**2 The Chemicals of living cells - *answers***

Self-assessment questions 2.03

**1** Cells need to take in water and salts, in addition to food.

**2** (a) A high thermal capacity means that any temperature rise is small in comparison with the amount of heat absorbed. This helps to protect the cell against extremes of temperature.

**3** (a) Cytoplasm, the cell membrane, membrane systems in the cell, the nucleus and

mitochondria all contain structural proteins.

(b) Enzymes are the other type of cell proteins.

**4** Proteins contain the elements carbon, hydrogen, oxygen, nitrogen and sulphur.

**5** All proteins are composed of sub-units called amino acids.

**6** (b) A protein which is denatured has changed its shape.

**7** A lipid is a fat or oil. It may be combined with other substances, e.g. phospho-lipid or lipo-protein.

**8** Lipids are found in cell membranes and other membrane systems in the cell. Some cells may have food reserves in the form of lipid droplets.

**9** (a) lipids are formed from the combination of fatty acids with glycerol.

(b) lipids contain the elements carbon, hydrogen and oxygen.

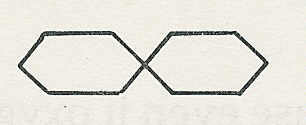
**10** (a) Sugars (glucose, fructose, maltose, sucrose), starch, glycogen and cellulose are examples

of carbohydrates.

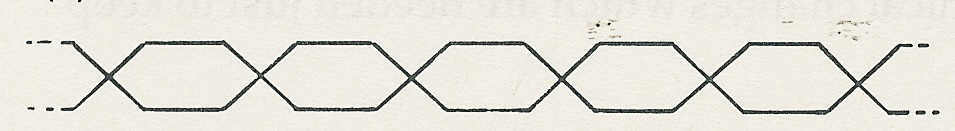
(b) Carbohydrates contain the elements carbon, hydrogen and oxygen.

**11** The formula for glucose is C6H12O6

**12** (a) Maltose

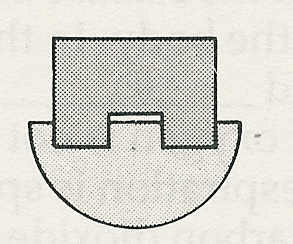


(b) Part of a starch molecule



**13** All cells contain *enzymes* which are *proteins* and act as *catalysts* which *speed up* chemical reactions. The reaction does not *use up* the *enzymes,* which can take part in further reactions.

**14** Using the lock and key model, enzyme A is most likely to react with substance R.



**R**

**15** If an enzyme normally works at 10°C, then

(a) a fall in temperature to 2°C will slow down the reaction

(b) a rise in temperature to 20°C will speed up the reaction (by x2)

(c) a rise in temperature to 65°C will denature the enzyme and stop it working (though the

reaction may speed up at first).

**The chemicals of living cells - answers (continued)**

Self-assessment questions 2.04

**16** An enzyme which has been denatured has changed its shape and will no longer combine with its substrate (the substance it acts on).

**17** (b)The optimum pH is 7 because the rate of reaction is greatest at this pH.

**18**  (a) A protein-digesting enzyme would have no effect on starch.

**19** All enzymes are produced inside *cells*. Enzymes which do their work outside cells are called *extra-cellular*. Enzymes which do their work inside cells are called *intra-cellular* Most of our digestive enzymes are examples of *extra-cellular* enzymes.

**20** In the course of brewing, enzymes in the grain catalyse the conversion of starch to maltose; enzymes in yeast catalyse the conversion of maltose to alcohol.

**21** Catalase speeds up the breakdown of hydrogen peroxide to water and oxygen.

**22** (a) Boiling denatures enzymes. If a substance still works after boiling, it cannot be an

enzyme.

(b) If the reaction still worked after A had been boiled, either A is not an enzyme or, if it

is, it is not necessary for the reaction.

**23** (a) The test for starch is iodine solution, which goes blue.

(b) When no blue colour appears after adding iodine, all the starch has gone and the

reaction is complete.