Carbohydrates and Proteins

Short Answer Questions (2M)

1. How are carbohydrates classified on their taste? Give examples of each?

A. Based on their taste, the carbohydrates can be classified as sugars and non-sugars.
Sugars: These are the carbohydrates which are sweet in tatste.
Eg: Glucose, Fructose, Sucrose.

Non-Sugars: These are the carbohydrates which are tasteless.
Eg: Sugars in rice, pulses and potato.

2. What do you understand by an aldose and and a ketoses.

A. Based on their functional groups carbohydrates are classified as aldoses and ketoses.
Aldoses: Carbohydrates which have aldehyde functional group.
Ketoses: Carbohydrates which have ketone functional group.

3. What do you understand by a pentose and an hexose?

A. **Pentose:** The Carbohydrates with "5" carbon atoms.
Hexose: The Carbohydrates with "6" carbon atoms.

4. Write in the increasing order of these carbohydrades, Maltose, Lactose, sucrose, Fructose, Gluclose in their sweetness.

A. 1) Lactose 2) Maltose 3) Glucose 4) Sucrose 5) Fructose

5. How are the carbohydrates classified based on the hydrolysis?

A. Carbohydrates are classified as 1) monosaccharides, 2) Oligosaccharides, 3) Polysaccharides based on their behaviour towards hydrolysis.

6. What are monosaccharides and polysaccharides?

A. **Monosaccharides:** These are simple carbohydrates which cannot be hydrolyzed to still simpler carbohydrates.
Eg: Glucose, Fructose, Mannose
Polysaccharides: These are polymeric carbohydrates which give a large number of monosaccharide units upon hydrolysis.
Their general formula $(C_6H_{10}O_5)n$ where 'n' is a large number.
Eg: Starch, Cellulose.

7. Mention the various steps involved in the manufacture of sugar from sugar cane?

A. The following are the main steps involved in the production of sugar from sugar cane.
a) Extraction of juice from sugar cane
b) Purification of sugar cane juice
c) Concentration of juice and crystalization
d) Separation of crystals and drying.

8. Write the uses of "bagasse"

A. It is a byproduct in the sugar industry. It is used as fuel in the production of electricity or in the

manufacture of paper and hard boards.

9. Why are the alcohol distilleries located at the places of much water resources?

A. The wash is subjected to fractional distillation to get 96% alcohol. Fractional distillation needs large quantity of water for cooling. So distilleries are normally located in a place having water resources like riverse or streams.

10. What are Amino acids? Give two examples?

A. **Amino Acid:** These are compounds having an amino group ($-NH_2$) and carboxylic acid group ($-COOH$) in a molecule.

Eg: 1) Glycine 2) Alanine.

11. What is "sickle cell haemoglobin"?

A. Haemoglobin consists of 574 amino-acids. The change of even one amino-acid in the sequence produces in effective haemoglobin called "Sickle Cell haemoglobin". This causes a disease called "Sickle cell Anaemia".

12. Write the functions of Proteins?

A. **Functions of Proteins:**

a) Proteins serve as the chief structural material of animal tissues.
b) Some proteins function as enzymes and they catalyze biological reactions.
c) They regulate metabolic processes
d) Some proteins act as anti - bodies. They protect the body from the disease causing germs.

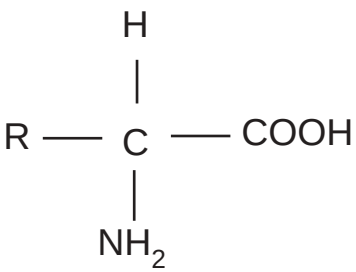
13. Distinguish between sugars and non sugars.

A.

Sugars	Non Sugars
1) These are sweet in taste	1) These are tasteless carbohydrades.
2) Examples are glucose, fructose	2) Examples are cellulose and starch

14. Write how zwitterions are formed?

A. Salt like structure of amino acids called zwitterions or "diploar ions". It is produced by the transfer of a proton from COOH to NH_2



