Raffles Girls' School
(SECONDARY)

Established in 1879

Name: _____

Class: 3 Register No: _____

BIOLOGY
YEAR THREE
PEN-AND-PAPER ASSESSMENT

Friday **6 May 2022** **1 hour**

INSTRUCTIONS FOR CANDIDATES

Write your name and register number in the spaces provided.
Write in dark blue or black ink.

For **Section A**, indicate your answers on the separate Answer Sheet provided.

Answer all other questions in the space provided.

All quantitative answers should include appropriate units and significant figures.

Omission of statements and working may result in loss of marks.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.

The use of an approved scientific calculator is expected, where appropriate.

The total number of marks for this paper is 40 and the weighting for this paper is 25%.

For examiners' use	
Question/ Section	**Marks Obtained**
Section A / 10	
1 – 10	
Section B / 30	
1	/ 6
2	/ 10
3	/ 6
4	/ 8
Total Marks	/40

Parent's / Guardian's Name: _____

Signature: _____ Date: _____

Section A: Multiple Choice Questions (10 marks)

There are ten questions in this section. Answer **all** questions. For each question, there are four possible answers **A, B, C**, and **D**. Choose the **one** you consider correct and record your choice in soft pencil on the separate Answer Sheet.

1 Which statements about the differences between phospholipids and triglycerides are correct?

1 The fatty acids in a phospholipid are always saturated but in a triglyceride they may be saturated or unsaturated.
2 Phospholipids have hydrophobic regions but triglycerides do not.
3 Phospholipids are polar molecules but triglycerides are non-polar.

A 1 and 2
B 1 only
C 2 and 3
D 3 only

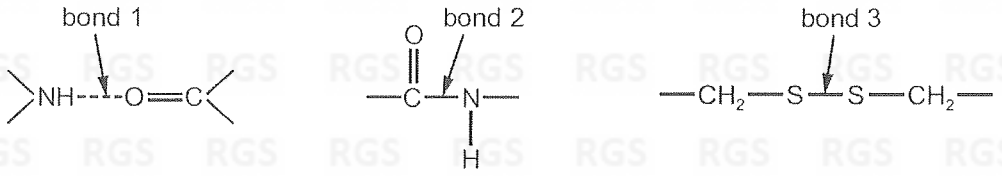
2 Four solutions were tested with Benedict's solution. The table shows the colour of the solutions after testing.

Solution	Colour
1	Green
2	Blue
3	Brick red
4	yellow

Which row shows solutions that could have given these results?

	Solution 1	Solution 2	Solution 3	Solution 4
A	0.05% reducing sugar	0.005% reducing sugar	1.0% reducing sugar	0.1% reducing sugar
B	0.5% reducing sugar	0.0% reducing sugar	1.0% reducing sugar	0.1% reducing sugar
C	1.0% reducing sugar	1.0% reducing sugar	1.5% reducing sugar	0.5% reducing sugar
D	0.05% reducing sugar	0.5% reducing sugar	1.0% reducing sugar	0.1% reducing sugar

3 The diagram shows three different bonds.



Which bonds can be found in proteins?

A 1 only

B 1 and 2

C 2 and 3

D 1, 2 and 3

4 Which statement is true for all enzymes?

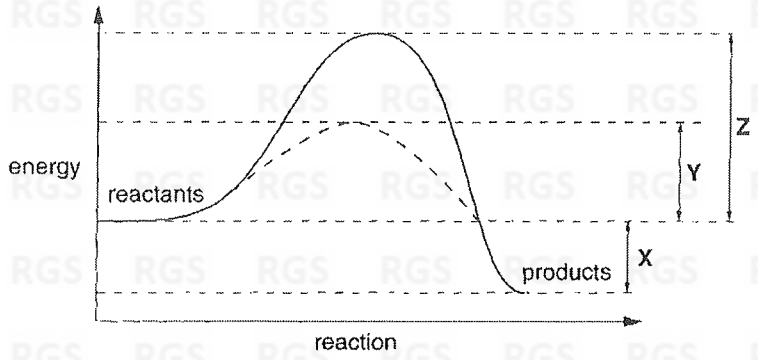
A Enzymes are specific for the substrate they catalyse.

B Enzymes can be denatured by high pH values.

C Enzymes can be denatured by high temperatures.

D Enzyme break down large complex biological molecules into smaller, simpler molecules.

5 The diagram illustrates energy changes in an enzyme-controlled reaction.



Which of the following represents the lowering of the activation energy?

