COVENANT UNIVERSITY
NIGERIA

TUTORIAL KIT
OMEGA SEMESTER

PROGRAMME: CHEMISTRY

COURSE: CHM 441

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CONTRIBUTORS: Dr Ajanaku K. O., Dr Siyanbola T.O. and Ajanaku C.O.

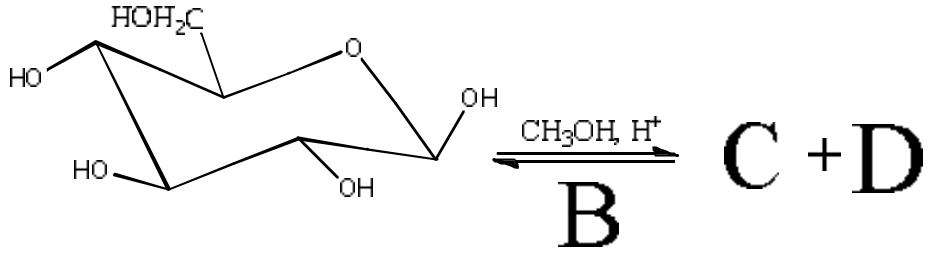
1. (a) List the monosaccharide components that makes up the following:
   (i) Sucrose (ii) Maltose (iii) Lactose (iv) Raffinose (4 Mks)

   (b) Draw the structure of the following compounds
   (i) D-Fructose (ii) D-Erythrose (iii) D-Mannose (iv) D-Arabinose

   (v) L-Lyxose (vi) D-Ribose (vii) L-glyceraldehyde (7 Mks)

   (c) Show the mechanism involved in converting D-glucose in the Fischer projection to pyranose D-glucose in the Harworth projection form (3½ Mks).

   (d) Complete the reaction below and give the name of the compound C.



(6 Mks)

   (e) List the three steps required in projecting from Harworth to Chair conformation (3 Mks).

2 (a) Using D-fructose as a starting material, show how an aldonic acid can be synthesized (10 Mks). (b) Wohl degradation synthesis is used in chain shortening of an aldose. Show how D-galactose can be converted to D-lyxose using Wohl degradation synthetic pathway (10½ Mks).

   (c) Draw the structure of the following fatty acids
   (i) Saturated fatty acid (ii) Isolated and unsaturated fatty acid (iii) Conjugated and unsaturated fatty acid (3 Mks).

3 What is a healthy diet?
4 Giving examples, mention the classes of vitamins.
5 What are RDAs and DRIs?
6 What types of food contain vitamin A?

7 How is food digested?
8 What deficiencies occur in the absence of Vitamin A?
9 What are enzymes?

10. (a) Differentiate between complete and incomplete protein (4 mks)

(b) By means of equation only, describe the peptide bond formation in the dehydration synthesis of amino acids (4 mks)

(c) State the importance of protein in the body (4 mks)

(d) Simply describe the chemistry of Kjeldahl method in protein analysis (8½ mks)

(e) State the advantages and disadvantages of the Kjeldahl method (3 mks)

11. (a) Define the following:

(i) Food adulteration

(ii) Food additives

(iii) Food colouring

(iv) Food fortification (3 mks each)

(b) State the purposes of using food flavouring (6½ mks)

(c) List the criteria for food fortification (5 mks)

SOLUTION

Answers To Questions

1 (a)

(i) Sucrose: D-glucose + D fructose (1 Mk)

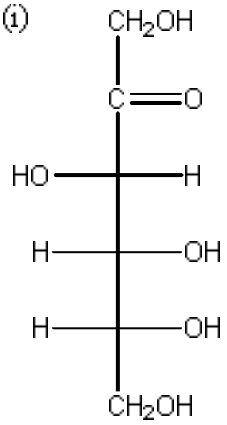
(ii) Maltose: D-glucose + D-glucose (1 Mk)

(iii) Lactose: D-galactose + D-glucose (1 Mk)

(iv) Raffinose: D-glucose + D fructose + D-galactose (1 Mk)

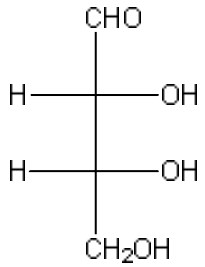
(b)

