

2022 Biology 11

Semester 1 Practice Examination

STUDENT ANSWER KEY

MULTIPLE CHOICE

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

SECTION TWO – SHORT ANSWER

Question 31

(7 marks)

This diagram shows a plant and an animal cell.

- i) Complete the table listing the names and functions of particular parts of the cells.

Label	Name of Part	Function
M	nucleus	Controls cellular activities
O	cytoplasm	Suspends all of the organelles

(2)

- ii) Which cell is the plant cell? Give two reasons for your choice.

Cell 1 (1)

Presence of two of the following: Rigid cells wall surrounding the cell membrane / Contains chloroplasts which are the site of photosynthesis/ rectangular shaped cell / large, single vacuole (2)

(3)

- iii) A student placed the plant cell into a concentrated salt solution. Describe any observations after 10 minutes and explain why this occurs.

The plant cell would plasmolyse (0.5)

The cell membrane would pull in from the cell wall as the cytoplasm volume decreases (0.5)

This occurs as water leaves the cytoplasm by osmosis (0.5) from a high water concentration in the cytoplasm to a low water concentration outside the cell.(0.5)

(2)

Question 32

(8 marks)

a) Write the word equation for photosynthesis

Carbon dioxide + water + light + chlorophyll -----> glucose + oxygen

0.5 mark off per substance missed in equation

(2)

b) This experiment investigated the effect of light intensity on the rate of photosynthesis. Describe the effect of one other factor on the rate of photosynthesis.

Temperature – an increase in temperature increases the rate of PHS up to the optimum
 Carbon dioxide concentration – an increase in CO₂ increases the rate of PHS until all enzymes are saturated with substrate. (1)

Error (1)

At high light intensity counting the bubbles would be difficult 100 bubbles per minute
 After a certain time period, the HCO₃ (source of Carbon dioxide might run out so photosynthesis would stop.)

Increased temperature as well as light intensity.

Ambient light – changing of light conditions in the room of experiment, more light available etc

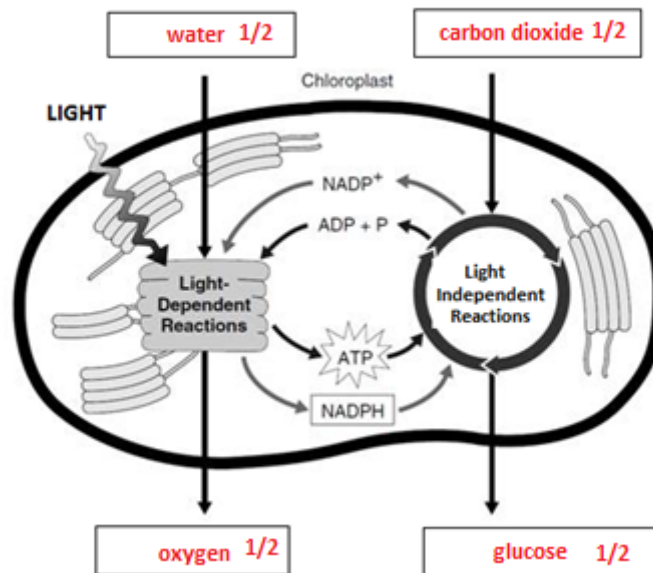
Reduce effect of errors (1)

Complete more trials, repeat the experiment again

Maintain temperature – utilise water-bath to keep temperature same throughout experiment.

Control and maintain light source – ensure only light plant receiving is from the light or ensure ambient is consistent by only using artificial lights in the room.

(2)



(2)

c) Light dependent thylakoids / grana (0.5)

Light independent stroma (0.5)

(1)

Question 33**(10 marks)**

Cell respiration is an essential life process for all cells. The image below is an electron micrograph of the organelle where aerobic cell respiration takes place.

a) Name this cell organelle **mitochondria (1)**

b) Describe the role of the internal membranes in this organelle.

Provide a large surface area (0.5) for the attachment of enzymes/ for cell respiration reactions (0.5)

c) What advantage is there in using an electron microscope over a light microscope like the ones we use at school?

High magnification allowing more detail of internal structures (1)

Greater resolution allowing greater ability to distinguish between two points (1)

d) Animal cells are capable of both aerobic and anaerobic respiration. Complete the missing parts of the table below to compare aerobic and anaerobic respiration in animal cells:

	Aerobic respiration	Anaerobic respiration
Location within the cell	Mitochondria (0.5)	Cytoplasm (0.5)
Products of the reactions	CO₂ H₂O ATP (0.5 mark off for each omission)	Lactic acid ATP (1)
Number of ATP produced per molecule of glucose	36-38 ATP	2 ATP

(4)

e) The graph shows data recorded during fermentation (anaerobic respiration) by yeast cells.