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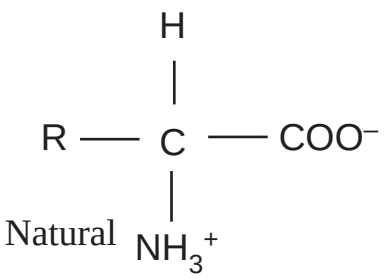
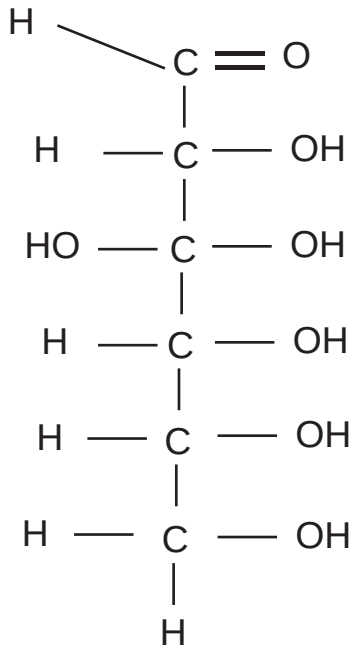


Natural

Zwitterionic Form

15. Write the structure of Glucose?

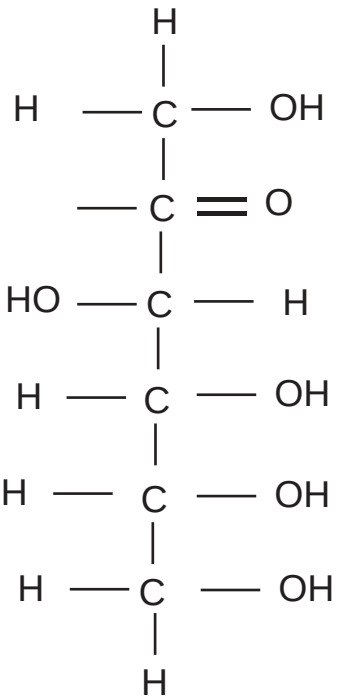
A.



Glucose

16. Write the structure of Fructose?

A.



Fructose

1. Define Carbohydrates?

A. **Carbohydrates:** The polyhydroxy aldehydes/ ketones are called carbohydrates. (or)
The compounds which can give polyhydroxy aldehydes /ketones are called carbohydrates.
Eg: Glucose, Fructose, Lactose etc.

2. Define Calorific Value?

A. **Calorific Value:** The amount of energy made available by consumptio of 1 gram of a substance is known as its calorific value.

3. What is defecation?

A. The juice obtain from the extraction from sugar cane is slightly acidic. It contain some impurities and suspended particles. Lime is added to precipitate the impurities as well to neutralize the juice. This step is called "defecation".

4. What is carbonation?

A. **Carbonation:** The process of removing excess of lime from the juice by passing CO_2 gas into the sugar juice is called carbonation.

5. What is sulphitation?

A. **Sulphitation:** The process of removing the traces of lime by passing SO_2 gas through the juice is called sulphitation.

6. What is "press mud"? Mention its use?

A. The precipitates of defecation, carbonation and sulphitation are called "press mud" and is useful as manure.

7. What is clarified juice?

A. The purified juice is called "clarified juice".

8. How are sugar crystals separated from juice?

A. The crystals are separated by centrifugation.

9. What is molasses?

A. **Molasses:** The thick black liquid obtained after the separation of sugar crystals is called molasses.

10. Write the chemical formula of ethyl alcohol?

A. C_2H_5OH

11. What is meant by fermentation?

A. **Fermentation:** It is the process of breaking down of large molecules into small molecules by the action of enzymes.

12. What are the enzymes produced by Yeast?

A. Yeast produces two enzymes namely 1) Invertage 2) Zymase

13. Which salts act as food to the growth of yeast in sugar solution?

A. Ammonium sulphate and Ammonium phosphate.

14. When does a fermentation comes to a stop?

A. When the concentration of alcohol reaches 15-20% in the solution, the yeast cells are killed and fermentation comes to stop.

15. What is wash?

A. The alcohol produced in fermentation tank is technically called "wash"

16 What is rectified spirit?

A. The product containing 96% alcohol and 4% water is commercially called "rectified spirit".

17. What is absolute alcohol?

A. The rectified spirit contains 4% of water. This water is removed by treatment with quick lime (CaO). The pure product is called "absolute alcohol".

18. What is denatured spirit?

A. The ethyl alcohol which is mixed with pyridine (or) methyl alcohol is called denatured spirit.

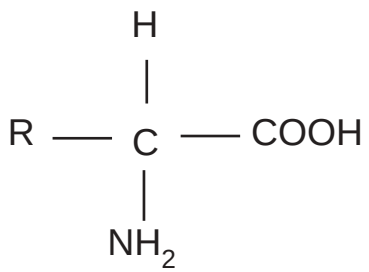
19. Name the chemicals added to denature the alcohol?