(i)



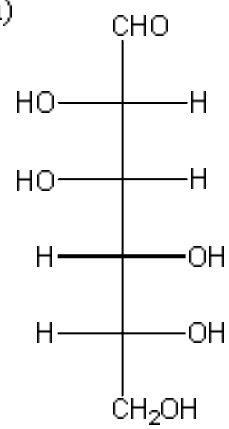
D-Fructose

(ii)



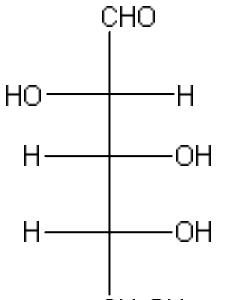
D-Erythrose

(iii)



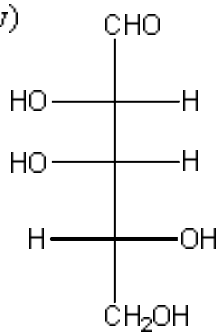
D-Mannose

(iv)



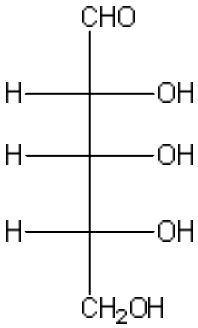
D-Arabinose

(v)



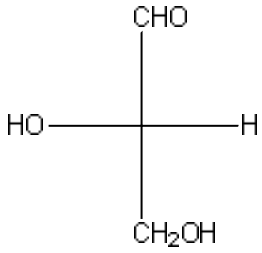
D-Lyxose

(vi)



D-Ribose

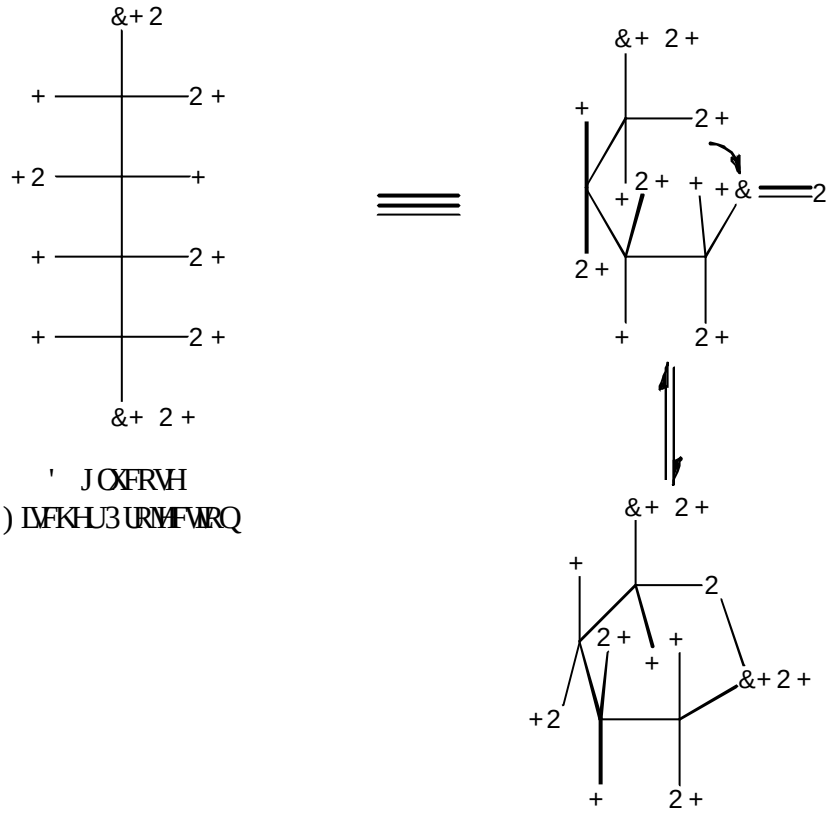
(vii)



D-Glyceraldehyde

7 Mks

(c)

