NEWMAN COLLEGE
Educating in the Marist Tradition

Newman College
Semester 1 Examination 2017

Question/Answer Booklet

Please place your student identification label in this

HUMAN BIOLOGY

Units 1 and 2

Section 1	/30
Section 2	/100
Section 3	/40
Total	/170
Weighting	/25%

Time allowed for this paper
Reading time before commencing work: Ten minutes
Working time for the 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 (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters.

Special items: non-programmable calculators approved for use in the WACE examinations.

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
SECTION ONE: Multiple-choice	30	30	40	30	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 *Newman College, Year 11 and 12 Exam Candidate Information*. Sitting this examination implies that you agree to abide by these rules.

2. Answer the questions according to the following instructions.

   Section One: Answer **a**ll the 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: Write answers in this Question/Answer Booklet. Wherever possible, confine your answers to the lines provided.

   Section Three: consists of **three (3)** questions. You must answer **two (2)** questions. **Tick** the box next to the question you are answering.

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. Additional working space pages at the end of this Question/Answer booklet are for planning or continuing an answer. If you use these pages, indicate at the original answer, the page number it is planned/continued on and write the question number being planned/continued on the additional working space.

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. If you make a mistake, place a cross through that square, then 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: 40 minutes.

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1. Which of the following substances can pass directly across the phospholipid bilayer of the plasma membrane without the assistance of a membrane protein?

   (a) water

   (b) glucose

   (c) fatty acids

   (d) amino acids

2. Phospholipids are comprised of

   (a) hydrophobic heads and hydrophilic tails.

   (b) fatty acids and glycerol.

   (c) hydrophilic heads and hydrophobic tails.

   (d) phosphate tails and lipid heads.

3. Active transport is best described as

   (a) the movement of molecules from an area of high concentration to an area of low concentration.

   (b) the movement of large molecules enclosed in a vesicle across a selectively permeable membrane.

   (c) the movement of molecules across a selectively permeable membrane through a channel protein.

   (d) the movement of molecules from an area of low concentration to an area of high concentration.

4. Emphysema is best described as

   (a) a bacterial infection that affects the lungs.

   (b) narrowing of the air passages in the lungs.

   (c) uncontrolled cell division in the lungs.

   (d) loss of elasticity of the air sacs in the lungs.

Questions 5 & 6 refer to the word equation below, which represents a catabolic enzyme (catalase) controlled reaction.

hydrogen peroxide → water + oxygen

5. The substrate in the above reaction is

   (a) water.

   (b) oxygen.

   (c) catalase.

   (d) hydrogen peroxide.

6. The products of the above reaction are

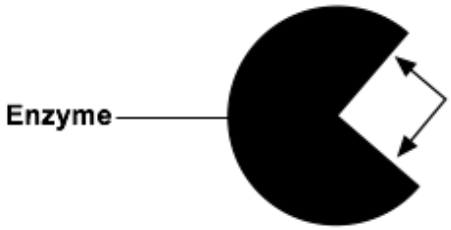
   (a) hydrogen peroxide and catalase.

   (b) water and oxygen.

   (c) catalase, water and oxygen.

   (d) none of the above.

7. The diagram below represents an enzyme.



The arrows are pointing at the

   (a) substrate site.

   (b) catalyst site.

   (c) active site.

   (d) absolute site.

8. Proteins are comprised of which of the following elements?

(a) carbon, nitrogen, hydrogen and oxygen

(b) carbon, hydrogen, sulfur and oxygen

(c) nitrogen, carbon, phosphate and oxygen

(d) nitrogen, hydrogen, sodium and oxygen

9. Which of the following correctly identifies the part of the digestive system where fat is broken down into fatty acids and glycerol?

(a) small intestine

(b) stomach

(c) large intestine

(d) oesophagus

10. Lysosomes are organelles found in eukaryotic cells which

(a) are involved in the processing and packaging of proteins.

(b) are essential in the production of energy.

(c) provide a platform for the production of proteins.

(d) contain digestive enzymes for degradation of cellular material.

Use the table below that shows the stages and duration of an individual's cardiac cycle to answer Question 11 and 12.

Stage	Duration (s)
Diastole	0.3
Atrial Systole	0.2
Ventricular Systole	0.3

11 The heart rate of the individual is

(a) 52 beats per minute.

(b) 75 beats per minute.

(c) 87 beats per minute.

(d) 100 beats per minute.

12 If the individuals stroke volume is 70mL, what is their cardiac output?

(a) 3640mL/min

(b) 5250mL/min

(c) 6090mL/min

(d) 7000mL/min

13. ATP is a product of cellular respiration. ATP is formed when

(a) ATP is joined to an inorganic phosphate.

(b) ATP loses an inorganic phosphate.

(c) ADP is joined to an inorganic phosphate.

(d) ADP loses an inorganic phosphate.

14. The gall bladder is an organ associated with digestion. The substance stored in the gall bladder

(a) synthesises fat.

(b) emulsifies fat.

(c) solidifies fat.

(d) removes fat.

15. As part of an experiment into the effect of different solutions on fresh muscle tissue, 12 drops of ATP were added to a strand of fresh muscle of initial length 50mm. After a few minutes, it's length was measured and found to be 42mm.