(i) Estimate the time at which ethanol concentration is at its maximum. **11-14 hrs(1)**

(ii) Use your understanding of anaerobic respiration in yeast to explain the trend in glucose and ethanol levels over time in the graph.

Glucose is the substrate/fuel (0.5)for anaerobic respiration so the level of glucose starts off high, then drops as the yeast cells grow and consume glucose (0.5)

Ethanol is the product (0.5)for anaerobic respiration so the level of ethanol is low at the start, then increases as the yeast release it as a byproduct of respiration(0.5)

(2)

Question 34

(11 marks)

Tank A

a) Calculate the averages to one decimal place and complete the table.(1) – 1 if more than 1 decimal place

b) State a hypothesis for this investigation.

As the water temperature increases, the breathing rate of the goldfish will also increase correct variables listed (1), directional statement/prediction (1) (2)

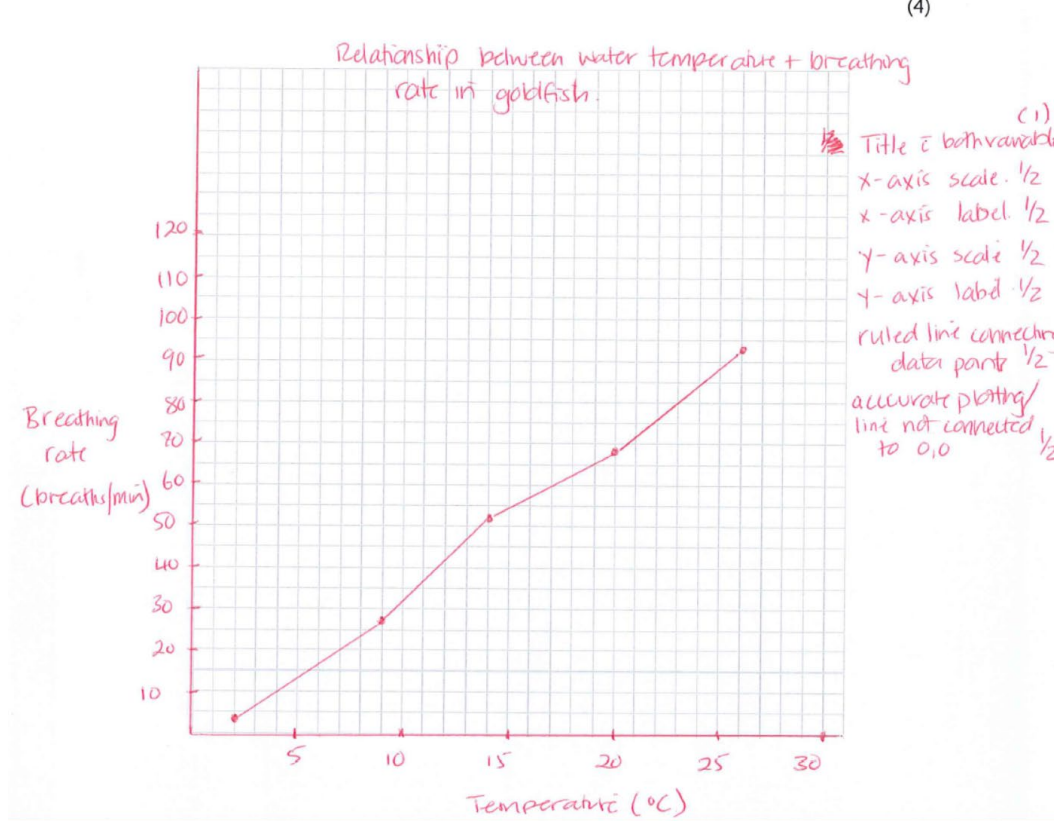
c) State the independent variable for this investigation

Water (0.5) temperature (0.5)

d) Use the grid provided to graph the data from this investigation. (4)

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(4)



e) Describe the trend shown in the data and suggest reasons to explain any relationships between the variables.

As the temperature increases from 2° C t 26 C, the breathing rate also increases from 4 breaths per minute to 94 breaths per minute (1) No mark if did not mention numerical data

Explanation: As the temperature increases, the rate of respiration of the cells increases.(1)

Fish must breath more often to supply oxygen (0.5) and remove CO2 (0.5) produced from respiration

Question 35

(13 marks)

Fish and Insects have respiratory structures and processes that enable efficient gas exchange in their particular habitats.

