

JABATAN PENDIDIKAN NEGERI TERENGGANU

**STPM 2022**

PEPERIKSAAN PERCUBAAN  
SEMESTER 1

**BIOLOGY**

Nama : .....

Kelas : .....

**DIBLAYAI OLEH KERAJAAN NEGERI TERENGGANU**

Tidak dibenarkan menyunting atau mencetak mana-mana bahagian dalam modul ini  
tanpa kebenaran Pengarah Pendidikan Negeri Terengganu



**Section A [ 15 marks]**

Answer **all** questions in this section.

- 1 Which is NOT true about the property and physiological role of water ?
- | <u>Property</u>             | <u>Physiological role</u>                 |
|-----------------------------|---|
| A Low viscosity             | Acts as a transport medium                |
| B Denser than ice           | Provides cooling effect                   |
| C Cohesive and adhesive     | Serves as a transport medium              |
| D High heat of vaporisation | Helps living organisms resist overheating |
- 2 What chemical property of lipids accounts for their insolubility in water?
- A The length of the carbon chain  
B The branching of saturated fatty acid  
C The large number of nonpolar C—H bonds  
D The C=C bonds found in unsaturated fatty acids
- 3 The following statements are true of parenchyma cells **except**
- A Most fleshy tissue of fruits is composed mostly of parenchyma cells  
B Parenchyma cells have thicker primary walls than that of collenchyma cells  
C Photosynthesis occurs within the chloroplast of parenchyma cells of the leaf  
D Most parenchyma cells retain the ability to divide and differentiate into other types of plant cells
- 4 The following features are true for Scanning electron microscope (SEM) and Transmission electron microscope (TEM) **except**
- I An electron beam is used  
II A three-dimensional view image is produced  
III The specimen is coated with a thin layer of metal  
IV A narrow electron beam is used to illuminate the surface of the specimen
- A I and II  
B I and IV  
C II and III  
D II and IV
- 5 Which of the following mechanism is bringing material into a cell?
- A Pinocytosis  
B Endocytosis  
C Exocytosis  
D Phagocytosis

6 Catalase catalyses the breakdown of hydrogen peroxide into water and oxygen.

A student carries out an experiment to determine the effect of pH on the rate of reaction of catalase by adding potato cubes to hydrogen peroxide.

What responding variable should the student record?

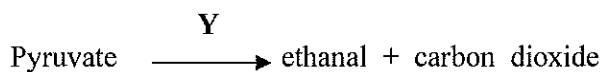
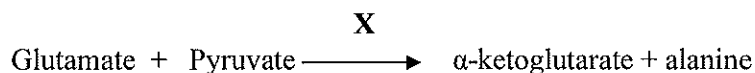
- A The pH of the solution at fixed time intervals
- B The volume of water produced after a given time
- C The volume of oxygen produced at fixed time intervals
- D The change in the mass of the potato at fixed time intervals

7 Some enzyme inhibitors bind to the enzyme causing it to change in shape. Which statements about this type of inhibition are true?

- I The  $K_m$  value increase
- II The inhibitor is competitive
- III The inhibitor is non-competitive
- IV The maximum rate of reaction is reduced

- A I and II
- B II and IV
- C I and III
- D III and IV

8 Two reactions catalysed by enzymes, X and Y, are given below.



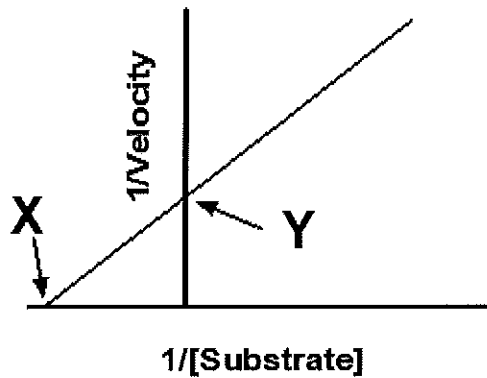
What are represented by X and Y?