Which of the following lines correctly identifies the results of this experiment?

	% difference in length of muscle strand	Reason for change
(a)	8	Contraction of muscle fibres
(b)	8	Relaxation of muscle fibres
(c)	16	Contraction of muscle fibres
(d)	16	Relaxation of muscle fibres

16. Which type of cell would possess the largest number of mitochondria?

(a) cartilage cell

(b) red blood cell

(c) cheek call

(d) muscle cell

17. Which of the following veins contains oxygenated blood?

(a) hepatic

(b) coronary

(c) pulmonary

(d) hepatic portal

18. Which of the following lines in the table below correctly identifies features of veins and arteries?

	Feature	***Artery***	***Vein***
(a)	State of muscular wall	Thin	Thick
(b)	Diameter of lumen	Narrow	Wide
(c)	Valves	Present	Absent
(d)	Pressure of blood vessel	Low	High

19. The flow of lymph in lymphatic vessels is brought about mainly by

(a) pumping action of lymph nodes in the neck and groin.

(b) osmotic pressure of fluid absorbed by body tissues.

(c) pressure exerted by surrounding muscles on contraction.

(d) two lymphatic ducts opening into veins from arms.

20. Which of the following helps maintain high blood pressure in the glomerulus?

(a) The vessel entering the glomerulus is narrower than the one leaving it

(b) Plasma proteins in the bloodstream tend to force small molecules out of the blood

(c) Filtrate present in the capsule tends to draw further filtrate from the bloodstream by osmosis

(d) The blood vessel supplying the glomerulus contains blood arriving from the renal artery

21. The tissue type responsible for sending messages around the body is referred to as

(a) connective tissue.

(b) epithelial tissue.

(c) muscle tissue.

(d) nervous tissue.

Use the information in the table below to answer Question 22

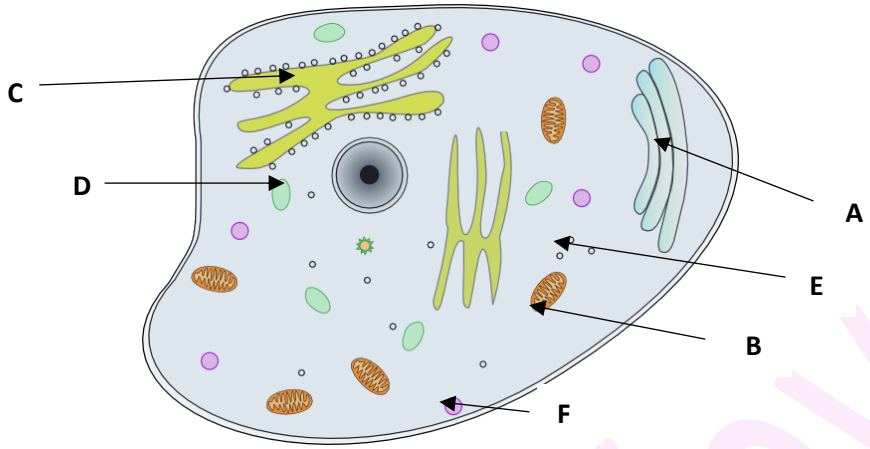
A number of cells were obtained and placed in a nutrient medium to allow growth. The table below shows the composition and concentration of the cell's cytoplasm and nutrient solution.

Substance	***Cytoplasm (g/L)***	***Nutrient Solution (g/L)***
Chloride	32	15
Potassium	27	3
Sodium	42	44

The nutrient solution is

(a) hypotonic.
(b) isotonic.
(c) exotonic.
(d) hypertonic.

Use the following diagram to answer Questions 23 to 25



23 Which letter indicates the site where biosynthesis, processing and transport of proteins can occur?

(e) A
(f) B
(g) C
(h) D

24 What are the outputs of organelle B when oxygen is present?

(a) Carbon dioxide and nutrients
(b) Sugar and water
(c) Nutrients and energy
(d) Water and carbon dioxide

25 The process that occurs when organelle F fuses with the cell membrane and expels waste material is named

(a) exocytosis.
(b) pinocytosis.
(c) endocytosis
(d) phagocytosis.

26. During muscle contraction, the z lines

(a) move closer together.

(b) move further apart.

(c) become thicker.

(d) become thinner.

27. Contraction of the diaphragm causes

(a) an increase in volume of the lungs due to inhalation.

(b) a decrease in volume of the lungs due to inhalation.

(c) an increase in volume of the lungs due to exhalation.

(d) a decrease in volume of the lungs due to exhalation.

28. The trachea remains open despite the position of the neck. This is due to the presence of

(a) cartilage.

(b) bone.

(c) tendons.

(d) ligaments.

29. Which of the following cells does not carry out the process of phagocytosis?

(a) lymphocyte

(b) macrophage

(c) erythrocyte

(d) neutrophil

30. An example of exocytosis is

(a) oxygen crossing the cell membrane.

(b) secretion of enzymes out of the cell.

(c) movement of water via osmosis.

(d) carbon dioxide removal from cell.