A. Pyridine (or) methyl alcohol.

20. Write the general formula of amino - acids?

A. The general formula of amino acids is

Where R: Group that differs from one amino-acid to other.



21. What is peptide bond?

A. The – CO – NH bond is called "Peptide bond"

22. What is dipeptide?

A. If two amino acids join, the resultant product is called dipeptide.

23. What are polypeptides?

A. The resultant products obtained by the join of a large number of amino acids is called polypeptides.

24. Define Protein?

A. Modified polypeptides are called proteins.

25. Which protein is responsible for carrying oxygen in the blood?

A. Haemoglobin.

26. What is the function of antibodies?

A. They protect the body from the disease causing germs.

Long Answer Questions (4Marks)

1. How are carbohydrates classified based on their behavious towards hydrolysis? Explain with examples?

A. Based on their behaviour towards hydrolysis, carbohydrates are classified in to

1) Monosaccharides
2) Oligosaccharides
3) Polysaccharides.

1) Monosaccharides : These are simple carbohydrates which cannot be hydrolyzed to still simpler carbohydrates.
Eg: Glucose, Fructose and mannose.
2) Oligosaccharides: These are carbohydrates which on hydrolysis give two to nine units of monosaccharides.
3) Polysaccharides: These are polymeric carbohydrates which give a large number of monosaccharide units upon hydrolysis.
They have the general formula $(C_6H_{10}O_5)n$.
Where "n" is a large number.
Eg: Starch and Cellulose.

2. How is Tollen's reagent prepared? How is glucose tested with it?

A. **Preparation of Tollen's reagent:** Take a clean test - tube and rinse with dilute nitric acid (HNO_3). Take about one gram of glucose into the test - tube and add 5m*l* of distilled water.

In another test - tube take 5 ml of dilute $AgNO_3$ solution. Add one or two drops of 5% NaOH. It produces dirty gray precipitate of AgOH. Add dilute NH_4OH dropwise carefully just to dissolve the precipitate. This solution is known as ammoniacal silver nitrate or Tollen's reagent.

Test for Glucose: Add ammoniacal silver nitrate solution to the glucose solution and heat the test tube on water bath. Observe the formation of silver paint or silver mirror on the walls of the test tube due to reduction of Ag+ ions to Ag by glucose.

3. How is benedict's reagent prepared? How is glucose tested with it?

A. **Preparation of Benedict's reagent:** Dissolve 8.65 grams of sodium citrate and 5 grams of sodium carbonate in 35 ml of water in a 50 ml standard flask. Filter if necessary. Dissolve 0.87 grams of copper sulphate in 5 ml. of water in a test - tube. Mix the two solutions and dilute to a total volume of 50 ml. A clear solution is obtained called Benedict's solution.

Glucose Test : Take glucose solution and add Benedict's solution. Heat the test - tube on a spirit - lamp. Observe the formation of red precipitate. Benedict's solution contains copper sulphate.

Glucose reduces the Cu^{2+} to Cu_2O.

4. What are the uses of Carbohydrates?

A. **Uses of Carbohydrates:**

1) They are mainly energy giving substances for living bodies.
2) Carbohydrates like cellulose are useful to support plant tissues.
3) Cellulose in the form of cotton is useful for our clothing and in the form of wood is useful for the furniture and building of houses.
4) Sugars from carbohydrates produce alcohol on fermentation.

5. How is cane juice purified?

A. The juice obtained from the crusing is slightly acidic. It contains some impurities and suspended particles. Acidity causes loss of sugar due to hydrolysis. Lime is add to precipitate the impurities as well to neutralize the juice. This step is called "defecation".
This juice is then heated in large tanks. Impurities floating on the surface are removed by pedal. Excess lime is removed as carbonates by passing CO_2 gas into the solution. This process known as "Carbonation".

Sulphur dioxide gas is also passed through the solution at this stage is removed any traces of lime. This process is known as sulphitation. The precipitates of defecation, carbonation and sulphination are called "press mud" and is useful as manure. Thus cane juice is purified.