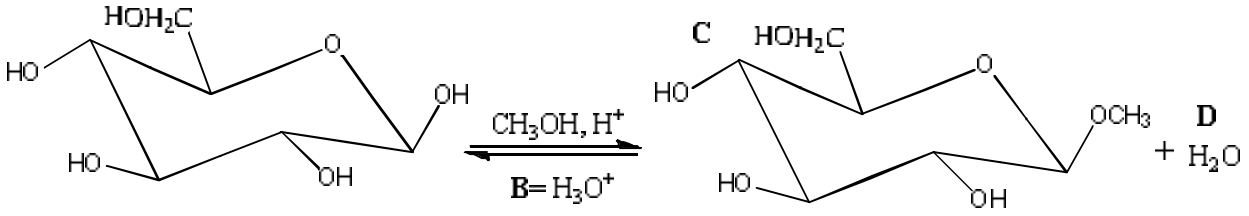


' JOXFRVH
) LVFKHU3URMHFWRQ

' JOXFRVH S\UDQRVHI RUP
+DZRUWK3URMHFWRQ

ò 0 NV

(d)



Beta-D-glucopyranose
(a hemiacetal)

C= Methyl-Beta-D-glucopyranose
(a hemiacetal)

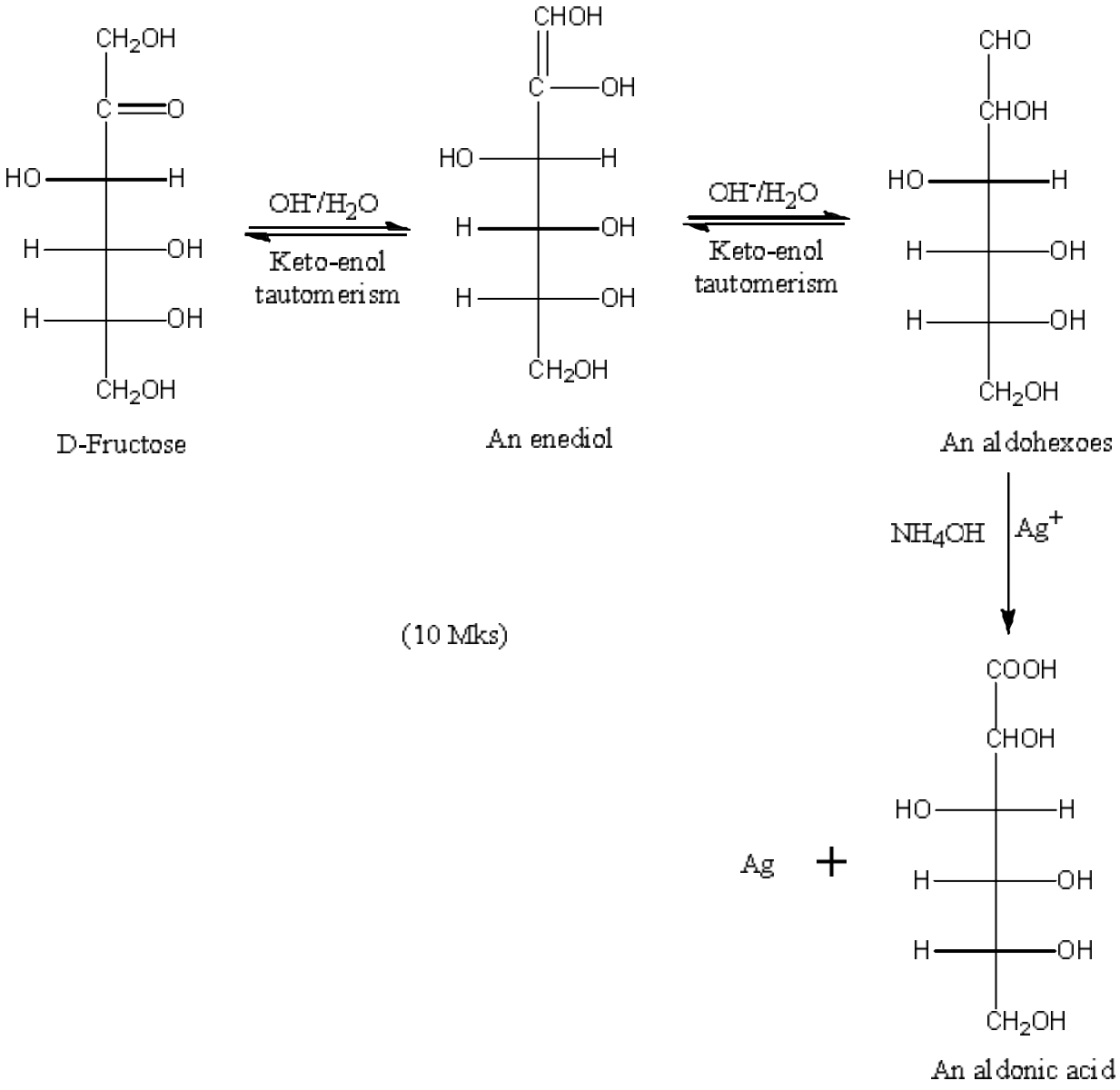
(6 Mks)