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

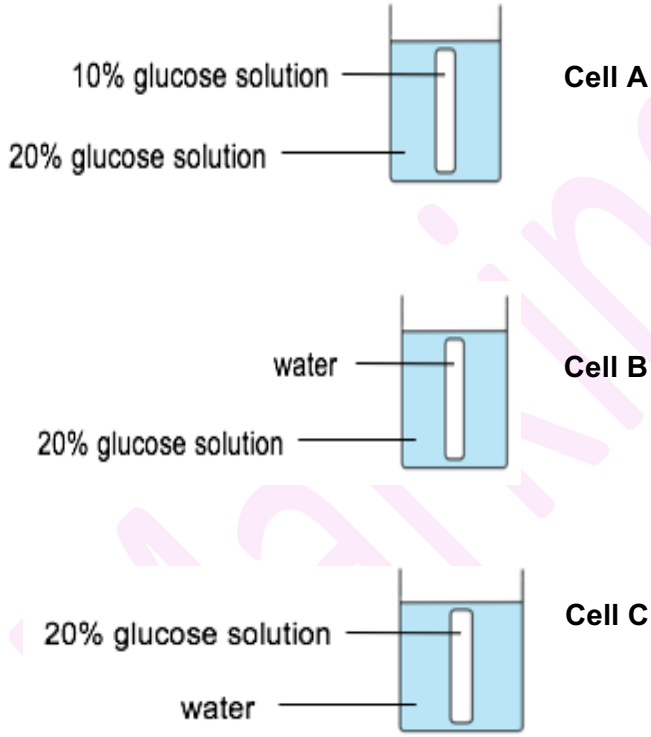
This section has **nine (9)** questions. Answer **all** questions. Write your answers in the spaces provided.

Additional working space pages at the end of this Question/Answer booklet are for planning or continuing an answer. If you use these pages, indicate at the original answer, the page number it is planned/continued on and write the question number being planned/continued on the additional working space page.

Suggested working time: 90 minutes

Question 31 **(10 marks)**

A student set up an experiment using model cells to investigate osmosis. The diagrams below show the apparatus used in the experiment.



The model cells were weighed before being placed in the beakers. After 2 hours the model cells were removed from the beakers and reweighed.

(a) Which of the model cells would have the greatest increase in mass after two hours? Give a reason for your choice. (3 marks)

Selection & Reason	Marks
C	1
has the greatest concentration gradient/difference	1
Water moves into the cell via osmosis	1
Total	3

(b) Explain why dialysis tubing can be used to represent the cell membrane for this experiment. (2 marks)

Explanation	Marks
Small pores in the dialysis tubing	1
Acts like a selectively permeable membrane/ semi-permeable	1
Total	2

(c) Explain why it is important for the student to dry the model cells before each weighing.

(2 marks)

Explanation	Marks
To gain an accurate/reliable weight	1
So that water on the outside of the 'cell' is not included in the weight/mass	1
Total	2

(e) Diffusion and osmosis are two terms used to describe the movement of substances across the cell membrane. State one difference and two similarities between diffusion and osmosis.

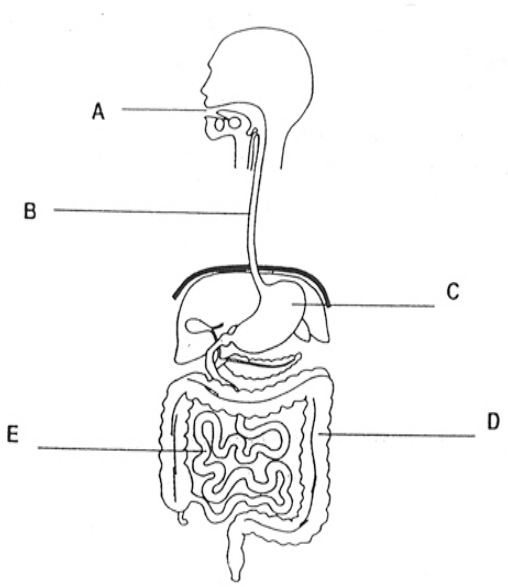
(f) (3 marks)

Comparison	Marks
Difference	
Osmosis ONLY refers to the movement of water/ movement of water across a selectively permeable membrane Diffusion- movement of other substances other than water	1

Similarities	
High to low concentration	**1**
Both passive processes/ no energy requirement	**1**
Total	**3**

Question 32 **(12 marks)**

The diagram below represents the human digestive system.



As food passes through the alimentary canal it is broken down both mechanically and chemically.

(a) Explain how structure A both mechanically and chemically breaks down food.

(4 marks)

Explanation	**Marks**
Mechanical	
Teeth	Any 2
Chewing food/ grinding food/mechanical digestion (Breaking food down into smaller pieces)	
Chemical	
Release salivary amylase	
Breaks down starch/carbohydrate to simple sugars	
Total	4

(b) Name and describe the process by which food passes down structure B into the stomach.

(3 marks)

Name & Description	Marks
Peristalsis (must state the name)	1
Any two of the following	
Muscular contraction and relaxation of muscles in oesophagus	1
Push bolus down	1
Total	3

(c) Structure C is the stomach. The stomach contains gastric juices which aid in the process of digestion.

Complete the table below by outlining the function of the named gastric juices.

