

Answers for extension worksheet – Option C

1

(4 – 1 mark per correctly filled box)

Level of protein structure	Types of bond
primary	peptide linkages
secondary	hydrogen bonds
tertiary	hydrogen bonds, disulfide bridges, ionic bonds, van der Waals forces
quaternary	two or more proteins held together by a non-protein group (for example, an iron atom in hemoglobin)

- 2 a i The allosteric site of an enzyme is the site (not the active site) to which a regulator molecule binds. (1)
- ii A non-competitive inhibitor binds to an enzyme molecule at a site away from the active site. (1)
- iii The active site is the site at which the substrate molecule(s) binds. (1)
- iv End-product inhibition occurs when rising levels of a product of a metabolic reaction affect an enzyme earlier in the pathway and turn off the pathway. (1)
- v Rising levels of a product cause the reaction to be 'switched off', so that the product is no longer formed. As levels of the product fall, the reaction is 'switched on' again, and production resumes. (1)
- b The shape and bonding between enzyme and substrate are specific. If the substrate is not the correct shape and does not have appropriate charges on its molecule, it will not bind to the active site and the reaction will not proceed. (2)
- 3 a X = carbon dioxide, Y and Z = ADP and NADP (can be either way round) (3)
- b in the stroma (1)
- c to regenerate RuBP (1)
- d a condensation reaction (1)
- 4 a If an organism is starving, protein can be used as a source of energy. Protein is split into amino acids, which are then deaminated (the NH_2 group is removed). The remainder of the molecule enters the respiratory process. Some amino acids are converted to pyruvate, others enter the Krebs cycle. In either case, ATP is synthesised in the usual way. This only occurs during starvation because the protein comes from the organism's tissues and leads to loss of body mass. Protein may also be respired if an excess is taken in the diet. (3)

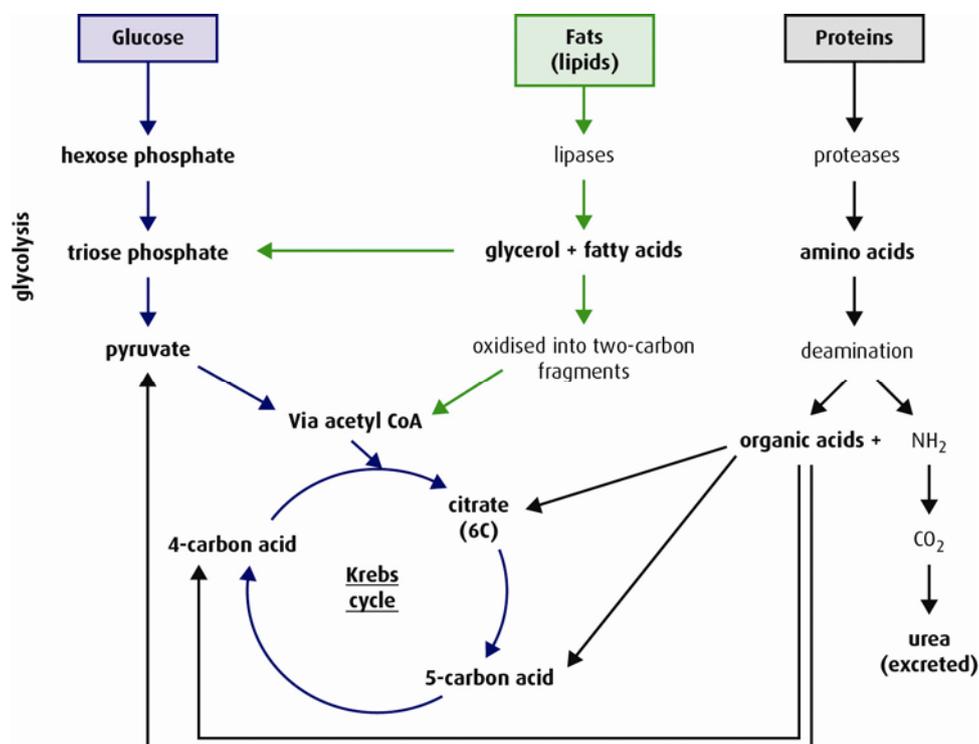
- b** When fat is used as a source of energy, it yields more than 1 g of water for each 1 g of fat converted, making it ideal for a camel in very dry conditions.

Fat is split into fatty acids and glycerol. Glycerol is phosphorylated and converted to pyruvate and enters the Krebs cycle. Fatty acids are converted to acetyl CoA in a series of steps that remove two-carbon units. The same series of reactions is repeated several times until the whole carbon chain is broken down, transferring a lot of energy for ATP synthesis. These reactions occur in the liver and excess acetyl CoA produced there is released and taken to other tissues. The liver can supply the needs of the whole body. (3)

- c** Glycolysis can be 'switched off' by end-product inhibition. The rate of respiration is controlled by the amount of ATP produced. If ATP production has been rapid it accumulates in cells and inhibits one of the enzymes that catalyses the phosphorylation of sugar in glycolysis. The enzyme involved is allosteric and the shape of its active site is determined by the ratio of ATP to ADP. This mechanism controls the rate of respiration. (2)

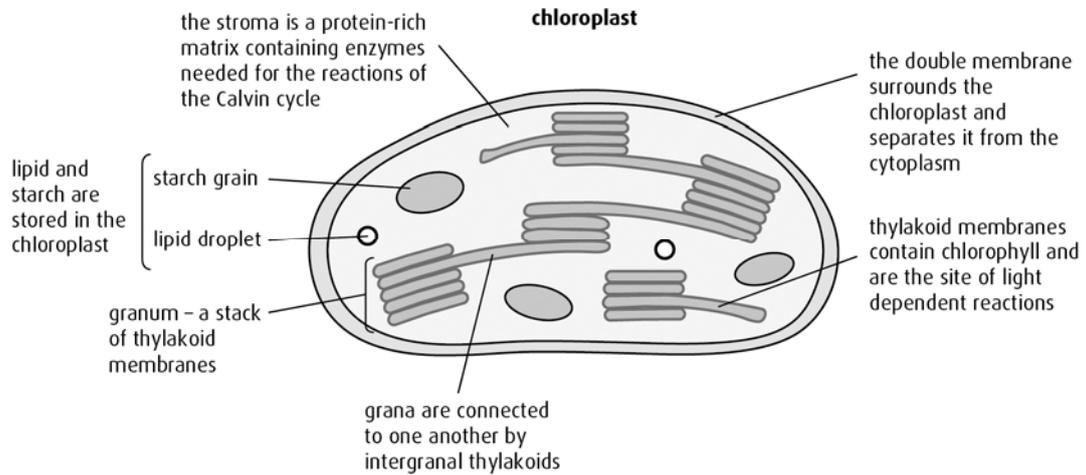
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(7)



6 a and b

(6)



7 Photosynthesis captures light energy from the Sun, which is the source of energy for the majority of food chains.

(1)

Photosynthesis produces oxygen and has created the Earth's atmosphere. It also regulates the concentration of carbon dioxide it contains.

(2)

Photosynthesis is an important part of the carbon cycle and has stored the energy in fossil fuels that are used today.

(1)