Section One: Multiple choice **33% (50 marks)**

This section has **25** questions. All questions appear in the separate multiple choice question booklet.

For each question shade the box to indicate your answer. Use **only** a blue or black pen to shade the boxes.

For example, if b is your answer: a ☐ b ■ c ☐ d ☐

If you make a mistake, place a cross through that square, then shade your new answer. **Do not** erase or use correction fluid/tape.

For example, if b is a mistake and d is your answer: a ☐ b ■ c ☐ d ■

If you then want to use your first answer b, cross out d and then circle b.

a ☐ b ■ c ☐ d ■

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: 30 minutes

1	**A**	B	C	D
2	A	**B**	C	D
3	**A**	B	C	D
4	A	B	C	**D**
5	A	B	C	**D**
6	A	**B**	C	D
7	A	B	**C**	D
8	A	B	C	**D**
9	A	B	C	**D**
10	A	B	**C**	D
11	A	**B**	C	D
12	A	B	C	**D**
13	**A**	B	C	D

14	A	**B**	C	D
15	**A**	B	C	D
16	**A**	B	C	D
17	A	**B**	C	D
18	A	B	**C**	D
19	A	**B**	C	D
20	**A**	B	C	D
21	A	B	C	**D**
22	A	B	C	**D**
23	**A**	B	C	D
24	A	B	C	**D**
25	A	B	C	**D**

Section Two: Short answer **47% (70 marks)**

This section has **six (6)** questions. Answer **all** questions. Write your answers in the spaces 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 page 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 that you are continuing to answer at the top of the page.

Suggested working time: 80 minutes

Question 26 **[10 marks]**

A group of students were investigating the effects of exercise on breathing rate. They collected the following data:

	Breathing rate (breath per minute)			
Length of time of exercise (seconds)	**Trial 1**	**Trial 2**	**Trial 3**	**Average**
Resting	41	48	48	46
30	56	52	52	53
60	52	56	52	53
90	60	64	64	63
120	68	60	68	65
150	68	76	76	73
180	76	80	80	79

a) Identify the independent variable.

Length of time of exercise

(1 mark)

b) Identify the dependent variable.

Breathing rate

(1 mark)

c) Write a suitable hypothesis for this experiment.

The longer the length of time exercising, the faster the breathing rate.

(1 mark)

d) List three (3) variables that should be controlled in the experiment.

ANY THREE SUITABLE VARIABLES:

Age of participants, type of exercise, health condition of participants, etc.

(3 marks)

e) In the table, calculate the averages.

Must be consistent with decimal points

The data was expressed as while numbers, so the average should also be whole numbers

(2 marks)

f) Explain why is it important to conduct several trials and calculate averages in an investigation.

To increase the reliability of the investigation, and reduce the effects of any high/low values

(2 mark)

Question 27 **[11 marks]**

a) Cells are the basic structural and functional units of all living things. One function of cells is cellular respiration.

Write the word equation for cellular respiration.

oxygen + glucose → carbon dioxide + water

Write the chemical equation for cellular respiration.

$6O_2 + C_6H_{12}O_6 \rightarrow 6CO_2 + 6H_2O$

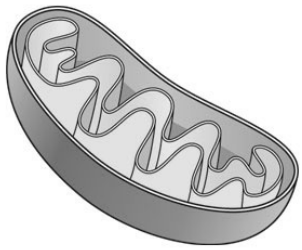
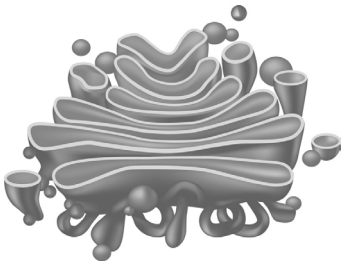
(2 marks)

b) Apart from cellular respiration, state three (3) other processes carried out by cells.

