Le-Chaterlier principle and It's application

41 (a) Reaction in forward direction

Explanation:
In the reaction **$N_2 + 3H_2 \rightleftharpoons 2NH_3$**, 4 moles of gas react to form 2 moles of gas.
By **Le–Chatelier' s Principle**, increasing **pressure** favors the side with **fewer moles of gas**, so the equilibrium shifts **forward**, producing **more ammonia (NH_3)**.

42. (b) According to Le chatelier's principle.

43. (d) Increase in volume, *i.e.*, decrease in pressure shifts the equilibrium in the direction in which number of moles increases (Δn positive)

44 (d) Shift in equilibrium position on changing value of a constant

Explanation:
Le–Chatelier' s Principle helps us **predict the direction of shift** in equilibrium when **conditions like temperature, pressure, or concentration** are changed.
It does **not** give numerical values like entropy or equilibrium constants.

45 (b) An adsorbent is used to remove SO_3 as soon as it is formed

Explanation:
By **Le–Chatelier' s Principle**, removing the **product (SO_3)** continuously reduces its concentration, so the equilibrium shifts **forward** to produce more SO_3.
A catalyst only helps reach equilibrium faster — it does not shift equilibrium.

46. (d) At constant volume. Three is no change in concentration (closed container).

47. (c) $H_2O(g) \rightleftharpoons H_{2(g)} + \frac{1}{2}O_{2(g)}$

In this reaction volume is increasing in the forward reaction. So on increasing temperature reaction will proceed in forward direction.

48. (b) When temperature increases precipitation of sodium sulphate takes place. Because reaction is exothermic so reverse reaction will take place.

49. (a) For high yield of ammonia low temperature, high pressure and high concentration of the reactant molecule.

50 (a) Twice

Explanation:
For the reaction **AB ⇌ A + B**, 1 mole of AB produces **1 mole of A** and **1 mole of B**.
Hence, if the **equilibrium concentration of A doubles**, then the **concentration of B must also double**, keeping the stoichiometric balance and equilibrium ratio constant.

51 (a) System in equilibrium

Explanation:
Le–Chatelier' s Principle predicts how a system **already at equilibrium** responds to a change in **temperature, pressure, or concentration**.
It **does not apply** to irreversible reactions that never reach equilibrium.

52 (c) Remains unaltered

Explanation:
Helium is an **inert gas**, and when added **at constant volume**, it only increases **total pressure**, not the **partial pressures** of SO_3, SO_2, or O_2.
Since partial pressures determine equilibrium, the **position of equilibrium remains unchanged**.

53. (c) Since $\Delta n = 0$.

54. (a) The rate of backward reaction favoured by increase of pressure in the reaction as Δn is positive

$$PCl_5 \rightleftharpoons PCl_3 + Cl_2$$

55. (a) $H_{2(g)} + I_{2(g)} \rightleftharpoons 2HI$

$\Delta n = 0$; $\because K_c = K_p$

56. (c) Solid + liquid $\rightleftharpoons$ Solution ΔH =+ve

Increase in temperature favours forward reaction.

57. (a) Addition of an inert gas of constant volume condition to an equilibrium has no effect.

58. (b) Le chatelier principle is not applicable to solid-solid equilibrium.

59. (a) $A + B + Q \rightleftharpoons C + D$

The reaction is endothermic so on increase temperature concentration of product will increase.

60. (a) In that type of reaction the state of equilibrium is not effected by change in volume (hence pressure) of the reaction mixture.