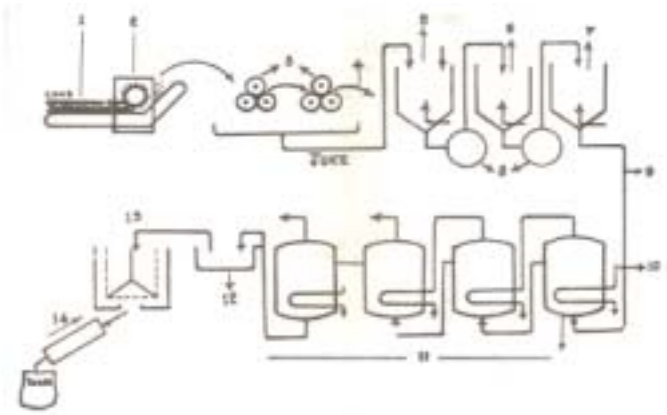
6. How is juice concentrated and sugar crystallized?

A. The purified juice is called "clarified juice", it contains 85% water. It is evaporated to approximately 40% of water in evaporators.

The juice is concentrated at low pressure in the beginning and in vauum in later stages. The resulting thick juice goes to vauum pans and is concentrated to supersaturation.

The sugar crystals are formed in the pan above the thick juice containing 10% water. This crystals are separated by centrifugation

7. Draw the Chart Showing the manufacture of sugar from sugar-cane?



1) Sugar-cane
2) Cutter Knives
3) Mills
4) Bagasse
5) LIme Defecation
6) CO_2: Carbonation
7) SO_2: Sulphination
8) Filters
9) Clarified Juice
10) Steam
11) Boilers
12) Crystallization paan
13) Centrifuses
14) Sugar

8. How is alcohol manufactured industrially?

A. Industrially alcohol is manufactured from molasses by fermentation followed by distillation. Fermentation is the process of breaking down of large molecules into small molecules by the action of enzymes. Ethyl alcohol is produced by fermentation of molasses by yeast.

The different steps involved in the production of ethyl alcohol from the molasses are as follows.

1) Molasses is diluted to 10% sugar by adding required water.
2) Salts like ammonium sulphate and ammonium phosphate are added to sugar solution. These act as food to the growth of yeast.
3) The solution of molasses and the salt is transferred to a fermentation tank.
4) The yeast is added to the above solution.

The temperature is maintained at 30°C and kept for 2-3 days for the fermentation to complete. The microorganism, yeast, produces two enzymes namely invertase and zymase.

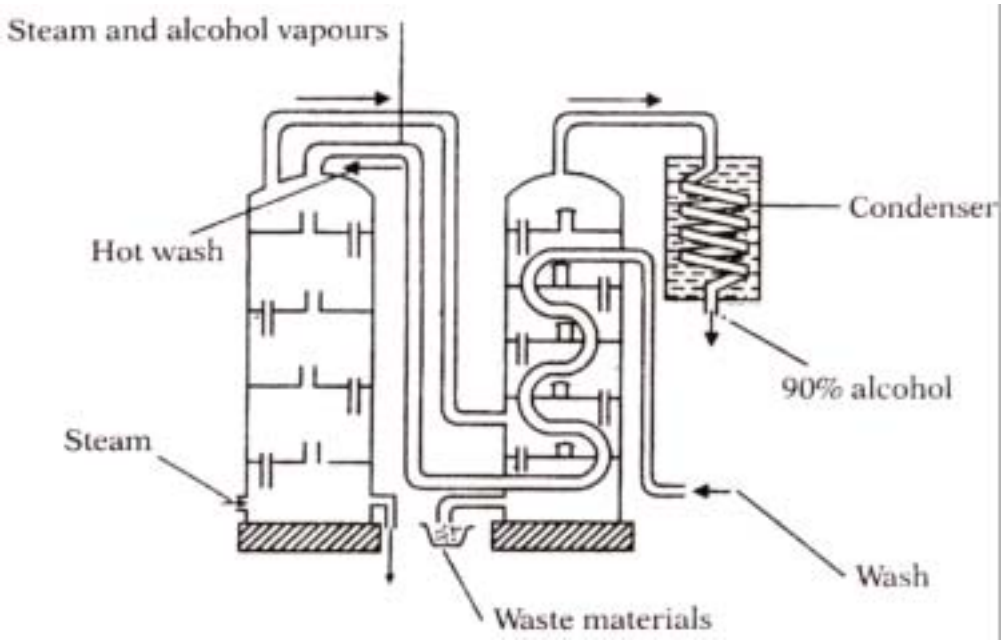
The enzyme invertase breaks down sucrose into glucose and fructose.

$$C_{12}H_{22}O_{11} + H_2O \rightarrow \underset{\text{(Glucose)}}{C_6H_{12}O_6} + \underset{\text{(Fructose)}}{C_6H_{12}O_6}$$

Glucose and fructose are converted to ethyl alcohol and carbon dioxide by the enzyme zymase.

$$C_6H_{12}O_6 \xrightarrow{\text{zymase}} 2C_2H_5OH + 2CO_2 \uparrow$$

When the concentration of alcohol reaches 15-20% in the solution, the yeast cells are killed and the fermentation comes to a stop. The alcohol produced in fermentation tank is called 'wash'. The wash is subjected to fractional distillation to get 96% alcohol. The below figure shows the manufacturing of alcohol.