A Y **B** Z **C** Z-Y **D** X+Y

6 Which process allows the movement of molecules that are too large to enter through a cell surface membrane?

A active transport

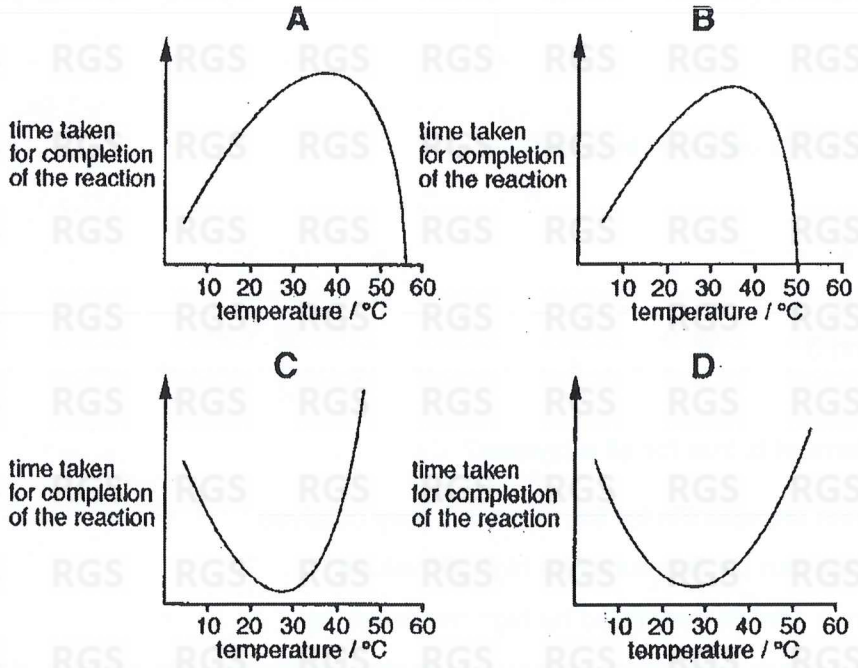
B endocytosis

C exocytosis

D facilitated diffusion

7 A fixed concentration of an enzyme, which is completely denatured at 50 °C, is added to a fixed concentration of its substrate. The time taken for completion of the reaction is measured at different temperatures.

Which graph shows the results?



8 Which of the following is absent from all prokaryotic cells?

A a cell wall

B a cell surface membrane

C a nuclear envelope

D genetic material

9 Where is the site of synthesis of lipids in a cell?

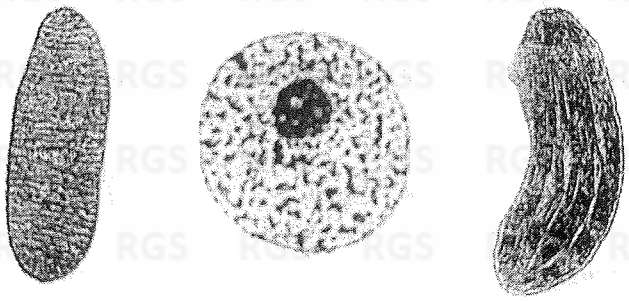
A Golgi body

B lysosomes

C rough endoplasmic reticulum

D smooth endoplasmic reticulum

10 P, Q and R are electron micrographs of cell organelles at different scales of magnification.



P Q R

In a cell that contains all three organelles, what would be the order of relative size?

	largest →		smallest
A	P	Q	R
B	P	R	Q
C	Q	P	R
D	Q	R	P

Section B: Structured Questions (30 marks)

Answer **all** questions. Write your answers in the spaces provided.

1 During an immune response, some white blood cells change into plasma cells. Fig.1 is a drawing made from an electron micrograph of a plasma cell.