ANY THREE: growth, reproduction, movement, excretion, ingestion, respond to stimuil

(3 marks)

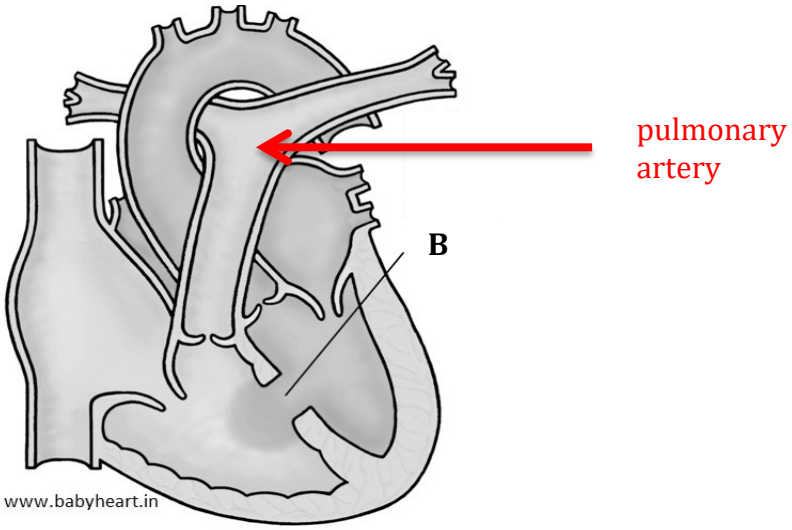
c) Cell organelles maintain life processes. In the table below, name and state the function of the organelles shown.

Cell organelle	Name	Function
	Mitochondrion	Produce energy through cellular respiration
	Golgi body	Package proteins that have been synthesised in the cell
	Centrioles	Formation of spindle fibres during cell division/mitosis/cellular reproduction

(6 marks)

Question 28 **[7 marks]**

The diagram below represents the structure of the heart and its associated blood vessels.



a) On the diagram, label the pulmonary artery.

(1 mark)

b) Sometimes babies can be born with a ventricular septal defect (VSD) in which a "hole" occurs at point B in the heart. What effect would VSD have on each of the following features of the heart?

Feature	**Effect** (increase/decrease/stay the same)
Stroke volume	Decrease
Pressure of blood leaving the heart	Decrease
Heart rate	Stay the same

(3 marks)

c) Explain how VSD would affect the oxygen concentration of the blood leaving the heart through the aorta.

Oxygen concentration would decrease

When the heart pumps, blood is pushed from the right ventricle into the left ventricle

So, deoxygenated blood is mixed with the oxygenated blood

(3 marks)

Question 29 **[15 marks]**

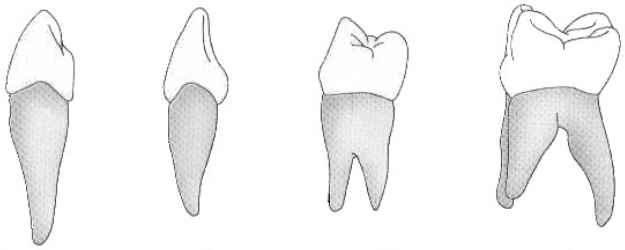
a) Distinguish between mechanical digestion and chemical digestion.

Mechanical digestion = breakdown of food into smaller pieces, without changing the chemical structure of the food

Chemical digestion = breakdown of food into new, simple substances

(2 marks)

b) The image below shows the teeth involved in mechanical types of digestion.



A B C D

i. Name the type of tooth labelled

A. incisor B. canine

ii. State the function of the tooth labelled D.

Crushing / grinding

(3 marks)

c) After being partially digested in the mouth, food passes to the stomach. What structure connects the mouth and the stomach?

oesophagus

(1 mark)

d) Name and describe the process that moves food through the structure named above.

Peristalsis – series of wave-like contractions of circular muscles behind food to push it through oesophagus

(3 marks)

e) Describe the role of each of the following enzymes.