9. What are the uses of alcohol?

A. **Uses of Alcohol:**

1) Ethyl alcohol is widely used as solvent
2) Alcohol is used in almost all the industries
3) Alcohol is used in pharmaceuticals industries in the preparation of medicine
4) Alcoholic bevarages like beer, wine, brandy, whisky, rum and gin contain ethyl alcohol in

different percentage.

10. What are the evil effects of alcohol?

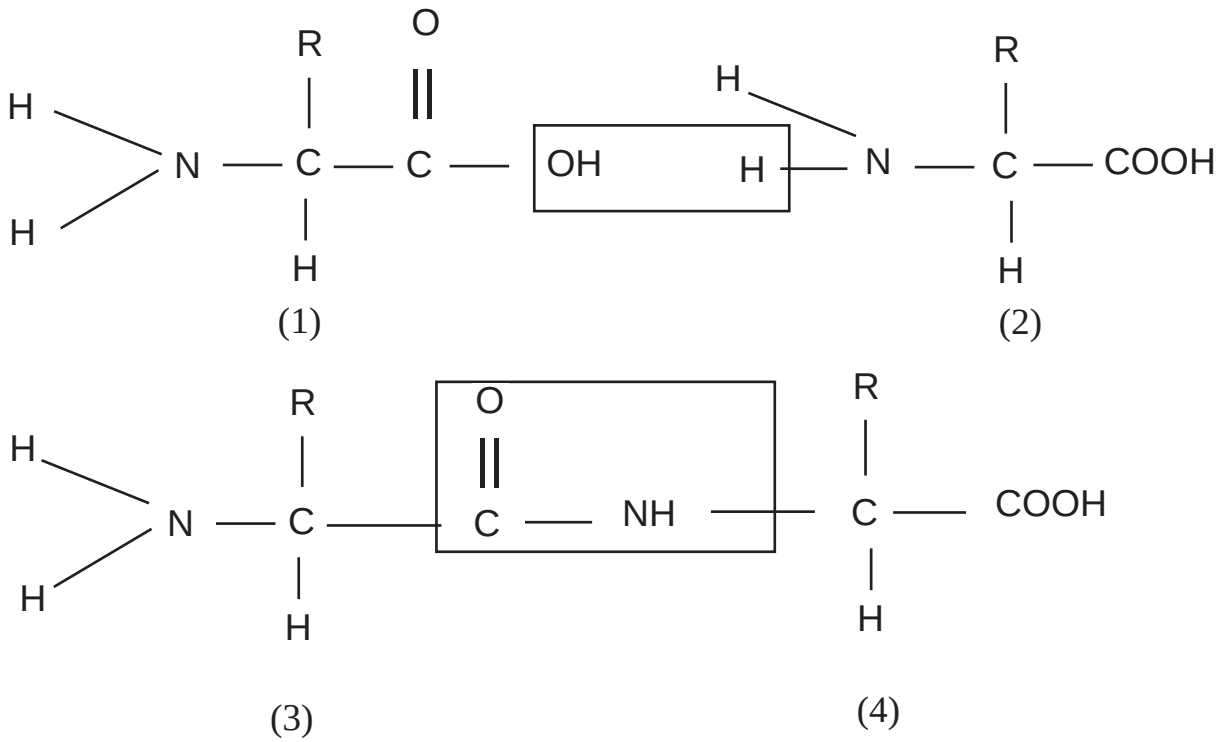
A. **Evil Effects of Alcohol:**

1) Consumption of alcohol in the form of beverages is harmful to health. It causes severe damage to blood circulation system and nervous system.
2) Additction to alcohol drinking leads to heart diseases and damages the liver.
3) It causes ulcers in the small intenstine due to increased acidity and damages the digestive system.
4) Alcohol consumed in the raw form is more harmful to health due to adulteration.
5) Consumption of denatured spirit causes blindness and death.

11. What are proteins? How does a peptide bond form? Mention the important functions of proteins?

A. **Proteins:** The modified polypeptides are called proteins.

Amino acids have two functional groups. Any two amino acids can join by eliminationof water as shown in the figure.