- a) Complete this summary table to show how each organism is adapted for gas exchange.

	Fish	Insects
Name the specific surface over which gas exchange occurs	Lamella (0.5) of gills (0.5)	Trachea/tracheoles (1)
Ventilation mechanism	Movements of the operculum (0.5) draw water in through the mouth and out through the gills (0.5)	Muscles (0.5) of the abdomen pump air in and out through the spiracles (0.5)
Mechanism to prevent respiratory surface drying out		Valves close over spiracles/ Hairs surround spiracle openings / respiratory surface is internal or deep inside the body(1)

(5)

- b) Explain why a counter-current system is advantage for gas exchange in fish.

In the counter current system, blood in the capillary flows in one direction, while water containing oxygen flows in the other direction. (1)

Diffusion (0.5) occurs from a high to low concentration gradient (0.5)

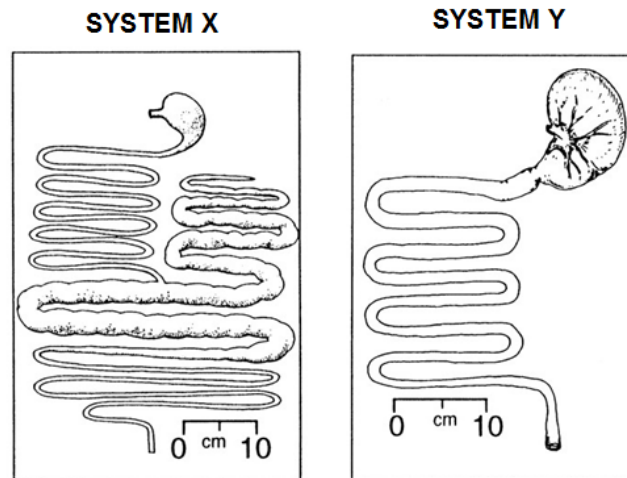
Blood is always coming into contact with water with a higher oxygen concentration, so diffusion continues to its maximum level./ in concurrent system, diffusion only occurs until the blood and water concentrations of oxygen are equal (1)

(3)

Question 36

(6 marks)

The digestive systems of a koala and a feral cat are shown below:



a) State which digestive system would belong to each animal and explain two different reasons for your choice.

- Animal X is a koala (0.5) and Animal Y is the feral cat (0.5)
- Koala is a herbivore (0.5) Cat is a carnivore (0.5)
- Plant material is more difficult to digest than animal material due to the cellulose cell walls (1)
- The koala has a longer digestive system so the plant material has more time to digest./cat does not require a long small intestine/digestive system as proteins are more quickly digested / cat has a shorter digestive system so food doesn't have time to decompose(1)
- The koala has a caecum that increases the surface area for digestion/has specific bacteria to digest cellulose, cat does not require a caecum for protein digestion (1)

(4)

c) The Spinifex plant and the Pitcher plant both live in extreme environments. The spinifex plant copes with hot, dry conditions and the Pitcher plant is found in soils that are low in nutrients. Describe a structural adaptation of each type of plant which allows it to survive in these extreme environments.

Spinifex – few stomata/ stomata on the underside of leaves/stomata sunken in pits/ stomata in pits lined with hairs./ Spinifex leaves have a small surface area. All of these reduce transpiration (1)

Pitcher plant – elongated, deep jug shaped structures with slippery steep sides and enzymes at the base. Insects fall in and are trapped and digested to provide amino acids/source of nitrogen for the plant (1).

(2)

SECTION THREE – EXTENDED ANSWER

(20%) 20 MARKS

Question 37

(20 marks)

- a) Water is an important substance in all living things.
Describe the structural features of vascular plants that allow the movement of water through its tissues and explain the processes involved in this movement of water. (12 marks)

