C.1 Diet (2h)

* C.1.1 Describe what the human body requires for a healthy diet.
  + Students should recognize the importance of a balanced diet, including minimum requirements and the need for essential minerals.
* C.1.2 Calculate the calorific value of a food from enthalpy of combustion data.
* C.1.3 Discuss the benefits and concerns of using genetically modified (GM) foods.
  + Crops and animals can be modified to provide more food, be more resistant to disease and be more tolerant to heavy metals. Concerns include the release of genetically modified organisms into the environment where they could spread and compete with the naturally occurringvarieties.

C.2 Proteins (3h)

* C.2.1 State the basic structure of 2-amino acids.
  + There are approximately 20 common 2-amino acids ( -amino acids) found in organisms. 2-amino acids have the following formula: central carbon attached to amine, carboxylic acid, R group and a hyrogen atom.
* C.2.2 Describe the condensation reaction of amino acids to form polypeptides.
* C.2.3 Explain how proteins can be analysed by chromatography and electrophoresis.
  + To use either of these techniques the peptide bonds in the proteins must first be hydrolysed to release individual amino acids. Include the use of Rf values in paper chromatography. Given isoelectric points, students should be able to determine a suitable pH to achieve good separation in electrophoresis.
* C.2.4 Describe and explain the primary, secondary, tertiary and quaternary structure of proteins.
* C.2.5 List the major functions of proteins in the body.
  + These are structure, biological catalysts (enzymes) and energy sources.

C.3 Carbohydrates (2.5h)

* C.3.1 Describe the structural features of monosaccharides.
  + Monsaccharides contain a carbonyl group (C=O) and at least two -OH groups, and have the empirical formula CH2O.
* C.3.2 Describe the straight-chain formula of glucose and the structural difference between alpha-glucose and beta-glucose.
* C.3.3 Describe the condensation of monosaccharides to form disaccharides and polysaccharides.
  + Limit examples to:
    - disaccharides-lactose and sucrose
    - polysaccharides-starch.
* C.3.4 List the major functions of polysaccharides in the body.
  + These are energy sources, energy reserves (eg glycogen) and precursors for other biologically important molecules.

C.4 Fats (2.5h)

* C.4.1 Describe the composition of fats and oils. C
* C.4.2 Describe the difference in structure between saturated and unsaturated fats, and explain the difference in their melting points.
* C.4.3 Calculate the number of C=C double bonds in an unsaturated fat using addition reactions.
  + The number of C=C bonds can be determined from the number of moles of I2 which add to one mole of fat.
* C.4.4 Describe the hydrolysis of fats to form soaps and the action of soaps.
* C.4.5 List the major functions of fats in the body.
  + These are energy sources, insulation and cell membranes.

C.5 Vitamins (2.5h)

* C.5.1 Define the term vitamin.
* C.5.2 Deduce whether a vitamin is water or fat soluble from its structure
* C.5.3 Describe the structures and major functions of retinol (vitamin A), calciferol (vitamin D) and ascorbic acid (vitamin C).
  + Vitamin A-required for the production of rhodopsin (light-sensitive material in the rods of the retina). Deficiency can cause night blindness and xerophthalmia.
  + Vitamin D-required for the uptake of calcium from food. Deficiency can cause weak bones (rickets).
  + Vitamin C-essential in the production of collagen: the protein of connective tissue. Deficiency can cause scorbutus (scurvy).
* C.5.4 Describe the effects of food processing on the vitamin content of food.
  + Most vitamins are unstable at higher temperatures so will be affected by prolonged cooking.

C.6 Hormones (2.5h)

* C.6.1 Outline the production and roles of hormones in the body.
  + Hormones are chemical messengers produced in glands controlled by the pituitary gland, which in turn is controlled by the hypothalamus. Limit examples of production and roles to adrenalin, thyroxine, insulin and sex hormones.
* C.6.2 Compare the structures of cholesterol and the sex hormones.
  + Stress the common steroid backbone but the difference in functional groups (see the data booklet).
* C.6.3 Describe the mode of action of oral contraceptives
* C.6.4 Outline the use and abuse of steroids

C.7 Enzymes (3h)

* C.7.1 Outline the basic characteristics of enzymes. Include:
  + enzymes are proteins
  + activity depends on tertiary and quaternary structure
  + the specificity of enzyme action.
* C.7.2 Determine Vmax and the value of the Michaelis constant (Km) by graphical means.
* C.7.3 Describe the significance of Vmax and Km.
* C.7.4 Describe the concept of the active site in enzyme structure
* C.7.5 Explain competitive inhibition and non-competitive inhibition.
* C.7.6 State and explain the effects of heavy metal ions, extremes of temperature and pH changes on enzyme activity.
* C.7.7 Describe the uses of enzymes in biotechnology.
  + Possible examples include proteases in biological detergents, glucose isomerase converting glucose to fructose and streptokinase in breaking down blood clots.

C.8 Nucleic Acids (2h)

* C.8.1 Describe the structure of nucleotides and their condensation polymers (nucleic acids).
  + A nucleotide contains a phosphate group, a pentose sugar group and an organic base. Students should be able to recognize, but need not recall, the structures of the five nucleotide bases: adenine, cytosine, guanine, thymine and uracil.
* C.8.2 Describe the double helical structure of DNA.
  + Students should be able to describe the hydrogen bonding between specific pairs of nucleotide bases.
* C.8.3 Outline the role of DNA as the repository of genetic information, including the triplet code.
* C.8.4 Describe the principles and uses of DNA profiling.
  + Include forensic uses and paternity cases.

C.9 Metal Ions in Biological Systems (2h)

* C.9.1 Explain that different metal ions fulfill different roles in the body due to their different chemical properties.
  + Emphasize differences in charge density, redox properties and complex ion formation.
* C.9.2 Describe the importance of the difference in Na+ and K+ concentrations across the cell membrane.
  + Explain active transport using the Na+/K+ pump as an example.
* C.9.3 Outline the importance of copper ions in electron transport and iron ions inoxygen carriers.
  + Use cytochromes and hemoglobin as examples.