spread of pathogens can be reduced. Identify THREE (3) ways in which this can be done. (3 marks)

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Question 34 (11 marks)

The diagram below shows part of the respiratory system.

(a) Name this structure. (1 mark)
(b) Identify the following parts.  

X: _____________________________

Y: _____________________________

(c) Complete the following table by describing how the following structures of the respiratory system are suited to their functioning.  

<table>
<thead>
<tr>
<th>Structure</th>
<th>Why are they suited to their function?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trachea</td>
<td></td>
</tr>
<tr>
<td>Lungs</td>
<td></td>
</tr>
<tr>
<td>Alveoli</td>
<td></td>
</tr>
</tbody>
</table>
(d) Complete the following table, comparing inspiration and expiration.

(4 marks)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Inspiration</th>
<th>Expiration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diaphragm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercostal muscles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ribcage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lung volume</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Question 35**  
(14 marks)

Researchers at Royal Perth Hospital have recently published the results of their longitudinal study into the effect of diet and lifestyle on bone density. In their study, they followed 500 women, aged 45 years, until they turned 65. Bone density scans were taken of the women’s left hip every 5 years to determine the percentage of bone present.

In the study, Group 1 was made up of 250 women, who were required to take a 400 mg calcium supplement every day. Group 2, another 250 women, were asked to take a sugar tablet, of similar size and shape to the calcium supplement, daily.

(a) Write one possible hypothesis that the researchers may have been testing.  
(1 mark)

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

(b) Name the dependent variable.  
(1 mark)

__________________________________________________________________________
(c) Name TWO (2) variables that were controlled in this study.

(2 marks)

_________________________________________________________

_________________________________________________________

(d) What is the term given to the sugar tablet Group 3 were asked to take, and why is such a tablet necessary? (2 marks)

_________________________________________________________

_________________________________________________________

_________________________________________________________

_________________________________________________________
The average results for each group are shown below.

<table>
<thead>
<tr>
<th>AGE (years)</th>
<th>AVERAGE BONE DENSITY (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>GROUP 1 (calcium)</td>
</tr>
<tr>
<td>45</td>
<td>93</td>
</tr>
<tr>
<td>50</td>
<td>92</td>
</tr>
<tr>
<td>55</td>
<td>90</td>
</tr>
<tr>
<td>60</td>
<td>88</td>
</tr>
<tr>
<td>65</td>
<td>86</td>
</tr>
</tbody>
</table>

(e) Graph this data on the graph paper below. (4 marks)
(f) What do the results show? (2 marks)

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

(g) Other than increasing the number of women in the investigation or repeating the experiment, provide TWO (2) ways in which the experiment could be improved. (2 marks)

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
Question 36  

(12 marks)  

The diagram below shows a cross section of part of the plasma membrane of a typical human cell. The substances labelled X and Y are about to be transported across the membrane in the direction shown by the arrows.

(a)  

i. Identify the parts listed below.  

\[ \text{A: } \underline{\text{______________________}} \]  

\[ \text{B: } \underline{\text{______________________}} \]  

ii. What are the TWO (2) components that make up structure A?  

(2 marks)  

\[ \underline{\text{_________________________________}} \]  

\[ \underline{\text{_________________________________}} \]  

SEE NEXT PAGE
iii. The type of transport that moves substance Y across the cell membrane is called Active Transport. Explain why this is so?

(2 marks)

___________________________________________________

___________________________________________________

___________________________________________________

(b) i. Explain the difference between endocytosis and exocytosis.

(2 marks)

___________________________________________________

___________________________________________________

___________________________________________________

___________________________________________________

iii. Explain the difference between pinocytosis and phagocytosis.

(2 marks)

___________________________________________________

___________________________________________________

___________________________________________________

___________________________________________________

___________________________________________________
The following hypothetical cells are cubical in shape, with the same length, breadth and height as indicated.