(2 marks)

	Function
Hydrochloric acid	Any one of: Kill/ destroy bacteria/ activate inactive enzymes
Digestive enzymes	Break down protein

(d) Contrast the structure and function of E and D. (3 marks)

Comparison		**Marks**
Any three rows		
Large intestine	***Small intestine***	
Large diameter	Smaller diameter	1
Shorter length	Longer length	1
Reabsorption of water	Reabsorption of nutrients/ final digestion	1
Lack of villi	Villi present	1
No enzymatic digestion	Enzymatic digestion	1
	Total	3

Question 33 **(13 marks)**

Asthma is a common disease that affects the respiratory system.

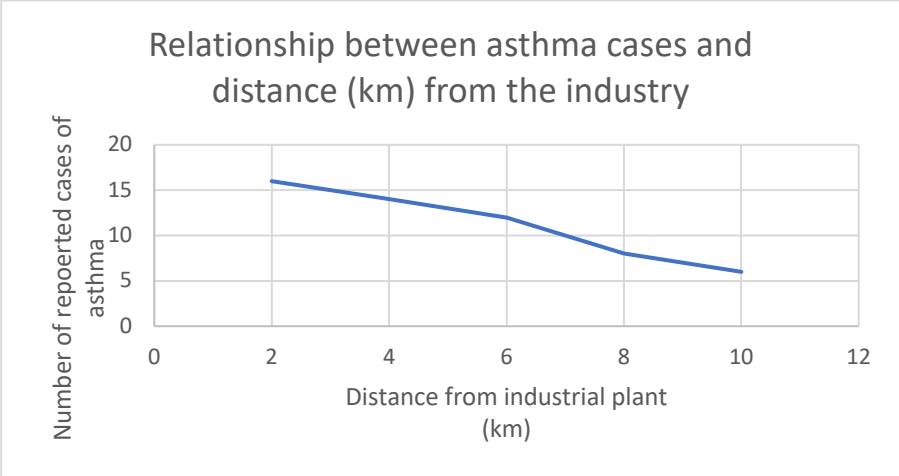
It has long been known that asthma attacks can be triggered by exposure to irritating airborne particles such as mould spores, tobacco smoke and air pollution.

A study was carried out to show the effect of proximity to industrial plant exhaust fumes on people with asthma. A sample of the results gathered from this investigation is shown in the table below

Distance from industrial plant (km)	***Reported cases of asthma***
2	16
4	14
6	12
8	8
10	6

(a) Use the data in the table to draw a graph of the info in the table. (5 marks)

A spare grid is provided on page 35 of this Question/ Answer booklet. If you need to use it, cross out this attempt.



Graph marks distribution	**Marks**
Title appropriate with both independent and dependent variables included	1-5
Identify lines using keys/labels	
Correctly constructs axes using appropriate scale	
Correctly plots points to form a line	
Labelling axes with correct name and unit	
Total	5

(b) Write a suitable hypothesis for this investigation. (2 marks)

Hypothesis	Marks
The closer the distance to the industrial plant	1
The more cases the of asthma reported	1
Total	2

(c) Identify the dependent and independent variables in this investigation.

(2 marks)

Variables	Marks
Independent- Distance from industrial plant (km)	1
Dependent- number of reported cases of asthma	1
Total	2

(d) The investigation was repeated on several occasions. Each time it was repeated, the results were significantly different. One of the scientists involved in the investigation stated that the results were inaccurate.

Explain why the scientist could be correct in making this statement. (2 marks)

Explanation	Marks
Results should be the same each time/ consistent results	Any 2
Study lacks a control	
Sample size is unknown/ sample size may be too small	
Total	2

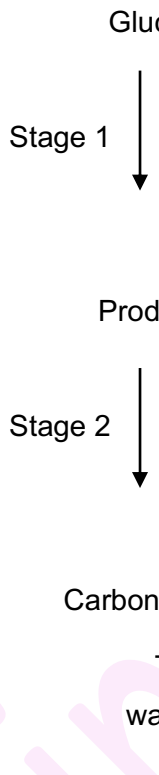
(e) The scientists decided to trial a new asthma medication on the group. Half of the subjects were given the medication and the other half were given a placebo.

What is a placebo? (2 marks)

Description	Marks
Inactive substance (must use this term) given to a control group	1
Cannot be distinguished from the real medication	1
Reduces bias/ acts as a control	1
Total	2

Question 34 **(10 marks)**

The process of aerobic respiration in a muscle cell is outlined below.



(a) (i) Identify Stage 1 (1 mark)

Stage 1	Marks
Glycolysis	1
Total	1

(ii) Name product Y from stage 1 (1 mark)

Product	Marks
Pyruvic acid	1
Total	1

(iii) What other substance must be present in order for Stage 2 to occur? (1 mark)

Reactant	Marks
Oxygen	1
Total	1

(iv) In which organelle does Stage 2 take place? (1 mark)

Organelle	Marks
Mitochondria	1
Total	1

(v) How many molecules of ATP are formed from each glucose molecule during both Stage 1 and Stage 2 combined? (1 mark)

Number of ATP	Marks
36 - 38 ATP	1
Total	1

(b) Describe the process of anaerobic respiration. (4 marks)

Description	Marks
Respiration without oxygen	1-4
Takes place in the cytoplasm	
Glucose broken down into two pyruvic acid molecules	
Pyruvic acid converted into lactic acid	
2 ATP produced	
Total	4

