TSSPDCL-2019 JLM KEY (15-12-19)

Q.NO	A	B	C	D
1	C	B	D	D
2	D	B	C	B
3	B	B	B	A
4	A	D	A	D
5	C	D	D	C
6	B	B	B	D
7	B	B	A	B
8	A	A	*	*
9	D	D	A	A
10	A	B	A	D
11	A	C	D	A
12	C	A	A	D
13	D	B	D	B
14	D	C	D	D
15	D	D	B	B
16	B	D	D	C
17	*	C	B	A
18	B	C	A	C
19	B	C	D	A
20	C	B	C	D
21	D	B	B	B
22	A	D	B	A
23	A	A	D	C
24	D	B	A	A
25	B	C	C	D
26	A	D	B	A
27	C	D	A	D
28	B	D	D	C
29	B	A	D	*
30	C	A	B	A
31	C	C	D	D
32	B	D	C	A
33	D	A	A	B
34	A	B	A	B
35	A	D	C	A
36	D	A	B	A
37	A	A	D	C
38	D	A	C	A
39	C	C	C	B
40	A	B	C	B
41	B	C	D	B
42	D	D	B	B
43	D	A	D	D
44	A	C	D	B
45	C	B	C	C
46	*	C	B	D
47	B	A	D	D
48	C	D	A	C
49	D	C	C	A
50	A	B	A	A
51	D	A	B	C
52	C	B	A	B
53	D	B	B	D
54	C	C	A	B
55	B	A	D	D
56	D	*	A	A
57	A	D	B	D
58	A	A	A	C
59	D	A	C	C
60	B	*	A	D
61	A	D	C	B
62	A	A	C	C
63	C	D	B	A
64	B	D	*	C
65	B	A	B	B
66	D	A	A	C
67	A	B	B	A
68	A	D	B	C
69	D	D	D	B
70	B	A	D	D
71	C	A	D	A
72	C	D	C	D
73	B	C	A	B
74	B	B	D	B
75	C	C	C	D
76	B	D	B	D
77	D	B	C	A
78	D	C	B	C
79	A	B	B	B
80	B	B	A	B

ఈ 'కీ' అభ్యర్థుల అవగాహన కోసం మాత్రమే. TSSPDCL వారు ఇచ్చే తుది 'కీ'ని ప్రామాణికంగా పరిగణించగలరు.

సాయిమేధ, కోఠి - హైదరాబాద్

How many images does it form?

REFRACTION OF LIGHT AT CURVED SURFACES

Continued from December 14th

9. Find the radii of curvature of a convexo – concave convergent lens made of glass with refractive index n = 1.5 having focal length of 24cm. One of the radii of curvature is double the other. (Ans: R_1 = 6 cm, R_2 = 12 cm) (AS-7)(T.Q)

A. For convexo – concave convergent lens

Radius of curvature of convex is +ve

Radius of curvature of concave is –ve

Given that, focal length of the given lens ; f = 24cm

Refractive index, n = 1.5

Radius of curvatures $R_1 = R_1$

$R_2 = 2R$ (say)

We know that,

$$\frac{1}{f} = (n-1)\left[\frac{1}{R_1} - \frac{1}{R_2}\right]$$

$$\Rightarrow \frac{1}{24} = (1.5-1)\left[\frac{1}{R} - \frac{1}{2R}\right]$$

$$\Rightarrow \frac{1}{24} = (0.5)\left[\frac{1}{2R}\right]$$

$\therefore R = 6\,cm$

Now $R_1 = R = 6$ cm

$\therefore R_2 = 2R = 2\times 6 = 12\,cm$

$\therefore$ Then R_1 and R_2 are 6 cm and 12 cm

III. High order Thinking Questions

1. A convex lens is made up of three different materials as shown in figure. How many images does it form? (AS-2)(T.Q)

A. Given convex lens is made up of three different materials.

They have three (different) refractive indices thus referring the three focal length to the same lens according to lens maker's

Formula, $\frac{1}{f} = (n-1)\left[\frac{1}{R_1} - \frac{1}{R_2}\right]$

As the lens offers three focal lengths, it forms three images.