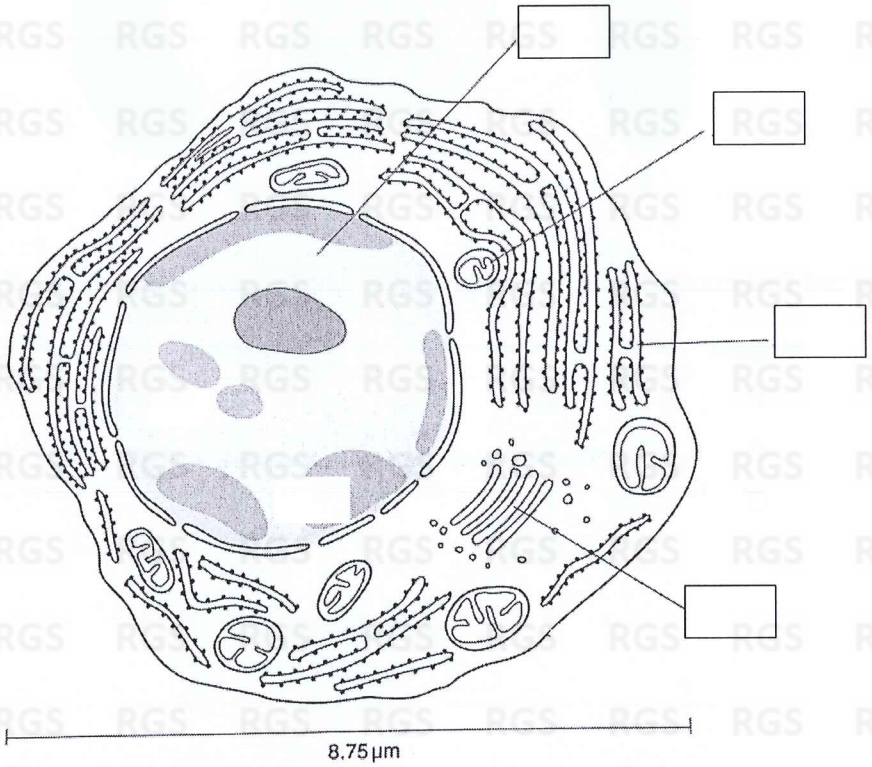


Fig. 1

(a) Fill in the letters **A** to **D** in Fig. 1 to identify where the following processes occur: [2]

A	protein synthesis
B	aerobic respiration
C	formation of secretory vesicles
D	control cellular activities

(b) With reference to Fig. 1, compare the visible features of this plasma cell with a typical prokaryotic cell.

.....

.....

.....

.....

.....

.....[3]

(c) Suggest a possible function of plasma cells during an immune response.

.....

.....[1]

[Total: 6]

2 **(a)** Table 2.1 shows four different biological molecules.

Table 2.1

Starch
Glucose
Glycogen
Haemoglobin

Classify these under the different categories in Table 2.2 and a molecule may appear in one or more categories in Table 2.2.

Table 2.2

Categories			
monomers	polymers	monosaccharides	polysaccharides

[4]

(b) Fig. 2.3 shows two different biomolecules.

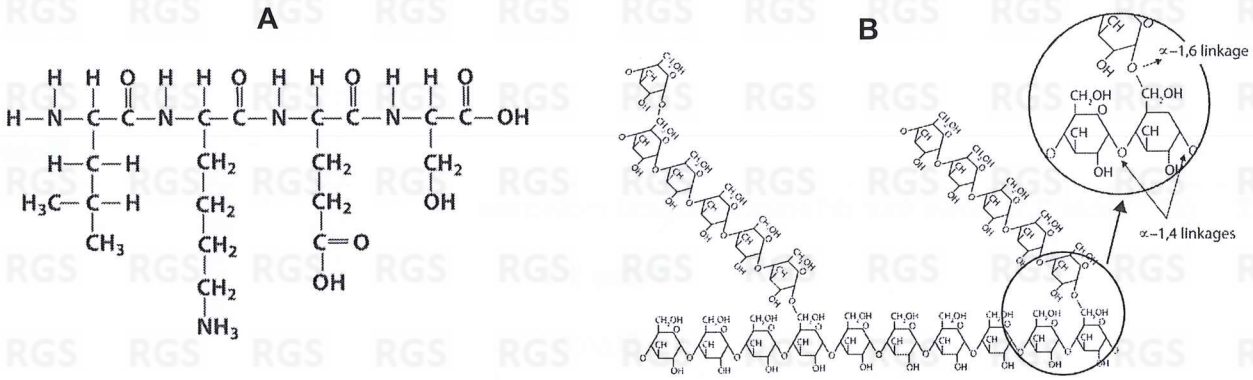


Fig. 2.3

(i) With reference to Fig. 2.3, state three main structural differences between A and B.

.....

.....

.....

.....

.....

.....[3]

(ii) Name and describe the test for the presence of A in a solution.

.....

.....

.....

.....

.....

.....[3]

[Total: 10]

3 Fig. 3.1 shows two pathways, X and Y, through which two different substances, oxygen molecules and potassium ions can move across a cell surface membrane down their concentration gradients.