(c) Give an example of a situation where anaerobic respiration would become very important. (1 mark)

Example	Marks
Sprint events (any reasonable)	1
Total	1

Question 35 **(8 marks)**

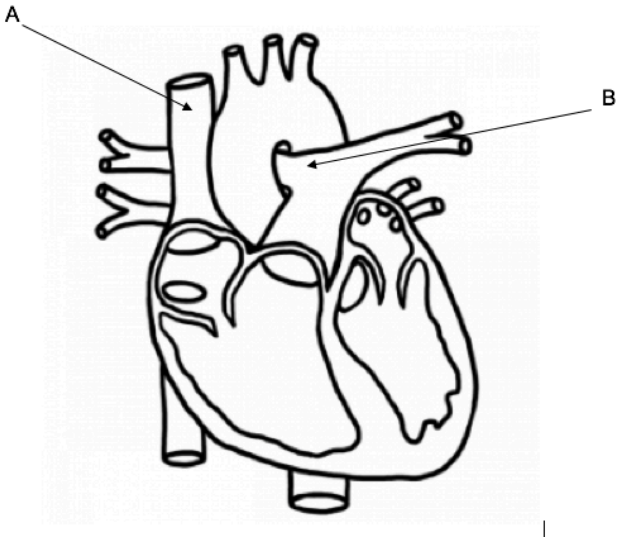
The statements in the table below describe the events during one cardiac cycle. The statements are **not** in the correct order.

A	Atria contract
B	Blood passes through the semi-lunar valves into the aorta and into the pulmonary artery
C	Blood passes through the atrioventricular valves into the ventricles
D	Ventricles relax
E	Ventricles contract

(a) Put one of the letters B to E into each box to show the events in the correct order. The first one has been done for you. (2 marks)

Correct sequence	Marks
A C E B D	2
Total	2

The diagram below represents the human heart and associated blood vessels.



(b) (i) Identify blood vessels A and B. (2 marks)

Description	Marks
A- Superior Vena cava	1
B- Pulmonary artery	1
Total	2

(ii) Describe one (1) similarity and three (3) differences between blood vessels A and B. (4 marks)

Description	Marks
Similarity	
Both carry deoxygenated blood	1
Differences	
Vena cava into heart pulmonary artery away from heart to lungs	1
Vena cava is a vein while pulmonary artery is an artery	1
VC: thin walls PA: thicker walls/elastic	1
VC: large lumen PA: smaller lumen	1
VC connected to atrium PA: connected to ventricles	1
Total	4

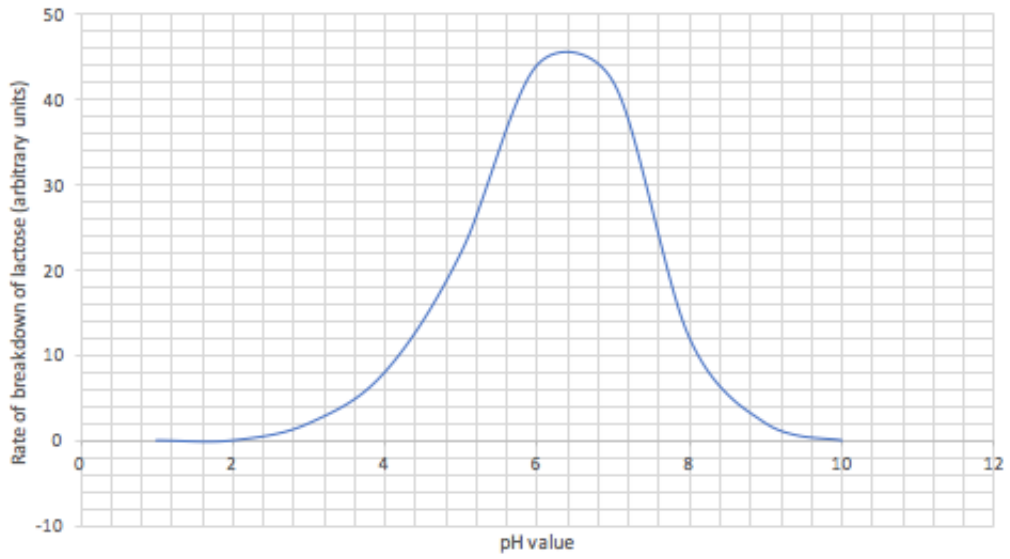
Question 36 **(12 marks)**

Lactose is a sugar found in milk which is broken down by the enzyme lactase. The word equation below outlines this chemical reaction.

$$\text{Lactose} \xrightarrow{\text{Lactase}} \text{glucose + galactose}$$

Figure 1 illustrates the rate at which lactose is broken down by lactase into glucose and galactose at different pH values.

Figure 1



(a) Using the information from Figure 1 above, identify the optimum pH value for lactase.

(1 mark)

pH	Marks
6.3- 6.5 ONLY	1
Total	1

(b) Would it be possible for lipase to break down lactose? Explain your answer.

(4 marks)

Explanation	Marks
No	1
Enzymes are specific	1
Enzymes work on only one substrate	1
Enzymes are complementary to one substrate/ bind to only one active site	1
Total	4

(c) The optimum temperature for enzymes in the human body is 37°C. Explain what would happen to enzymes if a person's body temperature increased to 45°C.

