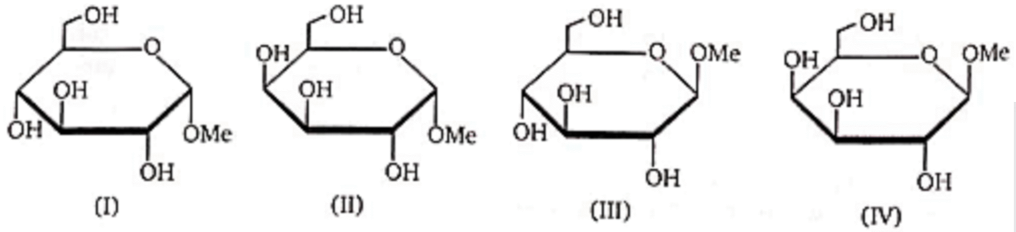
Sol. α-D-glucose and β-D-glucose are anomeric form of glucose and are diastereomers which are interconvertable when dissolved in water and there specific optical rotation is change it is a mutarotation.

Mutarotation is the alteration in the optical rotation of a solution due to the change in the equilibrium of the α- and β- anomers of glucose upon dissolution in water.

14. Identify the correct set of stereochemical relationships amongst the following monosaccharides I-IV



(A) I and II are anomers ; III and IV are epimers

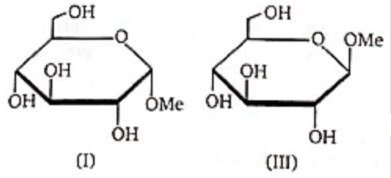
(B) I and III are epimers ; II and IV are anomers

(C) I and II are epimers ; III and IV are anomers

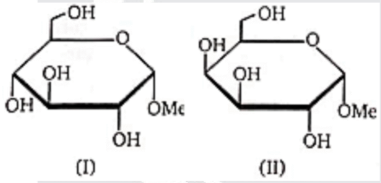
(D) I and III are anomers ; I and II are epimers

Ans. **(D)**

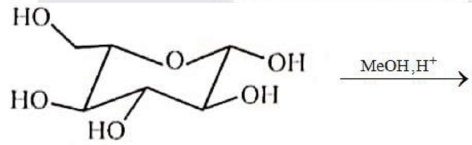
Sol. In (I) & (III) only change in the configuration at C_1 (anomeric carbon) so these are pair of anomers.

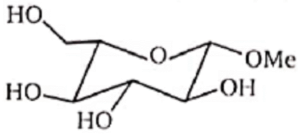


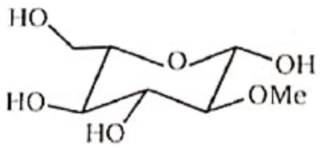
In (I) & (II) only change in the configuration at C_4 and no change in the anomeric carbon so these are epimers.

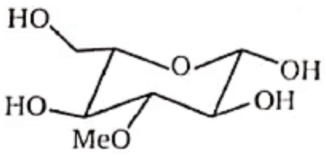


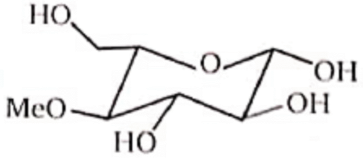
15. Predict the product of the following reaction.



(A) 

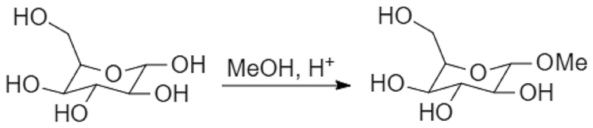
(B) 

(C) 

(D) 

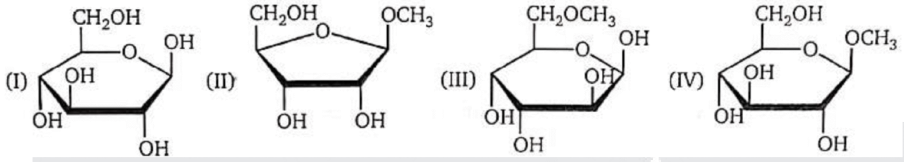
Ans. **(A)**

Sol.