Amylase breaks down carbohydrates into disaccharides/simple sugars

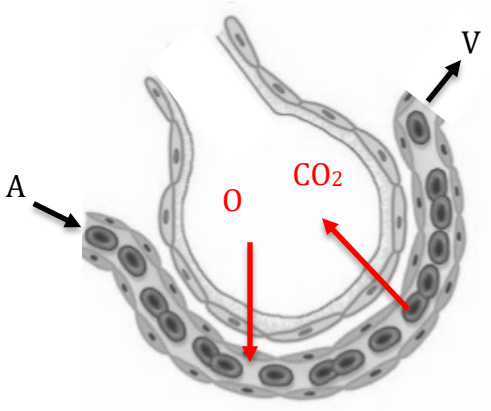
Protease breaks down proteins into polypeptides / amino acids

Lipase breaks down lipids into fatty acids and glycerol

(6 marks)

Question 30 **[15 marks]**

The below shows an alveolus in the lungs.



a) On the diagram, clearly draw and label the direction of diffusion of oxygen and carbon dioxide between the air in the alveolus and the blood.

(2 marks)

b) What molecule gives red blood cells the ability to carry oxygen and carbon dioxide?

haemoglobin

(1 mark)

c) Describe and explain the difference between the blood at the arterial end (A) and the venous end (V) of the capillary.

Arterial end contains deoxygenated blood because it is coming back from body tissue; venous end is oxygenated because it is travelling from the alveolus

(4 marks)

d) Discuss four features of the alveoli that make them suited for efficient gas exchange.

i. Thin walls to decrease the distance gases need to travel

ii. Covered in a layer of moisture so gases can dissolve

iii. Large surface area to increase the space available for gas exchange

iv. Surrounded by a network of blood capillaries so concentration gradient is maintained

(8 marks)

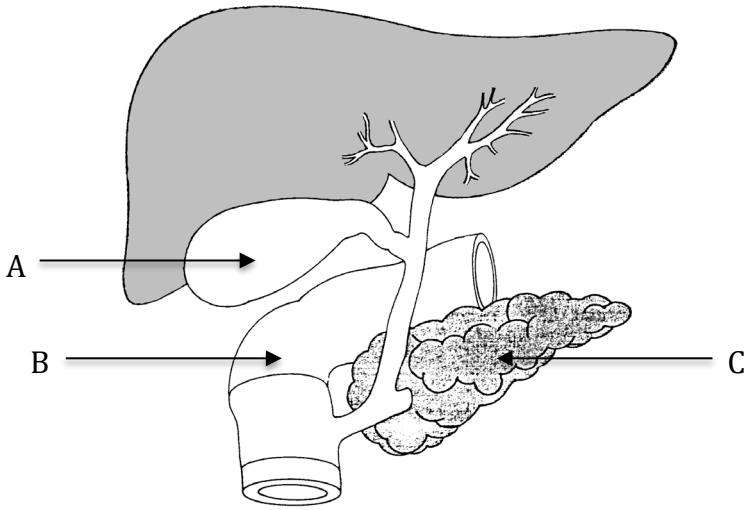
Question 31 **[12 marks]**

a) The liver is the largest internal organ of the human body. Explain the role of the liver in the breakdown of fat.

Produces bile that contains bile salts; these salts mechanically digest fat by breaking it into small droplet to increase surface area for digestion

(4 marks)

b) The diagram below shows the liver and other organs of the digestive system.



Name the structure labelled

A. gall bladder

B. duodenum

C. pancreas

(3 marks)

c) Fatty liver disease affects about one in ten Australians.

i. State <u>three</u> (3) factors that increase a person's chances of developing a fatty liver.

ANY THREE FACTORS: overweight/obesity, diabetes, elevated triglyceride levels, excessive alcohol consumption, poor nutrition, etc.

ii. State <u>two</u> (2) long term consequences of fatty liver disease.