(e)

1. Draw Harworth projection with ring oxygen atom at the upper right.

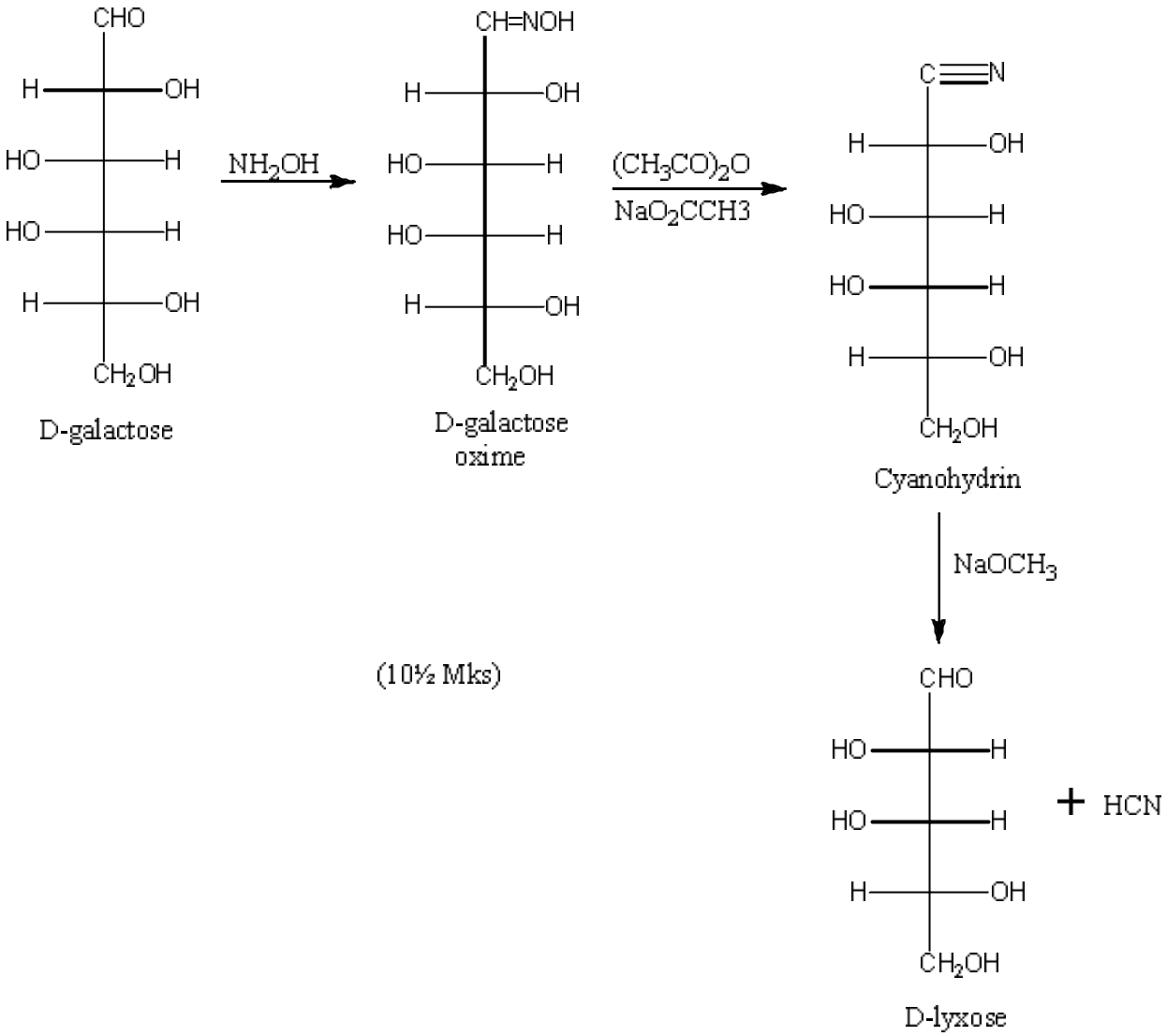
2. Raise the left most carbon atom C4 above the ring plane.
3. Lower the anomeric carbon atom below the ring plane. (3 Mks)