- |   | <b>X</b>    | <b>Y</b>  |
|---|-------------|-----------|
| A | Lyase       | Isomerase |
| B | Isomerase   | Hydrolase |
| C | Transferase | Lyase     |
| D | Transferase | Hydrolase |

9 After vigorous activity, what will happen to the lactate produced in muscle cells?

- A Reduced to glucose
- B Oxidised to pyruvate
- C Converted into glycogen
- D Oxidised to carbon dioxide and water

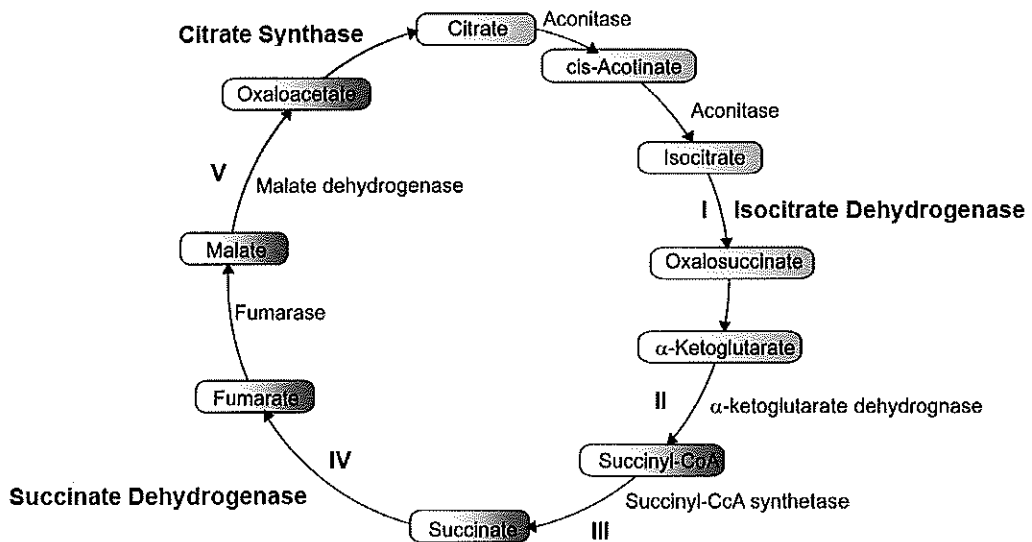
10 The graph below shows Lineweaver-Burk plot for catalysis succinate dehydrogenase



If X equals to  $-4 \times 10^4 \text{ M}^{-1}$  and Y equals to  $2.5 \times 10^9 \text{ mol}^{-1} \text{ min}$ , which of the following is true ?

- A  $K_m = 2.5 \times 10^5 \text{ M}^{-1}$
- B  $K_m = 2.5 \times 10^{-5} \text{ M}$
- C  $V_{\text{max}} = 4.0 \times 10^{-10} \text{ mol}^{-1} \text{ min}$
- D  $V_{\text{max}} = 4.0 \times 10^{10} \text{ mol min}^{-1}$

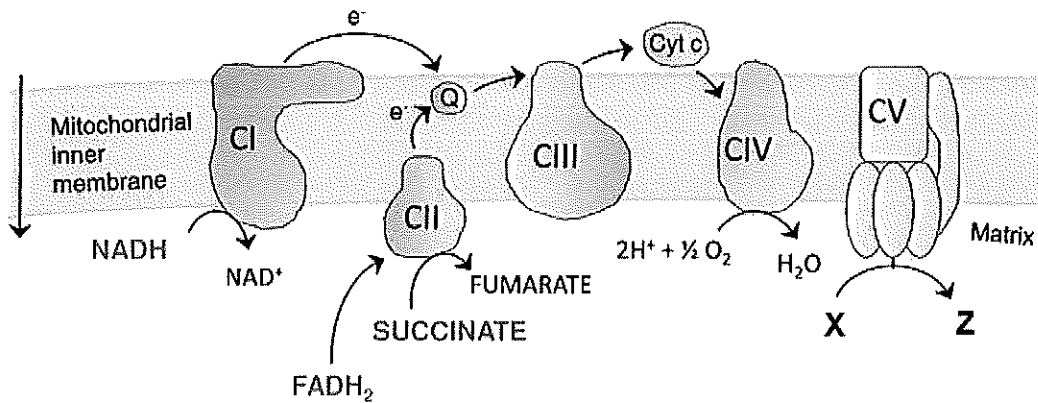
11 The diagram below shows the Krebs Cycle.