10th Class Special

2. You have a lens. Suggest an experiment to find out the focal length of the (AS-3)(T.Q)

A. (1) Take a V-stand and place it on a long table at the middle.

(2) Place a convex lens on the V-stand. Imagine the principal axis of the lens.

(3) Light a candle and ask your friend to take the candle far away from the lens along the principal axis.

(4) Adjust a screen (a sheet of white paper placed perpendicular to the axis) which is on other side of the lens until you get an image on it.

(5) Measure the distance of the image from the V- stand of lens (image distance 'v') and also measure the distance between the candle and stand of lens (object distance 'u'). Records the values in the table.

Object distance 'u'	Image distance 'v'	Focal length 'f'

(6) Now place the candle at a distance of 60 cm from the lens, try to get an image of the candle flame on the other side on a screen. Adjust the screen till you get a clear image.

(7) Measure the image distance 'v' and object distance 'u' and record the values in table.

(8) Repeat the experiment for various object distances like 50 cm, 40 cm, 30 cm etc. Measure the image distance in all cases and note them in table.

(9) Using the formula $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$, find '$f$' in all the cases. We will observe the value 'f' is equal in all cases. This value of 'f' is the focal length of the given lens.

3. Let us assume a system that consists of two lenses with focal length f_1 and f_2 respectively. How do you find the focal length of the system experimentally when (AS-3)(T.Q)

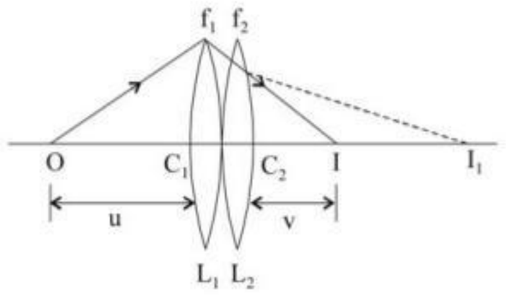
(i) two lenses are touching each other.

(ii) they are separated by a distance 'd' with common principal axis ?

A. (1) As shown in the figure consider two thin lenses with focal lengths f_1 and f_2 in contact.

(2) Let "O" be the object on the principal axis and 'u' be the distance between object and first lens.

(3) Let "I_1" be the virtual image on the principal axis and "v_1" be the distance between image and second lens.



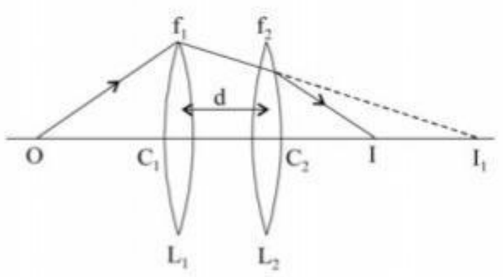
(4) From the lens formula, the focal length of first lens can be written as

$$\frac{1}{f_1} = \frac{1}{v_1} - \frac{1}{u} \quad \text{——(1)} \left(\because \frac{1}{f} = \frac{1}{v} - \frac{1}{u}\right)$$

(5) Now the image I_1 will act as an object for second lens if the second lens forms image "I" at a distance "v" from it.

