

Scheme for Trial STPM Biology Term 1 2022 Set 1

Section A

Nu.	Answer
1	B
2	C
3	C
4	B
5	D
6	D
7	B
8	D
9	A
10	D
11	B
12	A
13	C
14	B
15	C

Section B

16. (a) Steroids

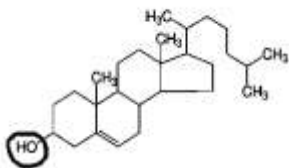
[1 mark]

(b) *X*: Cholesterol

Y: Oestrogen

[2 marks]

(c)



X

[1 mark]

(d) Amphipathic molecules because polar hydrophilic phospholipid heads attracted to water and form hydrogen bonds with the molecules and nonpolar hydrocarbon fatty acid tails form hydrophobic interactions with one another.

[2 marks]

(e) Gives membranes fluidity and allow lipid soluble substances and small nonpolar substances to pass through.

[1 mark]

17. (a) - Enzymes immobilization is a process where an enzyme is attached to an inert and insoluble material to increase enzyme efficiency.

[1 mark]

- This process ensures that there is an increased enzyme availability for the substrate and a greater turnover of products.

[1 mark]

(b) Entrapment in a gel – enzymes are physically trapped in a gel for example silica or alginate.

Entrapment in microcapsule – Enzyme is trapped in a permeable microcapsule.

Cross-linking – Enzymes form cross links with other molecules.

Covalent bonding – Enzyme is bound covalently to a matrix of cellulose or collagen.

Adsorption on to an insoluble matrix for example resin.

Any 3 [3 marks]

(c) - The enzymes can be reused.

- The products are not contaminated by the enzyme.

	- Water potential is affected by the pressure potential (ψ_p) of the cell wall against the cellular components.	1M
	- Pressure potential always has a positive value.	1M
	- Pressure potential is a zero when the cell is flaccid.	1M
		Total=6M Max=5M

19.(a) Enzymes are globular protein catalysts that increase the rate of specific chemical reactions

There are six types of enzymes:

- (i) oxido-reductase
- (ii) transferase
- (iii) hydrolase
- (iv) lyase
- (v) isomerase
- (vi) ligase/synthetase

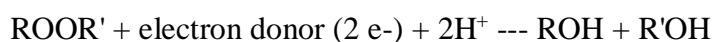
[Max 6 marks]

(b)

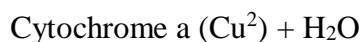
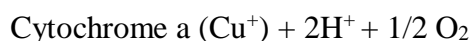
(i) **Oxidoreductase enzymes** transfer oxygen, electron or hydrogen ion from one molecule (the oxidant) to another (the reductant).

Examples:

- Peroxidase



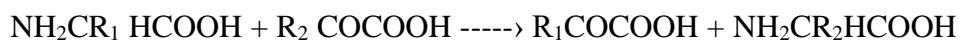
- Oxidase



(ii) **Transferase enzyme** transfer a functional group (e.g. a methyl or phosphate group) from one molecule to another.

Examples:

- Transaminase



Phosphorylase

Glycogen + phosphate \rightarrow glucose phosphate

(iii) **Hydrolase enzyme** catalyse hydrolysis or breaking up of a complex chemical with water

Example:

- Maltase

Maltose + $H_2O \rightarrow$ 2 glucose

(iv) **Lyase enzymes** catalyse non-hydrolytic reactions in which groups are either removed or added to a substrate, thereby creating or eliminating a double bond, especially between carbon atoms or between carbon and oxygen.

Examples:

- Decarboxylase (removal of CO_2)

Pyruvate + coenzyme A + NAD + Acetylcoenzyme A + NADH + H^+ + CO_2

- Carboxylase (fixation of CO_2)

Ribulose biphosphate (RuBP) + $H_2O + CO_2 +$ 2 phosphoglyceric acid (PGA)

(v) **Isomerase enzymes** catalyse changes within one molecule, often by rearranging the functional groups and converting the molecule into one of its isomeric forms.

Examples:

- Phosphoglucomutase

Glucose-1-phosphate \rightarrow Acetyl coenzyme A + NADH + H^+ + CO_2

Phosphohexosimerase

- Glucose-6-phosphate \rightarrow Fructose -6 phosphate

(vi) **Ligase/Synthetase** enzymes catalyse a reaction that joins 2 substrates using energy derived from simultaneous hydrolysis of a nucleotide triphosphate

examples :

Aminoacyl tRNA synthetase

Glysin + tRNA + ATP ----- Glysin-tRNA + AMP + pyrophosphate(PPi)

[Max 9 marks]

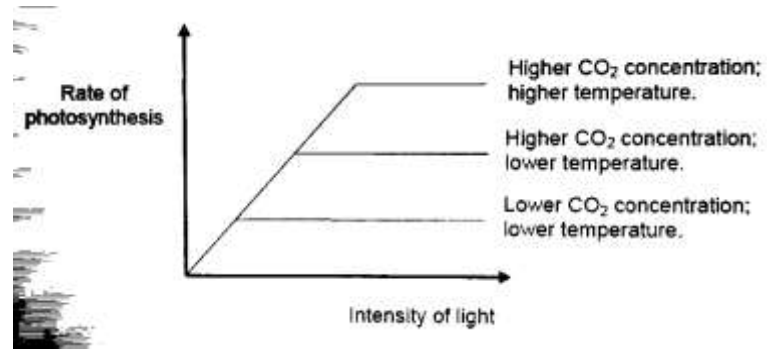
20.(a) - Light energy (photon) is used in the light phase of photosynthesis.

- The photons are absorbed by the primary pigments of photosynthesis for photoactivation process.
- When light intensity is very low, photosynthesis rate is low because photoactivation of photosystem on the thylakoid membrane cannot occur.
- When light intensity is increased, the rate of photosynthesis increases proportionally to light intensity as more NADPH and ATP are produced in the light dependent phase of photosynthesis.
- At higher light intensity, the rate photosynthesis reaches a maximum level called the saturation point.
- The rate of photosynthesis is limited by other limiting factors such as carbon dioxide concentration and temperature.

[Max 5 marks]

(b) - The main factors affecting rate of photosynthesis are light intensity, carbon dioxide concentration and temperature.

- The rate of a photosynthesis process will be limited by the factor which is in shortest supply.
- Any change in the level of a limiting factor will affect the rate of reaction.
- For example, the amount of light will affect the rate of photosynthesis.
- If there is no light, there will be no photosynthesis.
- As light intensity increases, the rate of photosynthesis will increase as long as other factors are in adequate supply.
- As the rate increases, eventually another factor will come into short supply.
- The graph below shows the effect of low carbon dioxide concentration.



- It will eventually be insufficient to support a higher rate of photosynthesis, and increasing light intensity will have no effect, so the rate plateaus.
- If a higher concentration of carbon dioxide is supplied, light is again a limiting factor and a higher rate can be reached before the rate again plateaus.
- If carbon dioxide and light levels are high, but temperature is low, increasing temperature will have the greatest effect on reaching a higher rate of photosynthesis.

[Max 10 marks]