Glycosides formation is the alkylation of the hemiacetal group of carbohydrates. That means conversion of hemiacetal in the full acetal group in the acidic medium.

16. Which of the following carbohydrate(s) would not undergo mutarotation in aqueous solution?



(A) II only (B) I, III and IV only (C) II and IV only (D) I and III only

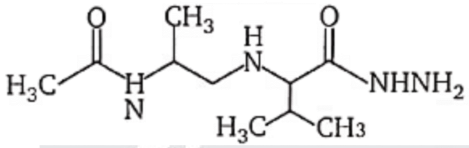
Ans. **(C)**

Sol. Mutarotation arise due to the free hemiacetal group in the carbohydrates so that α- and β-Anomers Can Interconvertible.

In the given four compounds only compound (I) and (III) have free hemiacetal group so both can show mutarotation.

While compound (II) and (IV) do not have free hemiacetal group so these can not show mutarotation.

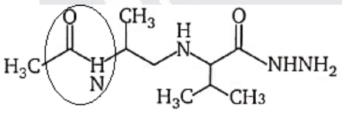
17. The number of peptide bonds in the compound.



(A) 1 (B) 2 (C) 3 (D) 4

Ans. **(A)**

Sol. A peptide bond is a covalent bond formed between two amino acids. It is an amide type of covalent chemical bond. In the given compound only one, such type of bond is present.



18. **Statement 1:** The percentage of β−D(+)-glucopyranose is more than α−D(+)-glucopyranose at equilibrium.

Statement 2: The presence of bulky groups in axial position makes β−D(+)-glucopyranose more stable.

(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1

(B) Statement-1 is True, Statement-2 is Tue; Statement-2 is **NOT** a correct explanation for Statement-1.

(C) Statement-1 is True, Statement-2 is False

(D) Statement-1 is False, Statement-2 is True.

Ans. **(C)**

Sol. The presence of bulky groups in equatorial position make α−D(+)-glucopyranose more stable

19. **Statement-1:** A solution of sucrose in water is dextrorotatory but on hydrolysis in presence of H + , the solution becomes leavorotatory

Statement-2: Inversion of sugar follows first order kinetics.

(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1

(B) Statement-1 is True, Statement-2 is True; Statement-2 is not a correct explanation for Statement-1.

(C) Statement-1 is True, Statement-2 is False

(D) Statement-1 is False, Statement-2 is True.

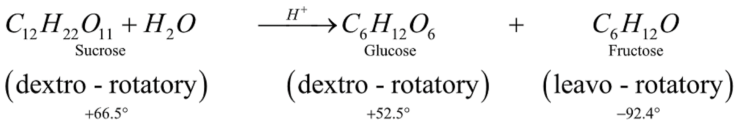
Ans. **(B)**

Sol. Hydrolysis of sucrose (dextrorotatory) gives equimolar mixture of glucose (dextrorotatory, +52.5º) and fructose(laevorotatory, -92.4º).

The mixture on the whole is laevorotatory and is called invert sugar.

The process is called inversion.