Which of the following reactions produces NADH?

- A I, II, III, V
- B I, III, IV, V
- C II, IV, V
- D I, II, V

- 12 A sequence of simplified electron transport chain in mitochondria is shown in the diagram below.



The electron transport chain completes when X forms Z.

Which of the following protein complexes on the inner membrane of the mitochondrion functions as proton pump?

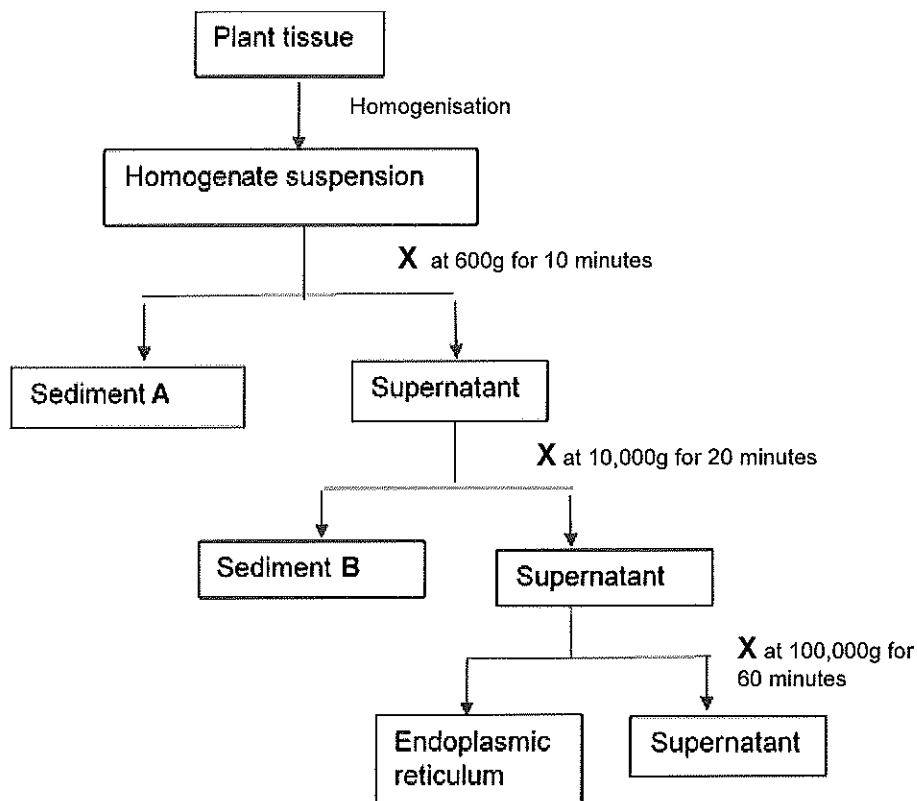
- A CI, CIII, Q
  - B CII, CIII, CIV
  - C CIII, CIV, CV
  - D CI, CIII, CIV
- 13 Which processes occur in photosystem I?

- I The release of oxygen
  - II The photolysis of water
  - III The production of NADPH
  - IV The cyclic photophosphorylation
- A I and II
  - B I and III
  - C II and IV
  - D III and IV

- 14 During the process of photosynthesis which involves the dark reaction, ribulose phosphate is converted to RuBP with the assistance of ATP. What is the function of ATP in the reaction?
- A Oxidising agent
  - B Reducing agent
  - C Source of energy
  - D Source of phosphate
- 15 Which statement is TRUE about photosynthesis in C<sub>4</sub> plant?
- A Calvin cycle occurs in mesophyll cells to produce sugar
  - B Malate is converted to Pyruvate in mesophyll cells and carbon dioxide enters the bundle-sheath cells
  - C Pyruvate from bundle-sheath cells enters mesophyll cells and is converted to Phosphoenolpyruvate
  - D Phosphoenolpyruvate carboxylase fixes the carbon dioxide and converts it to Oxaloacetate in the bundle-sheath cells

**Section B [ 15 marks]**  
 Answer *all* questions in this section

16 The flow chart below show the steps of the separation of organelles in the cell by using the cell differential technique that involve homogenisation process and process X.



(a) Name the process X. [ 1 mark ]

.....