(6) Now the focal length of second lens can be written as

$$\frac{1}{f_2} = \frac{1}{v} - \frac{1}{u_1} \quad \text{——(2)} \left(\because \frac{1}{f} = \frac{1}{v} - \frac{1}{u}\right)$$



$[\because$ From lens formula $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}]$

(7) Adding equations (1) and (2), we get

$$\Rightarrow \frac{1}{f_1} + \frac{1}{f_2} = \frac{1}{v_1} - \frac{1}{u} + \frac{1}{v} - \frac{1}{v_1}$$

$$\Rightarrow \frac{1}{f_1} + \frac{1}{f_2} = \frac{1}{v} - \frac{1}{u}$$

$$\therefore \frac{1}{F} = \frac{1}{f_1} + \frac{1}{f_2} \quad \text{——(3)}$$

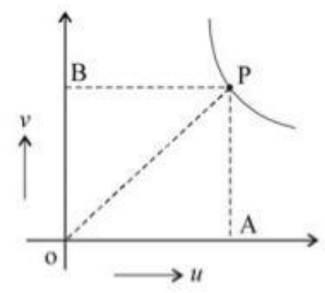
Equation (3) represents the combined focal length of two lenses which are in contact.

(8) The combined focal length for two thin lenses seperated by a distance d is given by the equation : $\frac{1}{F} = \frac{1}{f_1} + \frac{1}{f_2} - \frac{d}{f_1 f_2}$

4. Use the data obtained by activity -2, in the table -1, of this lesson and draw the graphs of u vs v and $\frac{1}{u}$ vs $\frac{1}{v}$? (AS-5)(T.Q)

Object distance (u)	Image distance (v)	Focal length (f)

A. (i) u- v Graph



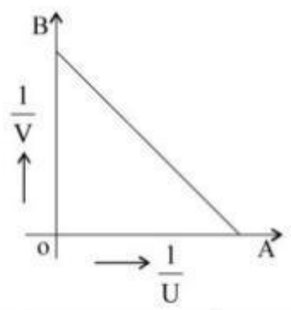
(1) A graph is drawn taking object distance (u) on X – axis and image distance (v) on Y – axis.

(2) The graph is rectangular hyperbola.

(3) The focal length of given lens

$$f = \frac{OA + OB}{4} cm$$

(ii) $\frac{1}{u}$ - $\frac{1}{v}$ Graph



1. A graph is drawn with $\frac{1}{u}$ on X-axis. $\frac{1}{v}$ on Y-axis.
2. The graph is a straight line making intercepts OA and OB on the axes.
3. The focal length of given lens

$$f = \frac{2}{OA + OB} cm$$

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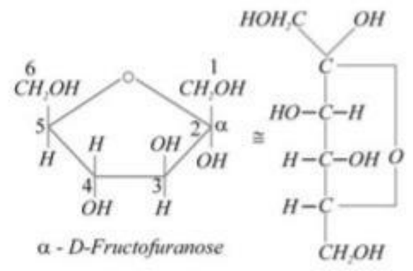
Which are reducing sugars?

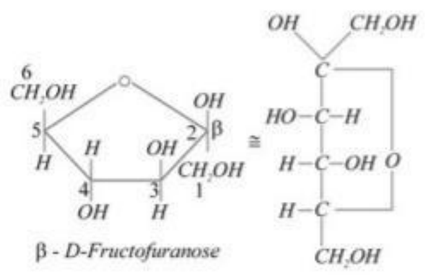
BIOMOLECULES

Continued from 4th December..

Cyclic structure of Two anomers of fructose(Haworth structures)



α - D-Fructofuranose



β - D-Fructofuranose

Oligo Saccharides: The disaccharides are composed of 2 molecules of monosaccharides. These on hydrolysis with dil acids(or) enzymes yield two molecules of either the same (or) different monosaccharides.

$C_{12}H_{22}O_{11} \xrightarrow{H_3O^+} C_6H_{12}O_6 + C_6H_{12}O_6$

Sucrose *Glucose* *Fructose*

$C_{12}H_{22}O_{11} \xrightarrow{H_3O^+} C_6H_{12}O_6 + C_6H_{12}O_6$

Lactose *Glucose* *Galactose*

$C_{12}H_{22}O_{11} \xrightarrow[Maltose]{H_3O^+} \underset{Glucose}{C_6H_{12}O_6} + \underset{Glucose}{C_6H_{12}O_6}$

In disaccharides, the two mono- saccharides are joined together by glycosidic linkage (-O-)

A glycoside bond is formed when hydroxy group of the hemiacetal carbon of one monosaccharide condenses with a hydroxy group of another monosachharide, to give -O-bond, by loss of H_2O.