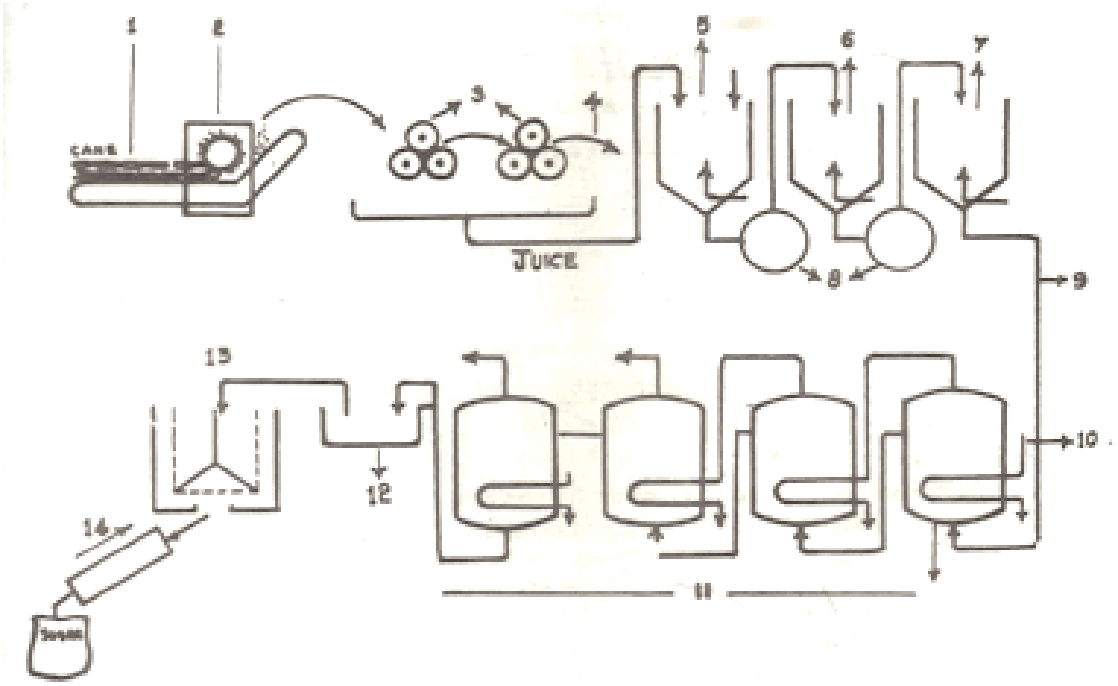


The – CO – NH bond is called "peptide bond". If two amino acids join, the result product is called di peptide.

Functions of Proteins:

1) Proteins serves as the chief structural material of animal tissues.
2) Some proteins function as enzymes and tehy catalyze biological reactions
3) They regulate metabolic processes
4) Some proteins act as anti-bodies. They protect the body from disease causing germs.

12. Draw the chart showing the manufacture of sugar from sugar-cane?



1) Sugar-cane
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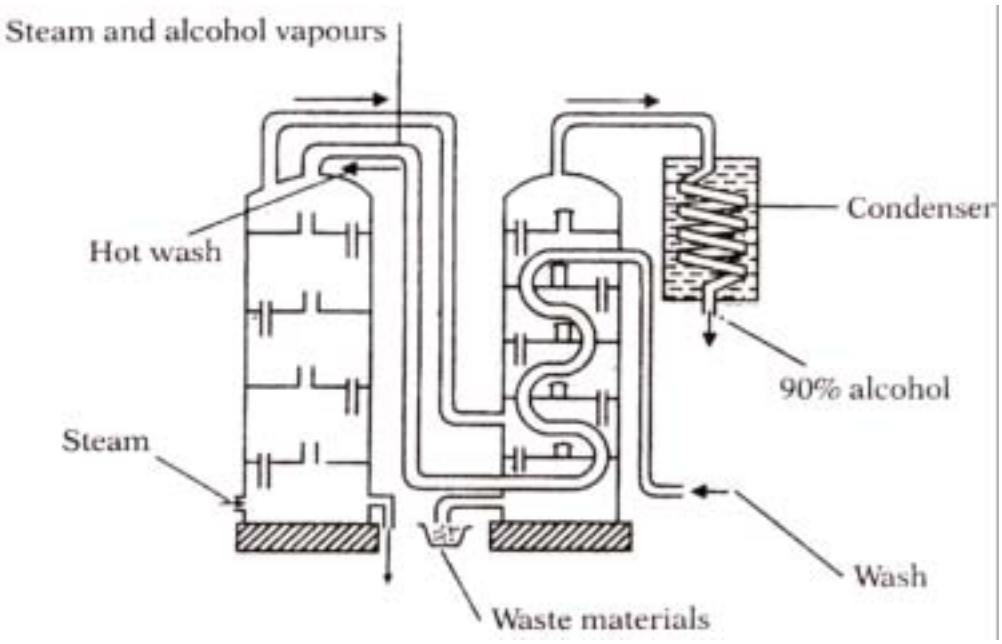
5) LIme Defecation
6) CO_2: Carbonation
7) SO_2: Sulphination
8) Filters
9) Clarified Juice
10) Steam
11) Boilers
12) Crystallization paan
13) Centrifuses
14) Sugar