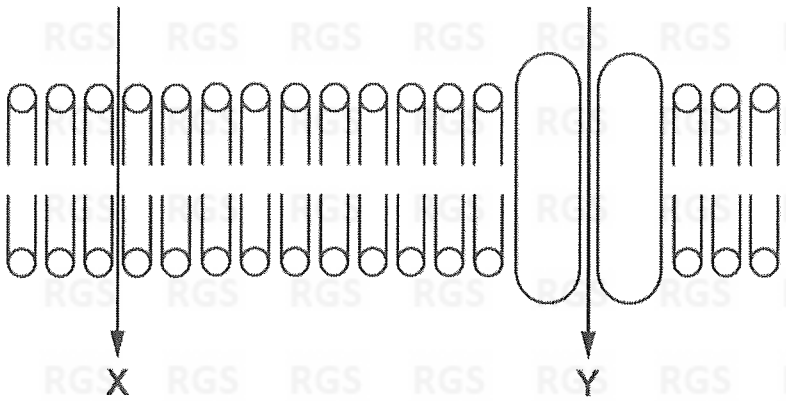


Fig. 3.1

(a) With reference to Fig.3.1,

(i) identify the pathway for oxygen molecules and potassium ions by completing Table 3.2 and name the mechanism in each case. [2]

Table 3.2

Substances	Pathway (X or Y)	Name of the Transport mechanism
Oxygen molecules		
Potassium ions		

(ii) provide a reason for your choice of transport mechanisms for each pathway.

pathway X: .....

.....[1]

pathway Y: .....

.....[1]

(b) Explain why phospholipids are able to form a bilayer in the cell surface membrane.

.....

.....

.....

.....[2]

[Total: 6]

4 Fig. 4.1 represents a model of a chemical reaction catalysed by an enzyme, peptinase.

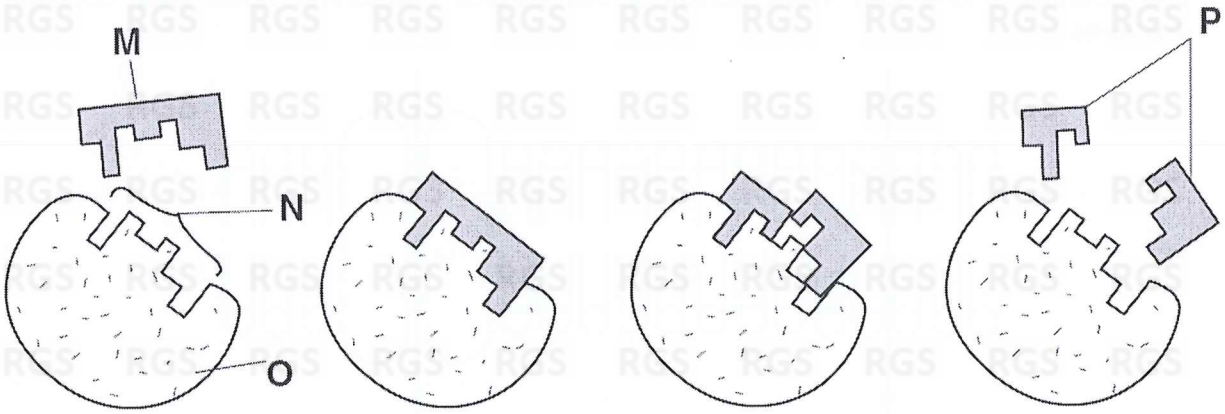


Fig. 4.1

(a) Identify M, N and P in Fig. 4.1. [2]

M .....

N .....

P .....

(b) In Fig. 4.1, circle the stage in which the activation energy is lowered for this reaction. [1]

(c) With reference to Fig. 4.1, explain why peptinase is needed in small amount.

.....

..... [1]

(d) Pectinase is used in the production of apple juice. A student investigated how pH affected the volume of apple juice produced when using pectinase:

- The student chopped an apple into small pieces.
- The pieces of apple were put into solutions with different pH values.
- Pectinase was added to each of the different solutions.
- The mixtures were filtered separately after two hours and the volumes of apple juice obtained were recorded. Table 4.2 shows the results.

Table 4.2

pH	Volume of apple juice obtained / cm^3
1.0	23.2
2.0	24.2
3.0	23.5
4.0	25.7
5.0	27.6
6.0	27.4
7.0	24.0
8.0	22.0

(i) State the pH at which pectinase is most active.

.....[1]

(ii) Explain why pectinase is most active at the pH you stated in **(i)**.

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.....

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.....[2]

(iii) Suggest how pectinase works to produce apple juice.

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.....[1]

[Total: 8]

--- END OF PAPER ---