GRADE 10

LIFE SCIENCES

THE CHEMISTRY OF LIFE

MEMORANDUM

QUESTION 1

1. Inorganic compounds lack carbon-hydrogen bonds. Examples: water, CO_2, minerals (Fe, Ca).
2. Roles of water:
    - Solvent for metabolic reactions
    - Transport medium (blood, xylem)
    - Regulates body temperature (sweating)
    - Structural support (turgor pressure in plants)
3. Macroelements: required in large amounts (Ca, K, N); Microelements: trace amounts (Fe, Zn, I).
4.
    - Iron: anaemia (fatigue, pale skin)
    - Iodine: goitre (thyroid swelling)
    - Nitrogen: poor leaf growth, yellowing
5. Eutrophication = nutrient over-enrichment → algal blooms → oxygen loss → aquatic life dies.
6. Diagram includes:
    - Runoff (fertilisers into water)
    - Algal bloom
    - Light blocked
    - Plants die
    - Bacterial decomposition
    - Oxygen depleted (hypoxia)
7. Leads to fish kills, biodiversity loss, and creation of "dead zones."
8. Roots absorb minerals via active transport → enter xylem → travel with water by transpiration pull.
9. Macro = structural/supportive; Micro = enzyme cofactors, hormones.
10. Prevent runoff, plant buffer zones, use organic compost, limit fertiliser use.

QUESTION 2

1. Carbohydrates:
    - Mono: glucose
    - Di: sucrose
    - Poly: starch
2. Glucose: hexagonal ring, OH groups, C atoms numbered 1–6.
3. Structure: cellulose (plants), mucus, glycoproteins; Energy: storage (glycogen/starch), quick energy.
4.
    - Starch: Add iodine → blue-black
    - Glucose: Add Benedict's + heat → orange/red
5. Lipids = C, H, O. Roles:
    - Energy storage
    - Insulation
    - Cell membranes (phospholipids)
6. Saturated = single bonds, animal fats, clog arteries;
   Unsaturated = double bonds, oils, healthier.
7. Triglyceride = glycerol + 3 fatty acids via dehydration synthesis.
8. Rub food on paper, dry → translucent spot = lipid.
9. Proteins = amino acid chains. Roles:
    - Enzymes
    - Hormones (insulin)
    - Antibodies
    - Transport (haemoglobin)
10. Biuret test: Add Biuret reagent → purple = positive for protein.

QUESTION 3

1. Enzyme = protein that speeds up chemical reactions by lowering activation energy.
2. Diagram:
    - Enzyme = specific shape
    - Substrate fits → reaction occurs → product released
    - Enzyme unchanged
3.
    - Temp: too high = denatured
    - pH: too acidic/basic = changes shape
    - Concentration: more enzymes = faster rate
4. Optimum = most efficient activity; beyond it = activity drops.
5. Denatured = enzyme loses shape, no longer fits substrate.
6. Industry: washing powders (amylase);
   Digestion: pepsin (stomach), amylase (saliva).
7. Fat-soluble = stored (A, D, E, K);
   Water-soluble = not stored (B, C).
8. Vitamin C = collagen, immune system; Deficiency = scurvy.
9. Vitamin D = calcium absorption → bones;
   Deficiency = rickets.
10. Cannot be stored (especially water-soluble); needed for enzyme co-factors.