Cirrhosis/hardening of the liver and liver failure

(5 marks)

Section Three: Extended answer **20% (30 marks)**

Question 32 **[15 marks]**

a) Ventilation maintains a concentration gradient for the exchange of gases in the lungs. Describe the sequence of events that occur during inspiration.

- diaphragm contracts
- moves downward/flattens
- intercostal muscles contract
- pull ribcage upward and outward
- increased volume in chest cavity
- decreased air pressure
- air moves into the lungs, from high pressure to low pressure

(7 marks)

b) Cells can become specialised for a particular function through a process called *differentiation*. Cells with a common function are grouped together to form four types of tissues – epithelial tissue, nervous tissue, connective tissue and muscular tissue. Describe the structure and function of the four basic types of tissues.

- Muscular – long and thin; able to respond to a stimulus by contracting and becoming shorter
- Nervous – cells have long projections from the body of the cell; respond to a stimulus by send electrical impulses
- Epithelial – very closely packed together and vary in shape depending on particular tissue; cover and line parts of the body
- Connective – cells are separated by large amounts of non-cellular material called matrix; support the body and help hold all the body parts together

(8 marks)

Question 33 **[15 marks]**

a) Describe the sequence of events that take place during one complete beat of the heart.
ANY SEVEN POINTS:

- Heart muscle relaxes
- called **diastole**
- and fills with blood from the vena cava and pulmonary vein
- Atrial contract, pushing blood into the ventricles
- called **atrial systole**
- AV valves (tricuspid – right and bicuspid/mitral – left) close to prevent backflow of blood
- Pulmonary and aortic valves (semi-lunar) open
- Ventricles contract, pushing blood into the aorta and pulmonary artery
- called **ventricular systole**

(7 marks)

b) Most nutrients are absorbed through the internal surface of the small intestine. Describe the features of the small intestine that make it suited for efficient absorption.

- Long length (6m) to increase surface area
- Inner lining is folded to increase surface area
- Finger-like projections called villi to increase surface area
- Microscopic projections called microvilli to increase surface area
- Single layer of cells surrounding villi to decrease distance for absorption
- Complex network of blood capillaries in villi for absorption of glucose and amino acids
- Lymph capillary called a lacteal in villi for absorption of fats
- Continual movement of intestinal contents by muscular contractions to maintain concentration gradient for efficient absorption

(8 marks)

Question 34 **[15 marks]**

a) Many substances move into or out of a cell by diffusion. Discuss diffusion and outline four (4) factors that will increasing the rate of diffusion.

Four marks for diffusion:

- Diffusion – movement of particles from high to low concentration
- Until they are evenly spread apart or reach equilibrium
- Occurs in gases and liquids
- Particles move in random directions, colliding with each other
- As they spread out, there are fewer collisions
- Passive process/no energy required

Four marks for factors:

- Temperature – the higher the temperature, the faster the rate of diffusion as molecules are moving faster
- Concentration gradient – the greater the concentration gradient, the faster the rate of diffusion
- Surface area – the larger the surface area, the faster the rate of diffusion due to more space
- Mass of the solute – the lower the mass of the solute, the faster the rate of diffusion
- Distance – the shorter the distance of diffusion, the faster the rate of diffusion

(8 marks)

b) Every cell in the human body is surrounded by a cell membrane. The cell membrane is too small to be seen, so scientists use the fluid mosaic model to account for its behaviour and composition. Describe the fluid mosaic model.

- Fluid – molecules are moving
- Mosaic – composed of many different molecules
- Phospholipid molecules arranged in a bilayer
- Hydrophilic (water-loving) heads on the outside
- Hydrophobic (water-hating) tails on the inside
- Cholesterol to slightly immobilise membrane
- Proteins embedded in the bilayer – channel protein, carrier proteins, cell identity markers, receptor proteins

(7 marks)