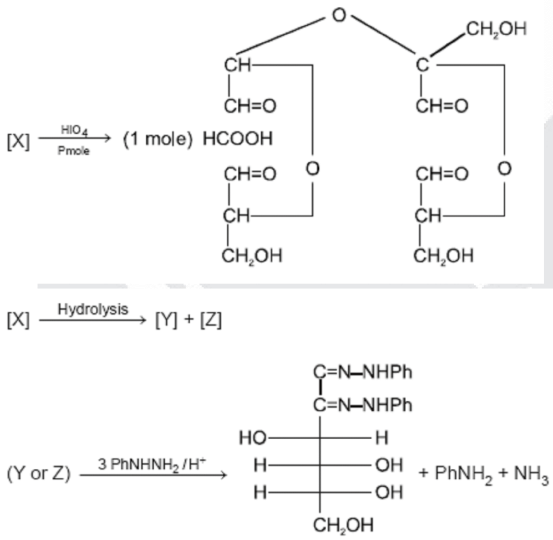
It follows first order kinetics



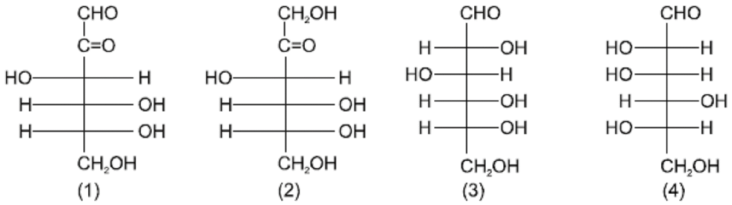
Statement-1 is True, Statement-2 is True;

Statement-2 is not a correct explanation for Statement-1

Comprehension 20 to 21



20. Compounds Y and Z can be :



(A) 1 only (B) 2, 3 (C) 1, 4 (D) 2, 3, 4

Ans. **(B)**

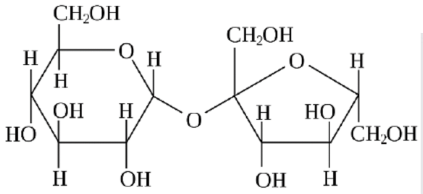
Sol. Hydrolysis of X, gives Y + Z, and Y+ Z both gives same osazone as given in the questions that means X and Y are D-glucose and D-fructose. Which are obtained by the hydrolysis of the (X) Sucrose.

21. Number of moles (P) of HIO4 used per moles of compound X is :

(A) 2 (B) 3 (C) 4 (D) 5

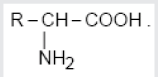
Ans. **(B)**

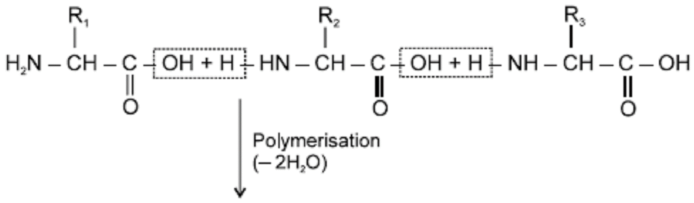
Sol. HIO_4 is used to break C-C glycolic bonds. In the sucrose three glycolic bonds are present so three mole of HIO_4 is required.

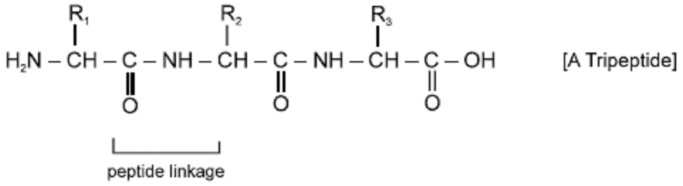


Sucrose

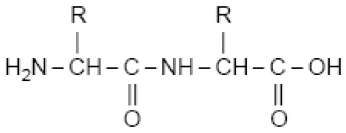
Comprehension 22 to 23

Proteins are biomolecules composed of α-amino acids. An α-amino acid has a general formula  The amino acids polymerise and form an amide linkage (peptide linkage) between two monomeric amino acid units. The polymerisation takes place as follows





Two or more similar amino acids can also polymerise, for example a dimer will be like

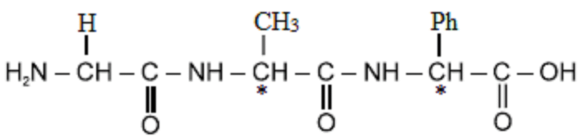


22. In the above trimer, if R_1 = H ; R_2 = CH_3 & R_3 = Ph
then total number of optically active stereoisomers will be :

(A) 8 (B) 6 (C) 4 (D) 2

Ans. **(C)**

Sol. In the following tripeptide 2 chiral carbons are present and no element of symmetry so total 2^n = 2^2 = 4 isomers are possible.



23. Which statement is incorrect about the given trimer.

(A) it will liberate CO_2 with $NaHCO_3$.