Sucrose (Cane Sugar) $C_{12}H_{22}O_{11}$

It is the most common disaccharide present in plants.

It is obtained mainly from sugarcane (or) beetroot.

- Naturally available sucrose is a dextrorotatory substance $[\alpha]_D = +66.5^0$.
- It is non reducing sugar.
- It does not show mutarotation.
- It is a colorless and odourless crystaline substance, which is highly soluble in water.
- Even though sucrose is a dextro rotatory, on hydrolysis with dil.acids(or)enzyme invertase, it gives equimolar mixture of dextro rotatory glucose and laevo rotatory fructose.

$$\underset{[\alpha]_D=+66.5^0}{\text{D - Sucrose}} \xrightarrow{H_2O} \underset{[\alpha]_D=+52.5^0}{\text{D - Glucose}} + \underset{[\alpha]_D=-92.4^0}{\text{D - Fructose}}$$

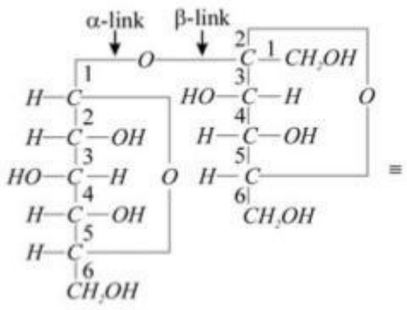
The net specific rotation of equimolar mixture of D-Glucose and D-fructose is

$$\frac{+52.5-92.4}{2} = -20^0.$$

- As the laevo rotation of fructose (-92.4^0) is more than dextrorotation of glucose $(+52.5^0)$, the mixture is laevorotatory.
- In the hydrolysis of sucrose there is a change in the sign of rotation from 'd' to 'l'. This change is known as **inversion** and the mixture is called **invert sugar**.

  1. $\alpha - D$ Glucose and $\beta - D$ fructose units are linked through α, β - glycosidic linkage between C-1 of $\alpha - D$ - Glucose and C - 2 of $\beta - D$ - fructose.
  2. Glucose unit is in pyranose and fructose unit is in furanose form.
- The reducing groups of glucose and fructose are involved in glycosidic linkage So sucrose is a **non- reducing sugar**

Cyclic structure of sucrose



SUCROSE

JEE MAIN Special

Maltose (Malt Sugar) $C_{12}H_{22}O_{11}$:

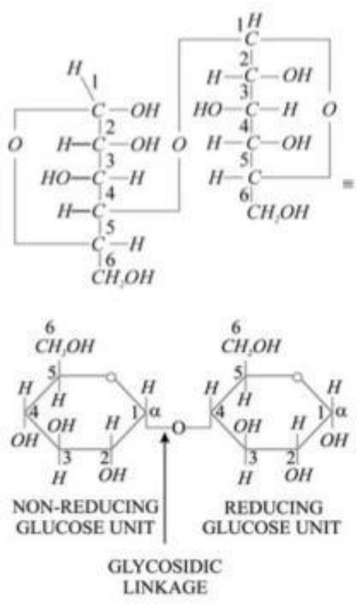
- It is obtained by partial hydrolysis of starch by diastase enzyme present in Malt.

$$2(C_6H_{10}O_5)_n + nH_2O \xrightarrow{Diastase} nC_{12}H_{22}O_{11}$$

Starch *Maltose*

- It is a reducing sugar.
- It undergoes mutarotation.
- On hydrolysis one mole of maltose yields 2 moles of D-Glucose.
- The two α-D-glucose units in maltose are linked through a α-Glycosidic linkage between C-1 of one unit and the C -4 of another.
- Both the glucose units are in pyranose form.