(b) (i) State the name of one of the organelles found in the sediments A and B [ 2 marks ]

**A:** .....

**B:** .....



(ii) State the function of the organelle in b (i)

[ 2 marks ]

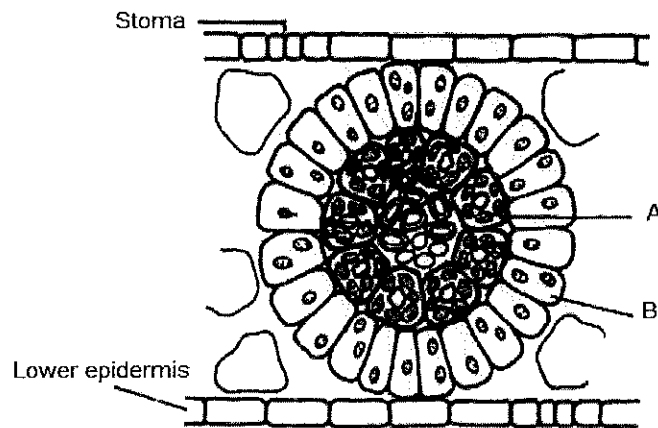
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.....

(c) Explain the importance of homogenising the tissue in a cold, isotonic buffer solution.

[ 2 marks ]

.....  
.....  
.....

17 The diagram below shows the cross section of the leaf structure of a type of plant in the tropical regions.



(a) Name the group of plants which show the above leaf anatomy.

[ 1 mark ]

.....

(b) Name one example of the plant in (a) and its habitat.

[ 2 marks ]

.....  
.....  
.....

(c) Name the structures labelled A and B. [ 2 marks ]

A: .....

B: .....

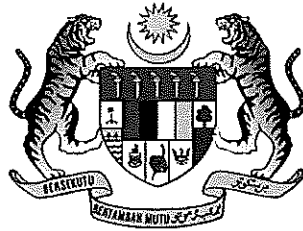
(d) Explain how photorespiration is inhibited by the type of plant in (a). [ 3 marks ]

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**SECTION C [ 30 marks ]**

Answer any **two** questions in this section.

- 18 (a) Explain properties of water as essential component of living matter? [ 6 marks ]
- (b) Explain how the structures of cellulose molecules are related to its functions in plant [ 4 marks ]
- (c) Describe the basic principle of chromatography for pigments separation [ 5 marks ]
- 19 (a) Explain the structure of plasma membrane based on Singer's model [ 8 marks ]
- (b) (i) Explain what is activation energy [ 2 marks ]
- (ii) Explain how enzyme speeds up chemical reaction [ 5 marks ]
- 20 (a) Describe how 4 ATP and 2 NADH molecules are produced in the cytoplasm of muscle cells. [ 5 marks ]
- (b) Explain what will happen to the high energy molecules that are produced in Krebs Cycle.. [ 7 marks ]
- (c) Describe the process that produce Carbon Dioxide in the bread making. [ 3 marks ]