13. Draw the chart showing the alcohol manufacture ?



PART - B
Multiple Choice

1. Of these which is the sweetest sugar

a) Lactose b) Sucrose c) Fructose d) Maltose

2. A Poly saccharide is

a) Glucose b) fructose c) Sucrose d) Starch

3. alodoses are

a) Polyhydroxy ketones b) Polyhydroxy aldehydes

c) Polyhydroxy amines d) Polyhydroxy esters

4. Hexoses contain

a) 3 carbons b) 4 carbons c) 5 carbons d) 6 carbons

5. Example of Cellulose

a) Cotton b) wood c) a & b d) None

6. Carbohydrates are mainly gives for living bodies

a) Energy b) Colour c) Force d) Power

7. The calorific value of glucose is

a) 3.81 cal/gr b) 686 cal/mol c) a or b d) None

8. Of which of these has more calorific value (K.Cal)

a) Pulses b) Bread

c) Rice d) Green Vegatables

9. In the Tollen's test glucose reduces

a) Ag metal to Ag ion b) Ag ion to Ag metal

c) Cu^{2+} in to Cu^{+} ion d) Cu^{+} ion to Cu^{2+} ion

10. In the Benedict's test glucose reduces the

a) Ag metal to Ag ion b) Ag ion to metal

c) Cu^{2+} to Cu_2O d) Cu+ ion to Cu^{2+} ion

11. Which acid is used in the test of sugar

a) Citric acid b) Hydrochloric acid

c) Ammonium Chloride d) Sulphuric Acid

12. In the test for starch, the starch solution immediately turns

a) Blue b) Red c) Yellow d) Pink

13. How are sugar crystals separated from juice

a) Centrifugation b) Fermentation

c) Defecation d) Sulphitation

14. Defecation is addition of

a) CO_2 b) $Ca(OH)_2$ c) SO_2 d) H_2O

15. Acidity in the juice is removed by adding

a) CO_2 b) $Ca(OH)_2$ c) SO_2 d) H_2O

16. The sugar content of molasses is

a) 10% b) 20% c) 50% d) 90%

17. Which of the following is not a byproduct of sugar industry

a) bagasse b) Pressmud c) Sugar d) Molasses

18. Which of these are used as animal feed supplement

a) Bagasse b) Press mud

c) Molasses d) All the above

19. The enzymes required for fermenataton

a) Invertase b) Zymase

c) Both a & b d) None

20. The chief use of ethyl alcohol is

a) For drinking b) as solvent

c) as medicine d) for making beverages

21. Which of the following is used to get absolute alcohol from rectified spirit

a) H_2SO_4 b) CaO c) P_2O_5 d) Pyridine

22. Amino acids are

a) Covalent Compounds b) Ionic Compound

c) Coordinate Covalent Compounds d) None

23. How many number of essential amino acids are there

a) 10 b) 9 c) 11 d) 7

24. Regulation of metabolic processes by

25. Starch is tested by

a) Tollen's reagent b) Benedict's reagent

c) Iodine Solution d) None

26. Mannose is a

a) Mono saccharide b) Poly saccharide

c) Oligo saccharide d) None

27. The widely used solvent next to water is

a) Sugar b) Benzene c) CCl_4 d) Alcohol

KEY

1) c	2) d	3) b	4) d	5) c	6) a	7) c
8) a	9) b	10) c	11) b	12) a	13) a	14) b
15) b	16) c	17) c	18) c	19) c	20) b	21) b
22) a	23) b	24) a	25) c	26) a	27) d	

