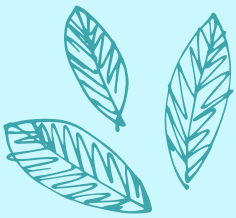

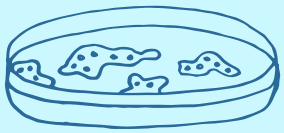
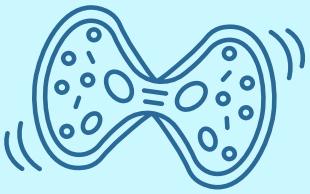

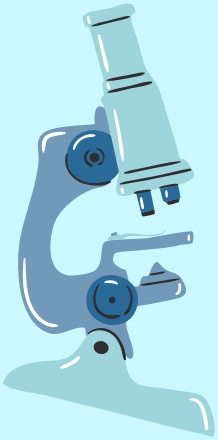
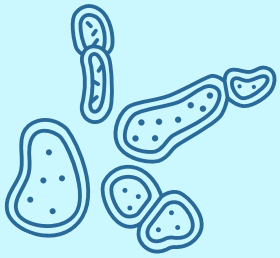
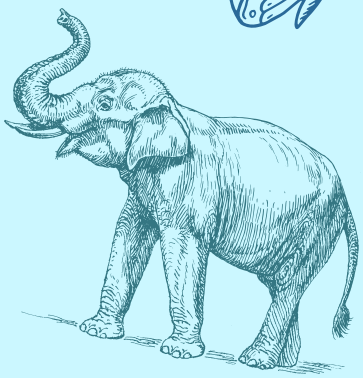
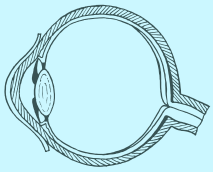

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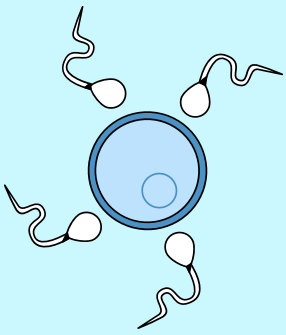

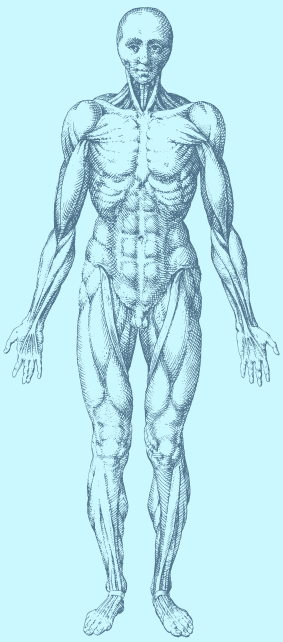

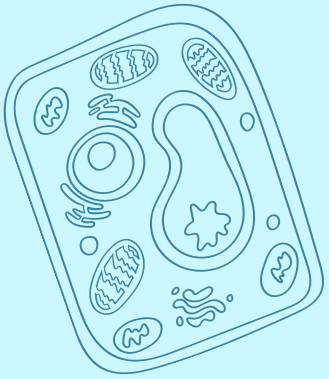

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Ch.1 Molecules of Life

(A) Carbohydrates

- Component: C, H, O (H:O ~ 2:1)
- General Formula: C x (H_2O) y
- Release energy when broken down to carbon & H_2O during glycolysis

	Monosaccharides	Disaccharides	Polysaccharides
Chemical formula	$C_6H_{12}O_6$	$C_{12}H_{22}O_{11}$	$(C_6H_{10}O_5)_n$
Form	Simplest form of carbohydrates	condensation between two monosaccharides (H2O will be formed)	polymerization of monosaccharides
Reducing sugar	Reducing	Reducing sugar **except sucrose**	Not reducing
Taste	Sweet	Sweet	Not sweet
Solubility in water	Soluble	Soluble	Insoluble
Examples	1) Glucose 2) Fructose 3) Galactose	1) glucose + glucose → maltose 2) glucose + fructose → sucrose 3) glucose + galactose → lactose	1) Starch 2) Glycogen 3) Cellulose
Functions	1) Transport form of carbohydrates in organisms 2) As substrate to release energy during respiration in cell	1) storage in plant cell (sucrose) 2) transport in phloem (sucrose) 3) converted into respiratory substrate	1) Starch: major storage in plant 2) Glycogen: major storage form in animal in liver, muscle 3) Cellulose: major component of cell wall

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	3) Building up of complex carbohydrates		

Experiment

1. Benedict's Test for reducing sugar

- Add equal volume of Benedict's solution and substance to be tested in the test tube.
- Mix and shake the test tube gently.
- Heat it in a boiling water bath for 5 mins.