Cyclic structure of Maltose



NON-REDUCING GLUCOSE UNIT

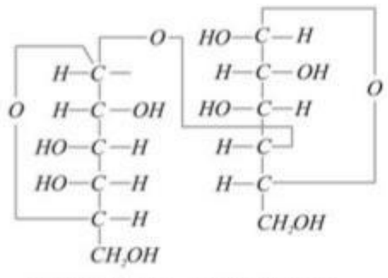
REDUCING GLUCOSE UNIT

GLYCOSIDIC LINKAGE

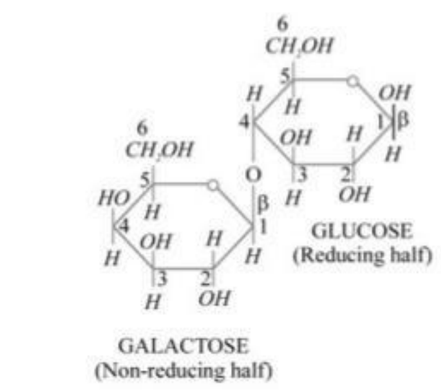
Lactose (Milk Sugar) $C_{12}H_{22}O_{11}$:

- Lactose occurs in milk and also called as **milk sugar**.
- Hydrolysis of Lactose with dil acid yields equimolar mixture of D-Glucose and D-Galactose.
- It is a reducing sugar
- The hydrolysis occurs in presence of enzyme emulsin.
- β-D-Galactose and β-D-Glucose units are linked through β-glucosidic linkage between C-1 of β-D - Galactose and C -4 of β-D - Glucose.
- Both Galactose and Glucose are in pyranose form.

Cyclic structure of Lactose



β-(D)-Galactose β-(D)-Glucose



GALACTOSE
(Non-reducing half)

GLUCOSE
(Reducing half)

Polysaccharides: Polysaccharides contains a large number of monosaccharide units joined together by glycosidic linkages

- Polysaccharides act as structural materials for higher plants and reserve food for plants as well as animals.
- Polysaccharides are also called glycans.

Starch $(C_6H_{10}O_5)_n$: Starch is known as amylum.

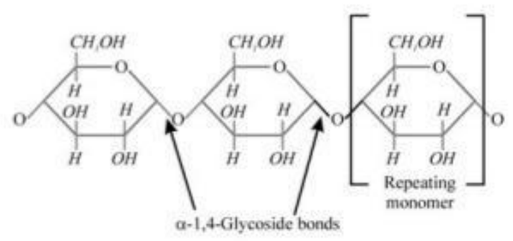
- Strach is a white amorphous substance.
- It has no taste and smell.
- Starch is most important dietary source for human beings
- High content of starch is found in cerals , roots, tubers and some vegetables.
- It is almost insoluble in cold water but soluble relatively more in boiling water.
- Starch solution gives a blue color iodine, which disappears on heating and reappears on cooling.
- Starch on complete hydrolysis gives D-Glucose units.

$$(C_6H_{10}O_5)_n \xrightarrow{n/2\ H_2O} \underset{Maltose}{\frac{n}{2}C_{12}H_{22}O_{11}} \xrightarrow{H_2O} \underset{D\text{-glucose}}{C_6H_{12}O_6}$$

- Starch is a polymer of α - glucose and consists of two components - **Amylose and Amylopectin**

Amylose: Natural starch contain 15-20% amylose.

- It is water soluble.
- It gives blue colour with iodine solution.
- Chemically amylose is a long unbranched chain with 200-1000 α-D-(+) -glucose units held by C-1 to C- 4 glycosidic linkage.
- Its molecular mass may be 10000 - 50000u.