2 (a)



(10 Mks)

(b)



(10½ Mks)

(c)

(i) Saturated fatty acid

(ii) Isolated and Unsaturated fatty acid

(ii) Conjugated and Unsaturated fatty acid

(3 Mks)

3. What is healthy diet?

A healthy eating pattern is one that provides enough of each essential nutrient from nutrient-dense foods, contains a variety of foods from all of the basic food groups, to sustain a healthy weight.

5. What are RDAs and DRIs?

- From 1941 to 1989, the Institute of Medicine's Food and Nutrition Board (FNB) released the Recommended Dietary Allowances or RDAs. The RDAs are a single set of nutrient specific values.. These values are collectively referred to as the Dietary Reference Intakes, or DRIs.

7. How is food digested?

Digestion begins in the mouth, when we chew and swallow, and is completed in the small intestine. Digestion involves the mixing of food, its movement through the digestive tract, and the breakdown of food into smaller molecules. The digestive process varies for different kinds of food.

9. What are enzymes?

- Enzymes are proteins that are catalysts of chemical reactions. From Chemistry it is known that catalysts are non-consumable substances that reduce the activation energy necessary for a chemical reaction to occur.
- Enzymes are highly specific to the reactions they catalyze. They are of vital importance for life because most chemical reactions of the cells and tissues are catalyzed by enzymes. Without enzymatic action those reactions would not occur or would not happen in the required speed for the biological processes in which they participate.

11. (a)

(i) Mixing, substitution, abstraction, concealing the quality, putting up decomposed food for sale, misbranding or giving false labeling and addition of toxicants to food, which are having adverse effect on the health of the consumer is called as food adulteration. (3mks)

(ii) Food additives are non nutritious substances which are added intentionally to food , generally in small quantity to improve its appearance , flavor, texture of storage properties. This is the concept of pickling or drying. When it is in excess amounts to adulteration (3mks)

(iii) Food colourings are dyes that are added to food to give food an attractive colour, so as to make it more appetizing and more saleable and to restore the original colour which may be changed or lost during food processing or storage. Also to ensure colour consistency (3mks)

(iv) Food fortification is the process whereby nutrients are added to food (relatively in small quantities) to maintain or improve the quality of the diet of a group, community or population. It is a public health measure to prevent or control some nutritional disorders (3mks)

(b)

- For safety and freshness- Mold, air, bacteria, fungi or yeast can easily ruin food without additives, which is why we add them to food to give a longer shelf life and to keep the product fresher longer. They can also help prevent fats and oils from becoming rancid and giving the product an off flavor. Another very important use is in the prevention of food borne illnesses and contamination. (2mks)

- For nutritional values- It is very common for a lot of our foods to be fortified to add nutritional components that are lost through processing or are insufficient in the population's diet. Adding nutrients into our food has helped to prevent vitamin and mineral deficiencies and prevent malnutrition. All products containing extra nutrients can also be found on the label. (2mks)

- With regard to improving food quality- Natural or artificial flavorings, colors, spices, and sweeteners are added to food to give the foods a better flavor, texture, and appearance. Things that help to improve quality would be emulsifiers which add stability and thicken food products. An example of this would be egg yolks which are commonly used as emulsifiers in various products. Additives can also help to preserve the acidity or alkalinity of products to help prevent spoilage. (2½ mks)

(c)

- Must be a part of the regular daily diet by relevant section of the population.
- Amount of nutrient added must provide an effective supplement for low consumers
- Not harmful to high consumers
- Do not cause noticeable change in the taste, smell, appearance or consistency
- Cost should be economical (5 mks)