(3 marks)

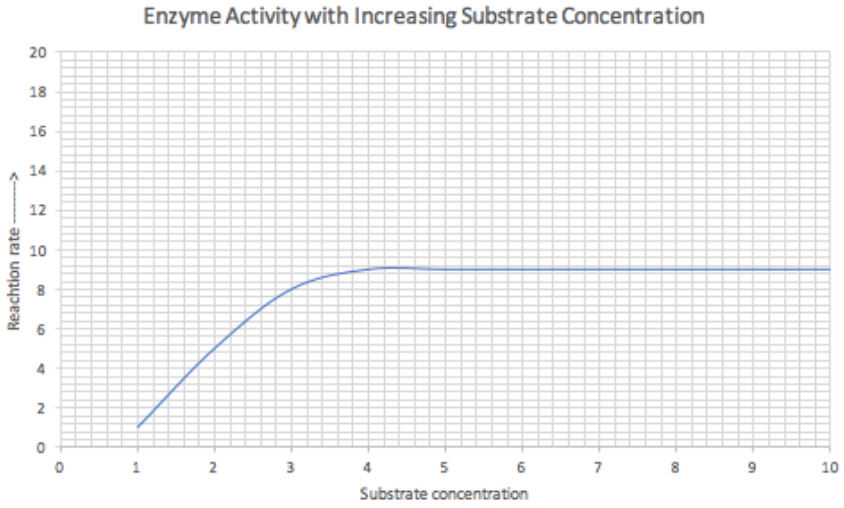
Description	Marks
Denature	1
Can no longer carry out reaction	1
No longer complementary to substrate/ can no longer bind to enzyme	1
Total	3

(d) Some enzymes require a cofactor in order to combine with their substrate. Briefly outline the role of a cofactor in the efficient functioning of an enzyme.

(2 marks)

Role	Marks
Changes shape of active site	1
Allows enzyme and substrate to combine	1
Total	2

The graph below illustrates an increase in substrate concentration and its effect on the rate of an enzyme controlled reaction.



(e) Explain why the reaction rate does not continue to increase after the substrate concentration reaches 4 on the graph. (2 marks)

Explanation	Marks
Active sites (must have active site) full/ occupied/ saturated	1
Not possible for further reactions to take place	1
Total	2

Question 37 **(14 marks)**

Blood is a transport medium. It allows essential substances to be carried around the body and transports waste products to the organs of excretion.

Blood consists of a straw-coloured liquid named plasma and solid components referred to as formed elements.

These formed elements are commonly known as red blood cells, white blood cells and platelets.

(a) What role does each of the following formed elements play in the body?

(2 marks)

White blood cells — Immunity (1)

Platelets — Blood clotting (1)

(b) The function of red blood cells is to transport oxygen around the body.

(i) Identify the substance that increases the oxygen carrying capacity of the red blood cell. (1 mark)

Substance	Marks
Haemoglobin	1
Total	1

(ii) Describe two (2) other features of red blood cells which increase their oxygen delivery capacity to cells. (2 marks)

Description	Marks
Biconcave shape/ disc- increase surface area to allow efficient exchanges of gases	1
No nucleus- allow room for haemoglobin	1
Total	2

(c) A second transport mechanism within the body is the lymphatic system. The lymphatic system is made up of lymphatic capillaries, lymph vessels and lymph nodes.

(i) What is the function of the lymphatic system? (3 marks)

Function	Marks
Collect fluid that escapes from capillaries	1
Return fluid to circulatory system/heart	1
Defend against pathogens	1
Total	3

(ii) Identify two (2) locations in the body where lymph nodes can be located.
(2 marks)

Locations	Marks
Groin/ neck/ under arm (any two)	2
Total	2

(iii) Explain why lymph nodes can become larger when you have an infection.
(2 marks)

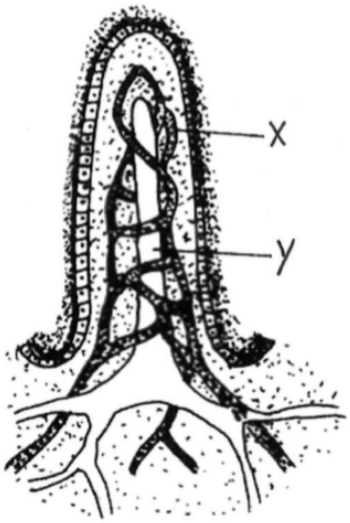
Advantage	Marks
Increase number of white blood cells	1
Increase activity of white blood cells due to infection/ fight off infection	1
Total	2

(iv) What is the advantage of lymph passing through several lymph nodes before returning to the circulatory system? (2 marks)

Name of structure	Marks
Filter debris	1
Trap bacteria/ pathogens	1
Total	2

Question 38 **(10 marks)**

Lining the wall of the small intestine are many tiny projections known as villi. Products of digestion are absorbed through the villi and used to fuel the body. A diagram of a villus is shown below.