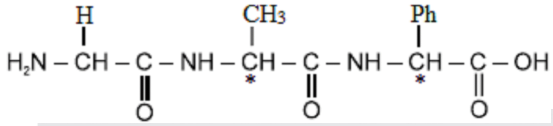
(B) It will liberate N_2 with $NaNO_2$ / HCl

(C) It will give yellow precipitate with 2, 4-Dinitrophenylhydrazine

(D) It will rotate plane polarized light.

Ans. (C)

Sol.



A) Above tripeptide contain -COOH group so it will liberate CO_2 with $NaHCO_3$.

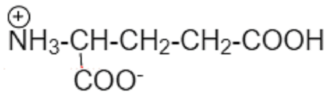
(B) Above tripeptide contain aliphatic $-NH_2$ group so it will liberate N_2 with $NaNO_2$ / HCl.

(C) In the given compound no >C=O group aldehydic and ketonic group is present so it will not give yellow precipitate with 2, 4-Dinitrophenylhydrazine

(D) In the following tripeptide, 2 chiral carbons are present and no element of symmetry so total, $2^n = 2^2 = 4$ isomers are possible.

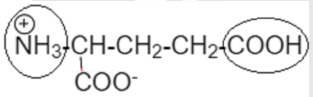
NUMERIC

24. How many acidic group is present in given amino acid ?



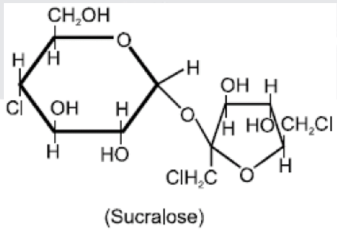
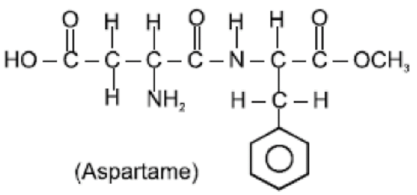
Ans. (2)

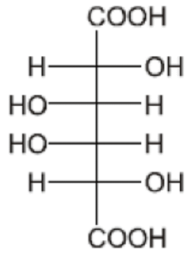
Sol.



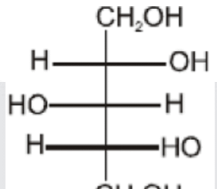
Matrix

25. Match the Following :

Column I (Artificial sweetners)	Column II (Characteristics)
(A)  (Sucralose)	(p) A derivative of dipeptide
(B)  (Aspartame)	(q) A derivative of disaccharide

(C) 
(Galactoric)
(Aldaric acid)

(r) Reduction prouct of an aldopentose

(D) 
(Xylitol)

(s) Oxidation product of aldohexose

Ans. **(A → q, B → p, C → s, D → r)**

Sol. (A) Sucralose is a derivative of sucrose it is a disaccharide.

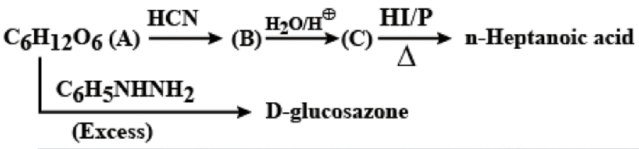
(B) Aspartame is the derivative of dipeptide because it is a methylester of a dipeptide composed of two amino acids, phenylalanine and aspartic acid.

(C) Aldopentose is 5 carbon's carbohydrate having aldehyde as functional group. Aldehyde give alcohol on reduction. So correct answer is C → s.

(D) Aldohexose is a six carbon's monosaccharides having aldehyde as a functional group. Aldehyde functional group on oxidation gives carboxylic acid having six carbons. So Correct answer is D → r.

Subjective

26. Compound (A), $C_6H_{12}O_6$, is oxidized by bromine water into a monobasic acid and also reduces Tollen's reagent and Fehling's solution. It also responds to the following reactions. Identify the compound (A).



Sol. (i) (A) is glucose because it is readily oxidized by Br_2 water to gluconic acid. It reduces Fehling's and Tollen's reagent because it is a reducing sugar.

(ii) With excess phenyl hydrazine it gives glucosazone.