Monday, December 27, 2021 3:10 PM

(A) :- In the question it is given that,

Optical rotation of D-Galactose is $+70.7^\circ$

→ optical rotation of α-form of D-Galactose is $+125.7^\circ$

→ optical rotation of β-form of D-Galactose is $+50.8^\circ$

→ So,
we have to calculate the proportion of these α and β forms of D-Galactose in a equilibrium mixture.

→ It was given in the Question that,

- Specific rotation of pure α-D-Galactose is $+125.7^\circ$
- Specific rotation of pure β-D-Galactose is $+50.8^\circ$

In an equilibrium mixture,

Specific rotation of mixture = [Proportion of α-form × Specific rotation of α-form] + [Proportion of β-form × Specific rotation of β-form]

(Given in Question) $+125.7^\circ$

$\Downarrow$

$+70.7^\circ$ (Given)

Let's Consider,

'x' as the proportion of α-D-Galactose and (1-x) is proportion of β-D-Galactose in equilibrium mixture.

So,

$$+70.7^\circ = [(x) \times 125.7] + [(1-x) \times 50.8]$$

($+50.8^\circ$ Given in Question)

$$70.7 = 125.7x + 50.8 - 50.8x$$

$$70.7 - 50.8 = 125.7x - 50.8x$$

$$19.9 = 74.9x$$

$$x = \frac{19.9}{74.9}$$

$$\boxed{x = 0.26}$$

→ So, as we assumed proportion of α-D-Galactose = x

$\simeq 0.26$

and,

proportion of β-D-Galactose is $1 - x = 1 - 0.26$

$\simeq 0.74$

∴ In an equilibrium mixture of D-Galactose,

the proportion of α-D-Galactose is ~0.26 and the proportion of β-D-Galactose is ~0.74.