Le-Chaterlier principle and It's application

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

22. (d) In reaction $CO + 3H_2 \rightleftharpoons CH_4 + H_2O$

Volume is decreasing in forward direction so on increasing pressure the yield of product will increase.

23 (c) Pressure is lowered

Explanation:
The reaction produces fewer moles of gas (4 → 2) and is **exothermic**.
Hence, **high pressure** and **low temperature** favor ammonia formation.
Lowering pressure shifts equilibrium **toward more moles of gas** (left), so yield **does not increase**.

24 (a) $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$

Explanation:
In this reaction, the **number of moles of gas** on both sides is the **same (2 = 2)**.
When $\Delta n = 0$, a **change in pressure has no effect** on the equilibrium position.

25. (a) In endothermic reaction rate of forward reaction can be increased by raising temperature.

26. (a) Being endothermic, the forward reaction is favoured by high temperature.

27. (c) According to Le chatelier's principle.

28. (b) On adding more PCl_5, equilibrium shifts forward.

29. (a) According to Le chatelier's principle.

30. (b) Increase in pressure causes the equilibrium to shift in that direction in which no. of moles (volume) is less.

31 (a) Decrease of pressure

Explanation:
In the reaction **A(g) + B(g) ⇌ C(g)**, two moles of gas combine to form one mole of gas.
So, the **forward reaction** causes a **decrease in volume (fewer gas molecules)**.
By **Le–Chatelier' s Principle**, **decreasing pressure** favors the side with **more gas molecules**, i.e., the **backward reaction**.

32. (b,c) According to Le-chatelier's principle.

33 (c) Introducing an inert gas at constant pressure

Explanation:
At **constant pressure**, adding an **inert gas** increases the **total volume**, which decreases the partial pressures of all gases.
Since the forward reaction produces **more moles of gas (1 → 2)**, it is **favoured**.
(At constant volume, there would be no effect.)

34 (d) All of these

Explanation:
Formation of ammonia ($N_2 + 3H_2 \rightleftharpoons 2NH_3$) is **exothermic** and results in **decrease of volume**.
Hence, **low temperature**, **high pressure**, and **removal of ammonia** all shift equilibrium to the **right**, increasing yield.

35 (d) Concentration, pressure and temperature

Explanation:
Le–Chatelier' s Principle applies to all changes that disturb equilibrium — **concentration**, **pressure**, and **temperature** all affect equilibrium position.

36 (b) Backward direction

Explanation:
Only gases affect pressure.
On the left, there is **1 mole of gas**, and on the right, there are **2 moles of gas**.
So, increasing pressure shifts equilibrium **toward fewer moles** — i.e., **backward direction**.

37. (d) By increasing the amount of F_2 in the reaction the amount of ClF_3 increases.

38 (d) It remains unaffected

Explanation:
When an **inert gas** is added **at constant pressure**, the **partial pressures** of the reactants and products **remain unchanged**, because the total pressure is kept the same by allowing the volume to expand.
Since the **ratio of reactants and products** does not change, the **equilibrium position remains unaffected**.

39. (b) According to Le chatelier's principle when we increase pressure reaction proceeds in that direction where volume is decreasing.

40. (a) Factors affecting equilibrium are pressure, temperature and concentration of product or reactant.