(a) (i) Identify structures X and Y in the diagram above. (2 marks)

Products	Marks
X- blood vessels/ capillaries	1
Y- lacteal/ lymphatic system	1
Total	2

(ii) Which of the products of digestion are absorbed into the structures labelled X and Y in the above diagram? (2 marks)

Products	Marks
X- glucose & amino acids – need both	1
Y- fatty acids & glycerol – need both	1
Total	2

(b) Describe two (2) features of the villi which makes them an efficient surface for nutrient absorption. (4 marks)

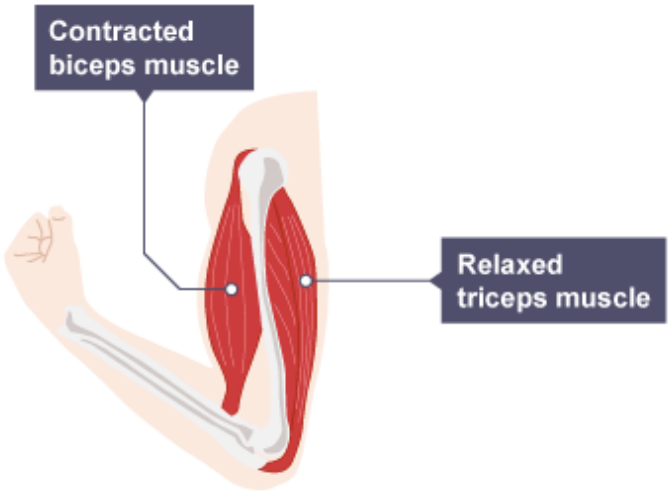
Feature Description	Marks
Thin walls – allow for rapid/efficient diffusion/active transport	2
Contains blood capillary and lacteal/ allow for efficient transport	2
Microvilli – finger like extensions of the epithelial cells - large surface area – maximises uptake area	2
2 x Feature = 1 Description =1 Total	4

(c) Coeliac disease is caused by an allergy to gluten. The disease causes the villi to be destroyed. Explain why a person suffering from coeliac might struggle to gain weight. (2 marks)

Explanation	Marks
Cannot absorb nutrients	1
Passes nutrients out of the body	1
Total	2

Question 39 **(11 marks)**

The diagram below illustrates a contracted bicep muscle and a relaxed tricep muscle.



(a) The bicep and tricep are referred to as an antagonistic pair.

(i) Which muscle would be the agonist and which would be the antagonist.

Muscle	Marks
Agonist- biceps	1
Antagonist- triceps	1
Total	2

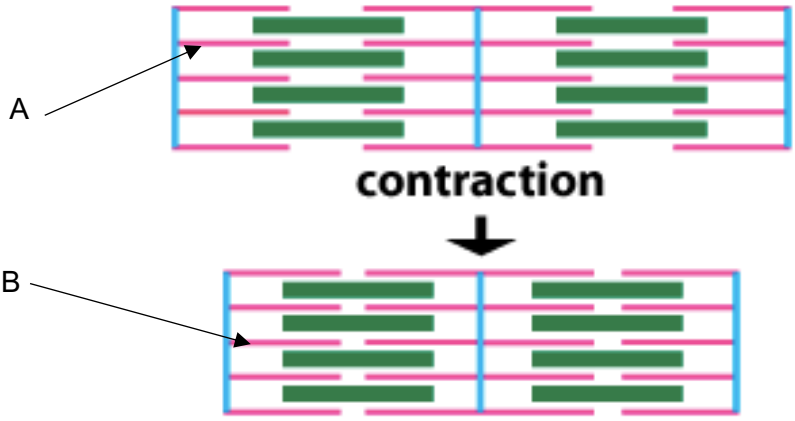
(2 marks)

(ii) Explain why having muscles arranged in antagonistic pairs is an advantage. (2 marks)

Explanation	Marks
Allows for movement to take place	1
Contracted muscle carries out movement while relaxed muscle restores to original position upon its contraction	1
Total	2

(b) Myofilaments are the basic unit of skeletal muscle which allow muscles to contract and relax.

The diagram below shows the myofilaments in a relaxed (A) and a contracted (B) state.



(i) Identify the two myofilaments labelled in the diagram. (2 marks)

names
A- Actin
B- Myosin
Total

(ii) The sliding filament theory has been proposed to explain muscular contraction. Briefly describe the sliding filament theory. (5 marks)

Description	Marks
Any five of:	
Actin and myosin slide over one another	1-5
Myosin heads attach to actin	
Myosin heads move actin closer together	
Z lines draw closer together	
Sarcomere shortened	
Actin and myosin stay the same length	
Requires ATP	
Total	5

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

This section has **three (3)** questions. You must answer **two (2)** questions. Write your answers on the lined pages provided.

Additional working space pages at the end of this Question/Answer booklet are for planning or continuing an answer. If you use these pages, indicate at the original answer, the page number it is planned/continued on and write the question number being planned/continued on the additional working space 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 40 to 42.**

Indicate the first question you will answer by ticking the box next to the question. Write your answers on pages 33–37. When you have answered your first question, turn to page 38 and indicate the second question you will answer on that page.