JABATAN PENDIDIKAN NEGERI TERENGGANU

**STPM 2022**

**PERATURAN PEMARKAHAN**  
PEPERIKSAAN PERCUBAAN  
SEMESTER 1

**BIOLOGY**

**MARKING SCHEME TRIAL YEAR BIOLOGY PAPER 1 STPM 2022**

<b>SECTION : A</b>		
<b>No</b>	<b>ANSWER</b>	
1	B	The cohesive force of water is due to the hydrogen bonds between water molecules causing water molecules to stick together. Adhesive force is the bonding of the water molecules to another material such as the wall of the xylem.
2	C	
3	B	Parenchyma cells form packing tissues and have
4	D	The scanning electron microscope uses a narrow electron beam to scan the surface of the specimen to produce a three-dimensional view
5	C	
6	C	The rate of an enzymic reaction is determined by the rate of appearance of the product or rate of disappearance of the substrate. It is easiest to measure the rate of evolution of oxygen in this experiment
7	D	
8	C	Transferase (X) is a class of enzyme that catalyses the transfer of specific functional group from one molecule to another. X is transaminase. Lyase (Y) is an enzyme class where it catalyses the breaking of chemical bonds by means other than oxidation and hydrolysis. Y is decarboxylase
9	B	After vigorous activity, lactic acid is transported to the liver where it is converted back to pyruvate through the oxidation process. This reaction is catalysed by lactate dehydrogenase
10	B	$Y = -1/K_m$ , $Y = -4 \times 10^4 \text{ M}^{-1}$ $-1/K_m = -4 \times 10^4 \text{ M}^{-1}$ $K_m = 0.25 \times 10^{-4} \text{ M}$ $K_m = 2.5 \times 10^{-5} \text{ M}$
11	D	Reaction III produces 1 GTP, which goes through substrate-level phosphorylation to produce 1 ATP for every succinyl-CoA. Reaction IV produces $\text{FADH}_2$ for every succinate
12	D	
13	D	Photosystem I is the second photosystem in the light-dependent reaction. In photosystem I, NADPH is produced from NAD. Photosystem I is a part of cyclic photophosphorylation.
14	D	In the regeneration of RuBP step of Calvin Cycle, Ribulose-5-phosphate is phosphorylated by phosphate ion from ATP to form Ribulose-1,5 bisphosphate
15	C	The first $\text{CO}_2$ acceptor is a 3-carbon molecule, phosphoenolpyruvate (PEP), which is present in the mesophyll cells. The enzyme responsible for this fixation is PEP carboxylase. The $\text{C}_4$ acid, oxaloacetate, is formed in the mesophyll cells. Oxaloacetate is then converted to malate or aspartate.
<b>TOTAL MARKS :</b>	<b>15</b>	

**SECTION B : ( 15 MARKS)**

No		Answers	Marks
16	(a)	Centrifugation	1m
	(b)	A : Nucleus	1m
	(i)	B : Chloroplast / mitochondria	1m
	(b)	Function –nucleus- It is the control centre for all activities in the cell.	1m
	(ii)	Function –chloroplast produces sugar via photosynthesis.@ mitochondria- generate ATP.	1m
	(c)	low temperature inactivates the enzymes and to prevent digestion of organelles.	1m
		Isotonic salt solution prevents changes in shape and volume of organelles because there is no net gain/loss of water.	1m
		The solution is buffered to maintain the pH, prevents denaturation of enzyme.	1m
Any 2			Max: 2m
<b>TOTAL</b>			<b>7 MARKS</b>

No		Answers	Marks
17	(a)	C4 plants	1m
	(b)	A hot / dry/arid habitat.	1m
		examples: sugar cane, Maize, Sorghum	1m
	(c)	A : Bundle sheath cells	1m
		B : Mesophyll cell	1m
	(d)	C4 plants have an additional Hatch-Slack Pathway.	1m
		PEP carboxylase with high affinity for carbon dioxide will first fix atmospheric carbon dioxide in mesophyll cells.	1m
		This increases carbon dioxide concentration in the bundle sheath cells, where carbon dioxide is fixed a second time by the enzyme Rubisco in the Calvin cycle.	1m
		Increased carbon dioxide reduces inhibition of Rubisco by oxygen. The photorespiration is inhibited.	1m
	Any 3		
<b>TOTAL</b>			<b>8 MARKS</b>

**SECTION : C (30 MARKS)**

No	Answers	Marks
18	(a) <i>Explain properties of water as essential component of living matter?</i>	(6 marks )
	<ul style="list-style-type: none"> <li>• <b>F1 Water has a high specific heat</b> 1m</li> <li>• P1 Heat is absorbed when hydrogen bonds break and is released when hydrogen bonds form. 1m</li> <li>• P2 This helps keep temperatures relatively steady, within limits that permit life. 1m</li> <li>• <b>F2 Water has high heat of vaporization.</b> 1m</li> <li>• P1 The evaporative loss of the most energetic water molecules cools a surface// evaporative cooling 1m</li> <li>• P2 Ice floats because it is less dense than liquid water. 1m</li> <li>• P3 This property allows life to exist under the frozen surfaces of lakes and polar seas. 1m</li> <li>• <b>F3 Water is an universal solvent</b> 1m</li> <li>• P1 because its polar molecules are attracted to ions and polar substances that can form hydrogen bond 1m</li> <li>• <b>F4 Water has high surface tension</b> 1m</li> <li>• P1 Hydrogen bonding keeps water molecules close to each other, and this cohesion helps pull water upward in the microscopic water-conducting cells of plants. 1m</li> </ul>	
	• Any 3 pairs F and P	6 marks
	<b>Total</b>	<b>4 marks</b>