(c)

i. Which of the cells in the diagram above (A, B or C) would have the largest surface area to volume ratio? (1 mark)

ii. Which of the cells in the diagram above (A, B or C) would supply its organelles with the substances they require most efficiently? (1 mark)
Question 37

(11 marks)

(a)

i. Give the scientific name for the cell labeled A. (1 mark)

_____________________________________

ii. Complete the following table by comparing the structure and function of blood cells. (4 marks)

<table>
<thead>
<tr>
<th>Structure</th>
<th>Erythrocytes</th>
<th>Leucocytes</th>
<th>Thrombocytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Function</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Use the following diagram to answer the questions below.

(b)

i. Identify the parts listed below: (2 marks)

6: __________________________________________

14: __________________________________________
ii. State ONE (1) function of the parts listed below: (2 marks)

1: ____________________________________________

11: __________________________________________

(c) Name TWO (2) cardiovascular diseases. (2 marks)

_________________________________________________________

_________________________________________________________
Question 38  
(13 marks)

The following diagram represents the human digestive system.

(a)

i. Identify the parts listed below.  
   (2 marks)

   E: __________________________
   D: __________________________

ii. State the muscular movement that takes place in the following parts.  
    (2 marks)

   B: __________________________
   G: __________________________  

SEE NEXT PAGE
iii. Complete the following table in relation to chemical digestion

(3 marks)

<table>
<thead>
<tr>
<th>Enzyme</th>
<th>Substrate</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Protein</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monosaccharide</td>
</tr>
<tr>
<td>Lipase</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

iv. What enzymes are present in pancreatic juices? (2 marks)

________________________________________________________________________
________________________________________________________________________

v. Name TWO (2) parts of the digestive system where protein is digested. (2 marks)

________________________________________________________________________
________________________________________________________________________
vi. The contents of the small intestine are liquid yet faeces are generally a solid consistency. Explain what causes this to happen. (2 marks)

_______________________________________________________

_______________________________________________________

_______________________________________________________

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Question 39 (5 marks)

The following diagram shows the different stages of mitosis.

(a) Identify the phases of mitosis that are taking place in the following:

1: ___________________________
2: ____________________________
3: ____________________________
4: ____________________________
5: ____________________________

(2 marks)
(b) How many chromosomes does each daughter cell in mitosis contain? (1 mark)

______________________________________________________

(c) Explain TWO (2) processes that take place during prophase (2 marks)

______________________________________________________

______________________________________________________

______________________________________________________

END OF SECTION TWO
Section Three: Extended answer 20% (40 Marks)

This section contains FOUR (4) questions. You must answer TWO (2) questions. You can choose question 40 or question 41 and question 42 or question 43. 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 can 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 for this section is 50 minutes.

Answer either question 40 or 41

---

### Question 40 (20 marks)

(a) Describe the journey of a carbohydrate (starch) food source through the different structures of the digestive system. Include in your answer the mechanical and chemical digestive processes that occur as well as the absorption of the final products. (10 marks)

(b) Relate the structure of the intestinal villi to their function. In your answer describe how the different nutrients are absorbed into the villi. (10 marks)

**OR**

### Question 41 (20 marks)

(a) The function of the kidney is to filter wastes out of the blood and remove them from the body in the urine. Compare the composition of the blood and the urine. In your answer discuss the blood composition in the renal artery and renal vein as well as the urine composition in the ureter. (16 marks)

(b) Describe FOUR (4) lifestyle choices that individual’s can take to maintain healthy kidneys. (4 marks)
Answer either question 42 or 43

Question 42 (20 marks)
(a) Describe the journey of a red blood cell from the time it enters the heart, passes through all body cells, passes through the alveoli in the lungs and returns back to the heart. Give names of the blood vessels, and the processes that take place. (8 marks)

(b) Explain the cardiac cycle. Include in your answer how the cardiac cycle is regulated, the process taking place in the heart and the length of each cycle. (8 marks)

(c) Name FOUR (4) factors that contribute to cardiovascular disease. (4 marks)

OR

Question 43 (20 marks)
(a) Cells constantly exchange materials with their environment. Describe the process of simple diffusion, facilitated diffusion and active transport. Explain the factors that affect their action. (12 marks)

(b) Explain the significance of meiosis and explain how it is different to mitosis. (8 marks)

END OF QUESTIONS
Additional working space
Use the grid to answer question 35 (e) if you have cancelled your first attempt.
Section One: Multiple choice.  

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.

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