Structural features	Processes
<p>1 mark:</p> <ul style="list-style-type: none"> • Root hairs (0.5) • long thin extensions of the roots (0.5) • Provide a large surface area (0.5) for water absorption • One cell thick (0.5) • reduces distance for water to move in (0.5) 	<p>UP to 3 marks:</p> <ul style="list-style-type: none"> • Water enters root hairs by osmosis(0.5), Water movement across a semi permeable membrane / water movement from a high water concentration to a low water concentration (0.5) • To allow this, Plants pump mineral ions inside the root hairs (0.5) • by active transport, (0.5) • This is called <u>root pressure</u> (1)
<p>1 mark:</p> <ul style="list-style-type: none"> • Xylem vessels (0.5) • long, narrow, hollow tubes for conducting water(0.5) • Xylem walls are strengthened with lignin(0.5) to prevent them collapsing (0.5) • Xylem vessels have no cytoplasm or end walls(0.5) so have reduced resistance to water flow (0.5) 	<p>Up to 3 marks</p> <ul style="list-style-type: none"> • Cohesive forces between water molecules (0.5) hold the water together in a continuous column in the xylem(0.5) • Adhesive forces between the water molecules and the xylem walls (0.5) enable the water to be drawn upwards a small distance up the sides of the xylem(0.5) • Water movement up the xylem is by the process of <u>Capillarity</u>(1)
<p>1 mark</p> <ul style="list-style-type: none"> • Spongy mesophyll (0.5) • Air spaces to allow diffusion of water vapour (0.5) • Stomata (0.5) • Two guard cells have an opening between them called the stoma(0.5) 	<p>UP to 3 marks</p> <ul style="list-style-type: none"> • Water moves into the guard cells by osmosis(0.5) • Active transport of potassium ions into the guard cells creates the osmotic pressure to pull water in by osmosis(0.5) • Water movement out through the stoma is called <u>transpiration.</u> (1) • As water moves from the leaf, another water molecule is drawn in to the root hair(0.5) this creates a pulling force drawing water up the plant (0.5)

- b) Unicellular organisms exchange materials through their cell membranes. Describe the structure of the cell membrane and state four factors which affect the rate of exchange of materials through the cell membrane.

(8 marks)

Structure of the cell membrane (4 marks)

- Phospholipid bilayer with phosphate heads and lipid tails
- Hydrophilic heads point outwards and hydrophobic tails point inwards
- Proteins embedded in the membrane
- Cholesterol present to give the membrane stability

Factor (4 marks)
• Size of particle
• Temperature
• Surface area to volume ratio
• Concentration gradient
• Thickness of membrane

Question 38

(20 marks)

a)

Similarity

Both circulatory systems transport nutrients to cells and remove wastes (1 mark)

Differences:

	Closed circulatory system	Open circulatory system
Different Features (up to 8 marks)	Blood is always contained in vessels (1)	'Blood' is only sometimes contained in vessels/blood can be free in body cavity(1)
	Arteries take blood away from the heart and connect to other blood vessels/capillaries and then veins. (1)	The vessels that take the blood away from the 'heart' open into the body cavity/sinuses. (1)
	Veins return the blood to the heart (after collecting blood from the capillaries) (1)	The blood has to re-enter the blood vessels from the body cavity/sinuses to return to the 'heart'. (1)
	Capillaries present. (1)	No capillaries are present(1)
	Capillaries/blood vessels take blood close to each cell(1)	Organs are bathed in blood. (1)
	Muscular/chambered heart pumps blood around the body(1)	Blood vessels pump blood around the body/There is no true 'heart'(1).
	Blood is at a high pressure delivering nutrients to cells(1)	Blood is at a lower pressure/moves slowly(1)
Named organism (1 marks)	Insects, worms, cnidarians (0.5)	All vertebrates eg. fish, mammals, amphibians, reptiles (0.5)

Evolutionary shift

A closed circulatory system enables a more efficient delivery of oxygen to the tissues because: blood under a higher pressure and every cell in the body is in contact with a capillary (1 mark)

This allows organisms to grow bigger and be more active. (1 mark)

- b) Differentiate between the two proposed models of enzyme action, then explain how temperature and substrate concentration can affect the rate of enzyme activity.

(8 marks)

Lock and Key Model of Enzyme Activity (1)

Substrate is exactly complementary to the shape of the active site shape.

Induced fit model of enzyme activity (1)

Substrate binds to active site and the enzyme changes shape to wrap around the substrate.

Temperature (up to 3 marks)

As temperature increases, the kinetic energy of the substrate and enzymes increase (1)

More collisions between substrate and enzyme mean the reaction proceeds at a faster rate. (1)

Enzyme activity is highest at the optimum temperature (1)

As temperature increases beyond the optimum, the shape of the active site may change and the enzyme denatures (1)

Substrate can no longer bind and the reaction stops. (1)

Substrate concentration (up to 3 marks)

As substrate concentration increases the rate of reaction increases (1) as more substrate binds to the active site.

At a particular substrate concentration, the enzyme activity plateaus (1)

the active site is saturated with substrate and no more can bind.(1)

End of Exam