18	(b) <i>Explain how the structures of cellulose molecules are related to its functions in plant</i>	4 marks
	<ul style="list-style-type: none"> <li>• P1 Based on structure, cellulose is a polymer of <math>\beta</math> glucose molecules forming a long unbranched chain 1m</li> <li>• P2 These chain arranged parallel to each other and 1m</li> <li>• P3 has cross linkages between them 1m</li> <li>• P4 This chain also has adjacent glucose molecules rotated by <math>180^\circ</math> 1m</li> <li>• <b>E1</b> provide stability/support to the plant 1m</li> <li>• <b>E2</b> Cellulose has the structure which is difficult to digest 1m</li> </ul>	
	Any 3P + 1E	4 marks
	<b>Total</b>	<b>4 marks</b>

18	(c)	<b>Describe the basic principle of chromatography for pigments separation</b>	<b>5 marks</b>
		<ul style="list-style-type: none"> <li>• P1 The process of chromatography separates molecules depending on their size/ solubility / adsorption (of solute by chromatography paper )- Any 2</li> <li>• P2 The solvent carries the dissolved pigments as it moves up the paper</li> <li>• P3 The pigments are carried at different rates because they have different solubility</li> <li>• P4 A pigment that is the most soluble will travel the greatest distance // a pigment that is less soluble will move a shorter distance.</li> <li>• P5 The distance travelled by pigment and the solvent front is measured.</li> <li>• P6 Rf value is calculated</li> <li>• P7 It (Rf value) shows the ratio of the distance travelled by pigment over the solvent front // correct formula</li> <li>• P8 The higher Rf value the further movement of the pigment // the lower Rf value the shorter movement of the pigment</li> </ul>	<p>1m</p> <p>1m</p> <p>1m</p> <p>1m</p> <p>1m</p> <p>1m</p> <p>1m</p> <p>1m</p> <p>1m</p> <p>Any 5</p> <p><b>Total</b></p>
			<b>5 marks</b>
			<b>5 marks</b>
<b>TOTAL</b>			<b>15 MARKS</b>

No	Answers	Marks
19. a)	<b>Explain the structure of plasma membrane based on Singer's model</b>	<b>(8 marks )</b>
	<b>F1-Consists of phospholipid bilayer molecules in which the proteins are embedded.</b>	1m
	P1-Phospholipid molecules have hydrophilic and hydrophobic feature // The head is polar while the hydrocarbon tail is non polar.	1m
	P2-Thus, the hydrophilic head is on the outer layer and the hydrophobic tail is on the inner layer.	1m
	P3-The phospholipids are free to move laterally and the position of proteins are constantly moving and not static.	1m
	<b>F1 and any P1/P2/P3</b>	<b>Max = 2m</b>
	F and P is independent	
	<b>F2-Mosaic pattern is due to scattered protein molecules.</b>	1m
	P4-Integral / Intrinsic proteins are firmly bound to the membrane fully or partially embedded	1m
	P5-Peripheral / Extrinsic protein is not embedded in the phospholipid bilayer, it is bound loosely to the surface of the membrane.	1m
	<b>F2 and any P4/P5</b>	<b>Max = 2m</b>
	F and P is independent	
	<b>F3-There are cholesterol molecules between phospholipids</b>	<b>1m</b>
	P6-Cholesterol maintain the fluidity of the membrane	1m



	<b>F4-The carbohydrate chain attach to phospholipid to form glycolipid.</b>	1m
	<b>F5-The carbohydrate chain attach to protein forming glycoprotein</b>	1m
	<b>Total</b>	<b>8 marks</b>

