

Numericals on Phase rule

Q.1 An alloy of Cd & Bi contains 25% Cd. Find the mass of eutectic in 1 kg of alloy if eutectic system contains 40% Cd.

Solution:

1 Kg of alloy contains 25% Cd= 250 gm of Cd

1 Kg of alloy contains 750 gms of Bi

Eutectic contains 40% Cd

Eutectic contains 60% Bi

% of Cd/ % of Bi = Mass of Cd/ Mass of Bi

$40/60 = 250 \text{ gm} / \text{mass of Bi}$

Mass of Bi = $250 \times 60 / 40 = 375 \text{ gm}$

Mass of eutectic = Mass of Cd+ Mass of Bi

$$= 250 + 375 = \underline{625 \text{ gm}}$$

Q.2 An alloy of Sn & Pb contains 80% tin. Find the mass of eutectic in 1 kg alloy if eutectic contains 60% tin.

Solution:

1 Kg of alloy contains 80% tin= 800 gms

1 Kg of alloy contains 20% Pb= 200 gm

Eutectic contains 60% tin

Eutectic contains 40% lead

% tin/% lead= Mass of tin/Mass of lead

$$60/40 = \text{Mass of tin}/\text{Mass of Pb}$$

$$\text{Mass of tin} = 200 * 60/40$$

$$= 300 \text{ gm}$$

$$\text{Mass of eutectic} = \text{Mass of tin} + \text{mass of Pb}$$

$$= 300 + 200$$

$$= \underline{500 \text{ gm}}$$

Q.3 An alloy AB of 20 gm contains 20%A. The molten AB on cooling gave out B & eutectic alloy with A & B of equal percentage. What is the amount of B that has formed.

Solution:

$$20 \text{ gm of AB alloy contains} = 20\% \text{ A} = 20 * 20/100 = 4 \text{ gm A}$$

$$20 \text{ gm of AB alloy contains} = 80\% \text{ of B} = 16 \text{ gm of B}$$

Eutectic contains 50% of A & 50% of B

$$\% \text{ of A} / \% \text{ of B} = \text{Mass of A} / \text{Mass of B}$$

$$50/50 = 4 / \text{mass of B}$$

$$\text{Mass of B} = 4 \text{ gm}$$

$$\text{Mass of Eutectic} = (\text{Mass of A} + \text{Mass of B}) \text{ in eutectic}$$

$$= 4 + 4 = \underline{8 \text{ gms}}$$

Molten AB on cooling gave out B & eutectic alloy

$$\text{Mass of Molten AB} = \text{Mass of B} + \text{Mass of eutectic}$$

$$20 = \text{Mass of B} + 8$$

$$\text{Mass of B} = 20 - 8 = \underline{12 \text{ gm}}$$

Answer : Mass of eutectic = 8 gms

Mass of B formed = 12 gm

Q.4 An alloy AB of 10 gm weight contains 25% A. The molten AB on cooling gave out B & eutectic alloy with A & B of equal percentage. What is the amount of B that has formed. Also calculate the mass of eutectic formed.

Solution:

10 gm of Alloy AB contains 25% A = $10 \times 25/100 = 2.5$ gm of A

10 gm of alloy AB contains 75% B = 7.5 gm of B

Eutectic contains 50 % of A & 50% of B

% A/%B = Mass of A/ Mass of B

$50/50 = 2.5 / \text{Mass of B}$

Mass of B = 2.5 gm in eutectic

Mass of Eutectic = (Mass of A + Mass of B) in eutectic
 $= 2.5 + 2.5 = \underline{5 \text{ gm}}$

Molten AB \rightarrow Eutectic + B

Mass of molten AB = Mass of eutectic + Mass of B

$10 = 5 + \text{Mass of B}$

Mass of B = $10 - 5 = \underline{5 \text{ gm}}$

Q.5 1000 kg sample of argentiferous lead containing 0.1% Ag is melted & then allowed to cool. If eutectic contains 2.6% Ag what mass of

i) Mass of eutectic will be formed.

ii) Mass of Pb will be separated out.

Solution:

Mass of Pb separated = 961.54 Kg

Mass of eutectic formed = 38.46 kg

Q.6 An alloy of Cd & Bi contains 20% Cd. Find the mass of eutectic in 2kg of alloy if eutectic contains 50% Cd.

Solution:

2 Kg alloy contains 20% Cd = 400 gm of Cd

2 Kg of alloy contains 1600 gm of Bi

Eutectic contains 50% Cd & 50 % Bi

% of Cd/ % of Bi = Mass of Cd/ Mass of Bi

50/50 = 400 / mass of Bi

Mass of Bi = 400 gm

Mass of Eutectic = Mass of Cd + mass of Bi

= 400 + 400

= 800 gm