☐ **Question 40** **(20 marks)**

(a) Describe the process of deamination and explain its importance in the removal of waste. (6 marks)

Description	Marks
Removal of amino group from amino acids	4
Enzyme controlled process	
Once amino group removed amino acid converted to ammonia	
Ammonia (quickly) converted to urea	
Importance	
	Any 2
Excess protein cannot be stored	
Ammonia highly toxic	
Must be removed from the body or cell death occurs	
Total	6

(b) The kidney is the main organ of excretion. Each kidney contains approximately 1 million tiny structures called nephrons. Starting with the afferent arteriole, explain how glomerular filtrate becomes urine under the headings of filtration, reabsorption and secretion. (14 marks)

Description	Marks
Filtration	
Blood enters glomerulus via afferent arteriole	
Fluid forced out of blood into glomerular capsule/ Bowman's capsule	
Blood in glomerulus under high pressure	
High pressure caused by afferent arteriole diameter wider than narrow efferent arteriole	1-5
Water and dissolved blood components enter capsule to form filtrate	
Filtrate does not contain blood cells & protein	
Blood cells & protein are too large to be forced through membranes	
Filtrate mainly contains water, sodium and other ions, glucose, urea and amino acids	
Reabsorption	
Substances removed from filtrate into peritubular capiliaries	
Substances of use to the body are reabsorbed throughout the tubule	
Long tubule provides large surface area for reabsorption	
Almost all water is reabsorbed	
All glucose reabsorbed	
All amino acids reabsorbed	1-5
Most urea not reabsorbed	
Secretion	
Unwanted substances removed from blood into filtrate	
Can be active or passive	
Urine composition	
Urine contains mainly water	1
Sodium and other ions not required by body are in urine	
No glucose or protein should be in the urine	
Urea and other waste products are removed from the body in urine	1-3
Total	14

Question 41 **(20 marks)**

Two men are working on a job site and both have accidently cut themselves while carrying a sheet of metal

One of the men cleans his cut to prevent bacteria and other pathogens from entering the wound. After applying some pressure to the cut, he notices that the bleeding is slowing down and after a few more minutes, the bleeding stops.

(a) Explain the process of blood clotting that has just occurred. (8 marks)

Explanation	Marks
	1-8
Blood vessels constrict	
Reducing blood flow to the injured area	
Internal walls of blood vessels become rough	
Platelets stick to internal surface of blood vessels	
Plug forms	
Soluble plasma proteins (clotting factors) initiate clotting	
Fibrin threads form a mesh	
Mesh traps blood cells, platelets and plasma	
Clot forms and blood loss stopped	
Total	8

The second man suffers from a condition called haemophilia. A person who suffers from haemophilia is missing a particular protein which allows the blood to clot.

This man's blood does not clot and he is in danger of losing a large volume of blood. He is taken to the hospital and may have to have a blood transfusion.

He explains that he is blood type A.

(b) Why is it important for him to advise the hospital staff of his blood type before receiving a transfusion. (4 marks)

Description	Marks
	Any 4
The man is type A and has antigen A on the surface of his red blood cells	
People with Type A blood produce B antibodies	
People with Type A blood DO NOT produce A antibodies	
Therefore it is possible for the man to receive a blood type that reacts against his own blood type	
such as B or AB that contain B antigens	
Mixing blood types can lead to clumping/ agglutination	
Total	4

(c) Discuss the ways in which carbon dioxide would be transported in the man's blood.

(8 marks)

Way	Explanation	Mark
Carbominohaemoglobin (1)	Small amount (1)	
	Carried by erythrocytes (1)	3
Dissolved in plasma (1)	Small amount only (1)	2
As Bicarbonate ions (1)	$CO_2 + H_2O$ forms CH_2O_3 which splits into $H^+ + HCO_3$ (2)	3
	HCO_3 joins with Na^+ and K^+ (1)	1
		Total 8

Question 42 **(20 marks)**

(a) Discuss the ways in which the alveoli are adapted to efficiently perform their function.

(8 marks)

Part of alveolus	Adaptation	Mark
Alveolar membrane (1)	One cell layer thick enables faster diffusion rate because there is less distance to travel(1)	2
Surfactant/ Mucous (1)	Allows Co_2 and O_2 to dissolve for quick transportation in blood (1)	2
Capillary surface is close to alveolus (1)	Capillary network very close to alveolus to allow for fast diffusion of gases (1)	2
Capillary has one cell layer thick endothelium (1)	One flattened endothelium cell enables fast diffusion of gases (1)	2
Total		**8**

(b) For efficient metabolism, cells require nutrients such as carbohydrates, proteins and lipids. Describe the structure and function of these three nutrients.

(12 marks)

2 marks for structure, 2 marks for function from each nutrient. Total 4 marks per nutrient.

	Structure	Function
Carbohydrate	**Contain CHO (1) Structural units are monosaccharides, disaccharides and polysaccharides (1)**	**Main energy source (1) Excess stored as glycogen or converted to fat (1)**
Proteins	**Contain CHON (1) and sometimes S and P. Amino acids are the basic structural unit (1)**	**Functions include catalytic / regulatory / movement / immunological / recognition / structural / transport (1)**
Lipids	**Contain CH and small amount of O (1) Made up of glycerol and fatty acids (1) Can be saturated, unsaturated and trans fats (1) Can be high or low density (1)**	**Energy reserve (1) Cell membrane / phospholipid (1) Cholesterol (1) Steroid hormone (1)**