Fill in the Blanks

1. Chemical Formula of Copper sulphate_____
2. Chemical formula of magnesium sulphate _____
3. The polyhydroxy aldehydes are _____
4. Glucose is a _____
5. In trioses there are _____ carbon atoms.
6. Starch is an example of _____
7. The general formula for poly sacharide is _____
8. Carbohydrates are naturally prepared by _____
9. $6H_2O + 6O_2 \xrightarrow[\text{Chlorophyll}]{\text{sunlight}} \_\_\_\_\_ + 6O_2$
10. The Carbohydrates provide us _____. _____ and _____
11. Carbohydrates in the living bodies are finally converted into _____
12. The calorific valus of glucose is _____ cal/g (or) _____ cal/mol

13. Plants prepare carbohydrates by the process known as _____
14. The number of monosaccharide units present in a oligosaccharide is _____ to _____
15. The dirty gray precipitate formed during the preparation of Tollen's reagent is _____
16. The spent cane is called _____
17. The purified juice contains _____ water
18. Molasses contains _____ of sucrose
19. Molasses is used in the manufacture of alcohol by _____
20. The enzyme _____ breaks down sucrose into glucose and fructose
21. _____ are used to separate the crystals of sugar and liquid juice.
22. The sugar cane contains _____ to _____ % of sucrose by weight.
23. _____ is the micro organism used for fermentation of molasses.
24. Sucrose is broken into _____ and _____ during fermentation
25. _____ enzyme breaks the sucrose
26. _____ enzyme breaks the Glucose
27. The products obtained from glucose during fermentation are _____ and _____
28. _____ is the byproduct of alcohol industry
29. When the concentration of alcohol reaches _____ in the solution, the yeast cells are killed and the fermentation comes to rest.
30. We get "absolute alcohol", by the treatment of "rectified spirit" with _____
31. Consumption of _____ spirit causes blindness
32. Denatured spirit is used as _____in industries
33. Amino acids are building blocks of _____
34. _____ amino acids are known to occur in living bodies
35. The essential amino acids must be supplied through _____ only
36. Haemoglobin is a _____
37. _____ serve as the chief structural materials of animal tissues.
38. Addiction to alcohol drinking leads to _____ diseases.
39. Salt like structure of amino - acids called _____
40. A large number of amino acids can join together to give _____
41. If two amino acids join, the resultant product is called _____

KEY:

1) $CuSO_4.5H_2O$	2) $MgCO_4.7H_2O$	3) Carbohydrates
4) Sugar	5) – 3 (three)	6) Poly saccharide
7) $(C_6H_{12}O_5)_4$	8) Plants	9) $C_6H_{12}O_6$
10) Food, Clothing, Shelter	11) Glucose	12) 3.81, 686
13) Photosynthesis	14) two, nine	15) AgOH
16) Bagase	17) 85%	18) 50%
19) Fermentation	20) Invertase	21) Centrifuge
22) 11, 15	23) Yeast	24) Glucose, Fructose
25) Invertase	26) Zymase	27) Ethyl alcohol, Carbondioxide
28) CO_2	29) 15-20%	30) Quick Lime
31) Denatured	32) Solvent	33) Proteins
34) 26	35) Diet	36) Protein
37) Proteins	38) Heart	39) Zwitter ions
40) Polypeptide	41) Dipeptide	

Match the following

SET-1

Group A		Group B
1. Silver Mirror	( )	a) Poly saccharides
2. Red Precipitate	( )	b) Oligo saccharides
3. Mannose	( )	c) Mono saccharides
4. Maltose	( )	d) Benedict's test
5. Cellulose	( )	e) Tollen's Test

SET-2

Group A		Group B
1. Sugar	( )	a) Cellulose
2. Non Sugar	( )	b) Amino-acids
3. Sweetest Sugar	( )	c) Protein
4. Haemoglobin	( )	d) Sucrose
5. Leucine	( )	e) Fructose

SET-3

Group A		Group B
1. Glucose	( )	a) $C_{12}H_{22}O_{11}$
2. Non Sugar	( )	b) CaO
3. Sweetest Sugar	( )	c) C_2H_5OH
4. Haemoglobin	( )	d) $MgSO_4.6H_2O$
5. Leucine	( )	e) $MgSO_4.7H_2O$
		f) $C_6H_{12}O_6$

KEY

SET-1

1. e, 2. d, 3. c, 4. b, 5. a

SET-2

1. d, 2. a, 3. e, 4. d, 5. b

SET-3

1. f, 2. a, 3. c, 4. b, 5. e