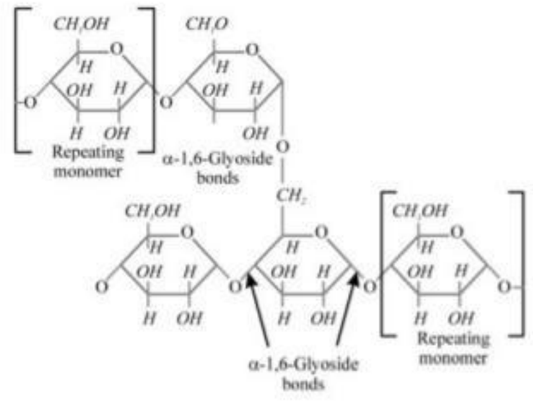


α-1,4-Glycoside bonds

Repeating monomer

Amylopectin: Natural starch contains about 80-85% of amylopectin.

- It is water insoluble component
- It does not give blue color with iodine solution.
- It is a branched chain polymer of α-D- glucose units in which chain is formed by C_1 to C_4 glycosidic linkage , where as branching occurs at C_1 to C_6 with glycosidic linkage



Repeating monomer

α-1,6-Glyoside bonds

α-1,6-Glyoside bonds

Repeating monomer

Cellulose $(C_6H_{10}O_5)_n$: Cellulose occurs exclusively in plant and it is most abundant organic substance in plant kingdom.

- Higher percentage of Cellulose is present in the natural plant polymer, cotton.
- Cotton contain 90% of cellulose.
- Wood contains 40 - 45% cellulose.
- Photosynthesis in the plants is responsible for the formation of cellulose.

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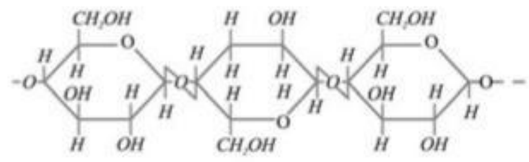
- It is a colour less amorphous solid.
- It is insoluble in cold water.
- Cellulose does not reduce Tollen's reagent and Fehling's solution because no **free hemiacetal hydroxyl group** is present in it.
- It does not form osazone.
- It is major constituent of cell wall of plant cells
- The molecular mass of cellulose is nearly 50,000 - 5,00,000u.
- It contains 300 to 2500 β-D-glucose units .
- Cellulose is a straight chain polysaccharide of β - D- glycosidic linkage.
- β-D-glucose units in cellulose are joined by β - glycosidic linkage between C_1 of one glucose unit and C_4 of next glucose unit.



Glycogen $(C_6H_{10}O_5)_n$: The carbohydrates are stored in animal body as glycogen

- It is also known as animal starch because its structure is similar to amylopectin
- It is heavily branched compared to starch
- It is present in liver,muscles and brain
- It is also found in yeast and fungi
- when body needs glucose , enzymes break the glycogen into glucose

Importance of carbohydrates: Carbohydrates are essential for life in both plants and animals

- These are major portion of our food
- Honey is instant source of energy .
- Glucose is used as a food for patients and children.
- Glucose may be used in the preparation of Jams and Jellies.
- In the treatement of Calcium deficiency calcium glucosate is used as a medicine.
  Vitamin-C can be prepared industrially using glucose.
- The carbohydrate antibiotic is streptomycine, Kenamycins, neomycins and gentamycins are used against bacteria which are resistatnt to pencillins.
- Starch is the most valuable constituent of food like rice, potatoes, etc. It is also used in the manufacture of dextrin, adhesives and explosives.
- Cell walls of bacteria and plants are made up of cellulose. Cotton fibre, paper and wood conain cellulose.
- The explosives like gun powder, medicines, pains, are manufactured using cellulose nitrate.
- Cellulose acetate is used in the manufacture of plastic.
- Glycogen is produced from glucose which is absorbed from the intestine into the blood, transported to liver, muscles etc. and is polymerised enzymatically. Similarly when the body needs glucose, the enzymes breakdown glycogen to glucose.