✓ reducing:	give brick-red precipitate
✕ non-reducing:	remains blue

2. Clinistix test for glucose

- Dip the clinistix paper into the solution to be tested.

✓ glucose:	turns to purple/ blue
✕ glucose:	remains pink

3. Diastix test for glucose

✓ glucose:	turns to brown
✕ glucose:	remains green

4. Iodine test for starch

- Add a few drops of iodine solution.

✓ starch:	turns to blue-black
✕ starch:	remains yellowish orange

(16/3) In which of the following pairs of carbohydrates can Benedict's test be used to distinguish the two carbohydrates from one another?

(1) sucrose and starch

(2) sucrose and maltose

(3) glucose and maltose

(4) glucose and starch

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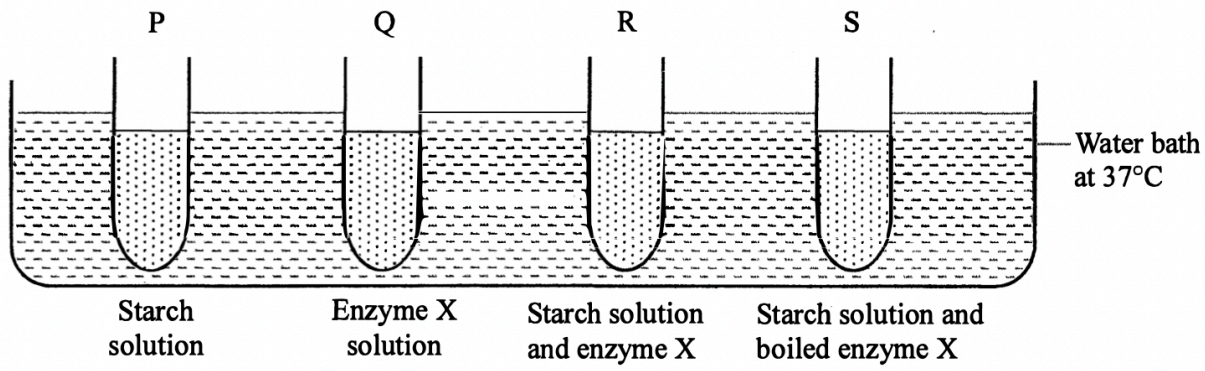
A. (1) and (3) only
B. (1) and (4) only
C. (2) and (4) only
D. (2) and (4) only

Ans: D (sucrose is not a reducing sugar)

Directions: Questions 3 to 4 refer to the diagram below, which shows for test tubes prepared by a student to investigate the action of a starch-digesting enzyme X:



(17/3) The student conducted some tests on the content of each test tube at the beginning and after 30 minutes. Which of the following correctly shows the results of the tests for tube R at the beginning?

	Benedict's test	Iodine test	Test for proteins
A.	Negative	Positive	Positive
B.	Negative	Positive	Negative
C.	Positive	Negative	Negative
D.	Positive	Negative	Positive

Ans: A

(17/4) Which of the following is not the purpose of the experimental design?
A. Setting up tube P to show the result of iodine test if starch is present

B. Setting up tube Q to show that enzyme X alone cannot give positive result in Benedict's test

C. Setting up tube S to show that enzyme X is denatured after boiling

D. Setting up water bath to simulate the temperature of the human body

Ans: C

(B) Lipids

- Component: C, H, O (with very little O)
- Solubility:
    - Insoluble in water (hydrophobic)
    - Soluble in organic solvent (lipophilic), e.g., ether, chloroform

Functions

1. For storage due to its insolubility and high energy yield
2. Energy source: when oxidized, it generates large amount of energy
3. Insulating layer to reduce heat loss (fat under skin)
4. Water-proof layer to prevent water loss (waxy cuticle)
5. Protection: around organs to absorb shock
6. Structural component of cell membrane
7. Dissolve lipid-soluble vitamins (i.e. A, D)

	Triglycerides	Phospholipids	Cholesterol
Structure	• condensation between glycerol molecules and 3 fatty acids (to give 3 H_2O) • Linked by ester bond	• condensation between phosphate group, glycerol, and 2 fatty acids by ester bond • Amphipathic: hydrophobic tail, hydrophilic head	/
Functions	• Storage form of energy	• major component of cell membrane	• Formation of bile salt, vitamin

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