19	b)(i)	<b><i>Explain what is activation energy</i></b>	<b>(2 marks)</b>
		Activation energy is the amount of energy needed for a reaction to proceed.	1m
		It is the energy required to bring the reactants to transition state before products can be formed.	1m
		<b>Total</b>	<b>Max=2m</b>
19	(b)(ii)	<b><i>Explain how enzyme speeds up chemical reaction</i></b>	<b>(5 marks)</b>
		1. Enzyme speeds up chemical reaction by lowering the activation energy without affecting the free energy.	1m
		2. Reacting molecules / Reactants require less kinetic energy to complete a reaction	1m
		3. Enzyme works by forming an enzyme-substrate complex during the transition state	1m
		4. The enzyme-substrate complex is an unstable intermediate	1m
		5. Chemical bonds are broken and new bonds are formed	1m
		6. When the enzyme - substrate complex breaks up, products are released	1m
		<b>Any 5</b>	<b>5 marks</b>
		<b>TOTAL</b>	<b>15 MARKS</b>

<b>No</b>	<b>SUGGESTED ANSWER</b>		<b>MARKS</b>
20	(a)	<b><i>Describe how 4 ATP and 2 NADH molecules are produced in the cytoplasm of muscle cells.</i></b>	<b>(5 marks )</b>
		1- In the energy investment phase of Glycolysis	1m
		2- glucose split into 2 molecules of Glyceraldehyde-3-phosphate (G3P).	1m
		3- 2 molecules G3P undergo dehydrogenation/oxidation to produce 2 molecules phosphoglycerate	1m
		4- 2NAD <sup>+</sup> is reduced to 2 NADH	1m
		5- 2 molecules phosphoglycerate which react with inorganic phosphate (present in the cytosol) to yield 1,3-biphosphoglycerate.	1m

6-	One of the phosphates from 1,3-biphosphoglycerate is used to phosphorylate ADP to produce ATP	1m
7-	2 ATP produce by substrate-level phosphorylation	1m
8-	3-phosphoglycerate is rearranged to 2-phosphoglycerate	1m
9-	A molecule of water is removed (from 2-phosphoglycerate) to form phosphoenolpyruvate (PEP)	1m
10-	2 molecules of phosphate from PEP is used to phosphorylate 2 ADP to yield 2 ATP and 2 Pyruvate molecules are formed	1m
Max		5 marks

20	(b)	<b><i>Explain what will happen to the high energy molecules that are produced in Krebs Cycle</i></b>	<b>(7 marks )</b>
		- 1. High energy molecules of Krebs cycle are (3) NADH/ reduced NAD molecules and (1) FADH <sub>2</sub> / reduced FAD molecule	1m
		- 2. NADH and FADH <sub>2</sub> will enter Electron Transport Chain	1m
		- 3. ETC consists of a series of electron carriers, flavoprotein, coenzyme Q/ ubiquinone and cytochrome complexes in the inner membrane of mitochondrion.	1m
		- 4. Hydrogen atoms are released from NADH enters ETC at flavoprotein	1m
		- 5. and hydrogen atoms are released from FADH <sub>2</sub> enters ETC at ubiquinone.	1m
		- 6. Hydrogen atoms split into protons and electrons that move along ETC losing energy at the each electron carrier.	1m
		- 7. This energy is used by electron carrier to pump protons from mitochondrial matrix into intermembrane space.	1m
		- 8. Concentration of protons is higher in the intermembrane space	1m
		- 9. causes protons move down into mitochondrial matrix via ATP synthase.	1m
		- 10. ADP and Pi is phosphorylated into ATP by oxidative phosphorylation	1m
		- 11. At the end of ETC, protons, electrons and oxygen combine to form water molecule.	1m
Max			7 marks

20 (c)	<p><b>Describe the process that produce Carbon Dioxide in the bread making.</b></p> <p>1- The yeast cells in the bread dough undergo anaerobic respiration due to absence of oxygen</p> <p>2- Alcohol fermentation occurs</p> <p>3- to regenerate NAD<sup>+</sup> for glycolysis.</p> <p>4- Pyruvate is converted to acetaldehyde (2C)</p> <p>5- by removal of Carbon Dioxide/ decarboxylation</p> <p>6- Acetaldehyde is reduced by NADH to ethanol.</p> <p style="text-align: right;">Max</p>	<p><b>(3 marks )</b></p> <p>1m</p> <p>1m</p> <p>1m</p> <p>1m</p> <p>1m</p> <p>1m</p> <p>3 marks</p>
<b>TOTAL</b>		<b>15 MARKS</b>