



MEDICAL UNIVERSITY OF VARNA
DEPARTMENT OF CHEMISTRY

Examination synopsis of chemistry
Academic Year 2012/2013

1. Protolytic theory of acid and bases. Strong and weak acids. Neutralization.
2. Protolytic theory of acid and bases. Acid-base reactions *à la* Brønsted. The Hydronium ion. Acids and the hydrogen ion. Bases and the hydrogen ion.
3. Acid-base reactions *à la* Brønsted. Conjugate pairs.
4. Autoprotolysis. Ampholytes.
5. Lewis acids and bases. Protons and electron-pairs. Acid-base reactions without protons.
6. Dissociation of water. Ion product of water.
7. pH. pH scale. pH indicators. Titration.
8. Oxidation-reduction reaction. Oxidizing and reducing agents
9. Electron half- and full ionic equations. The reaction between hydrogen peroxide and manganate (VII) ions.
10. Buffer solution. An acidic buffer solution. An alkaline buffer solution.
11. How do buffer solutions work? Calculating the pH of buffer solutions. Buffer capacity.
12. Alcohols. The different kinds of alcohols. The manufacture of alcohols.
13. The dehydration of alcohols. Reacting alcohols with sodium. Replacing the -OH group in alcohols by a halogen. Oxidation of alcohols.
14. Etherification of alcohols. Mechanism. Preparation of esters.
15. Aldehydes and ketones. Bonding and reactivity.
16. Aldehydes and ketones. Making aldehydes and ketones. Simple addition to aldehydes and ketone – the nucleophilic addition of hydrogen cyanide, sodium hydrogensulphite, ammonia, hydrazine, hydroxylamine and water.
17. Aldehydes and ketones. Reduction and oxidation of aldehydes and ketones.
18. Addition – elimination reaction of aldehydes and ketones.
19. Carboxylic acids. Making and acidity of the carboxylic acids. Differences in acid strengths between carboxylic acids, phenols and alcohols. Variations in acid strengths between different carboxylic acids.
20. Chemical reactions of the carboxylic acids. Etherification of carboxylic acids.
21. Reduction of carboxylic acids. Converting carboxylic acids into acyl chlorides. The decarboxylation of carboxylic acids and their salts.

22. Derivatives of carboxylic acids. Amides. Making and hydrolysis of amides. Chemical reaction of amides. Polyamides.
23. Derivatives of carboxylic acids. Acid anhydrides. Making and reaction of acid anhydrides with water, alcohols and phenol.
24. Derivatives of carboxylic acids. Nitriles. Making and hydrolysis of nitriles. Reducing nitriles to primary amines.
25. Derivatives of carboxylic acids. Esters. Fats and oils. Properties of simple esters, fats and oils. The mechanism for the etherification reactions. Hydrolyzing esters. Acid catalyzed hydrolysis of esters.
26. Lipids containing glycerol – triglycerides, glycerophospholipids (phospholipids). Polyesters.
27. Hydroxy carboxylic acids. Lactic acid. Lactic acid in foods.
28. Hydroxy carboxylic acids. Salicylic acids.
29. Hydroxy carboxylic acids. Citric acid
30. Hydroxy carboxylic acids. Fumaric and maleic acids.
31. Hydroxy carboxylic acids. Tartaric acid.
32. Important chemical reactions of the hydroxy carboxylic acids.
33. Amino acids. Amino acids classification according to R – group (biochemical). Optical activity of amino acids.
34. Amino acids as zwitterions. Acidifying an alkali to an amino acid solution. Acidifying an acid to an amino acid solution. Shifting the pH from one extreme to the other.
35. Isoelectric point. The titration curve. Peptides and polypeptides
36. Carbohydrates. Structure of monosaccharides. Aldoses. D-Glucose, D-galactose, D-mannose, D-ribose.
37. Carbohydrates. Structure of monosaccharides. Ketoses - D-fructose.
38. Structure of disaccharides. Maltose, cellobiose, lactose, sucrose.
39. Structure of polysaccharides. Cellulose, starch, glycogen.
40. Structure of polysaccharides. Sorbitol, glucosamine, pectin, glycosaminoglycans, heparin.
41. Important chemical reactions of monosaccharides.
42. Heterocyclic Compounds. Pyrrole. Porphin. Protoporphyrin. Hemoglobin.
43. Heterocyclic Compounds. Indole. Tryptophan. Tryptamine. Serotonin. Skatole.
44. Heterocyclic Compounds. Diazoles. Pyrazole. Antipyrine. Primidone. Analgin.
45. Heterocyclic Compounds. Pyridine. N-substitution. Pyridine carboxylic acids. Vitamin B₆.
46. Heterocyclic Compounds. Purine. Uric acid, adenin, guanine, xantine
47. Heterocyclic Compounds. Purine alkaloids.

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