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Chemical Engineering Interview Questions

Q1. What is a solvent?

A solvent is a substance in which a solute dissolves to form a solution. The solvent can be liquid, gas, solid, or a supercritical fluid.

Q2. What is Poly Chlorinated Biphenyls?

PCBs or Polychlorinated Biphenyls or chlorinated hydrocarbons are a group of man-made chemicals that consist of carbon, hydrogen, and chlorine atoms. They are solid or oily liquid with yellow color and do not have any taste or smell. PCBs are resistant to both pressure and temperature. Because of this property, it is used in equipment like transformers and capacitors. They are also widely used in plasticizer, lubricants, hydraulic fluid, heat transfer fluid. PCBs construction was banned in 1979. PCBs are chemically stable, have a high boiling point, and non-flammable, which makes them useful in various industrial applications.

Q3. What is quicklime and where it is used?

Quicklime, also known as Calcium Oxide(CaO) or burnt lime, is a chemical compound. It is caustic, white in color, solid at room temperature. Lime refers to the organic compound containing calcium-containing inorganic material, in which oxide, carbonates, and hydroxide of silicon, magnesium, calcium, aluminum, and iron predominate. It is the cheapest alkali known so far. Quicklime is used in various applications. Some of them are mentioned below: -

- It is used to produce steel, pulp, and iron.
- It is used in the manufacturing of cement.
- It is extensively used in medicinal industries and insecticides.
- Lime is used in laboratories for precipitation reaction and dehydration.
- It is used in the treatment of fuel gases.
- Last but not least, it is also used to manufacture caustic soda

Q4. Do you know third law of thermodynamics? Please explain.

The third law of thermodynamics states that a perfect crystal's entropy is always zero at absolute zero temperature. As the system does not contain the heat and all the atoms or molecules in the system are at their lowest energy point at zero kelvin, the system's microstate is at the ground state. Therefore, the entropy of the

system is also zero.

Q5. What are the three classes of organic solvent?

The three classes of organic solvent are **apolar, polar aprotic, and polar protic**.

Q6. Why taps were given in steam pipelines?

Taps were given in steam pipelines to remove condensate.

Q7. What is an isomer?

Isomers are those chemical compounds with the same chemical formula. However, they have a different structure—for example, C₈H₁₀, which has many isomeric structures like m-xylene, benzene, p-xylene, and o-xylene. Isomers can be different in chemo dynamic behavior and toxicity.

Q8. What is Arrhenius equation and why it is used?

Swedish chemist Svante Arrhenius gave the Arrhenius equation. Until 1899, it was not clear why the rate of reaction doubled for a 10-degree rise in most of the chemical reactions. After the Arrhenius equation is discovered, the problem is solved as it explains the relation between the temperature and rate of reaction.

$$k = A e^{-E_a/RT}$$

where k represents the kinetic reaction rate

E_a is the activation energy

R represents the universal gas constant and

T is the absolute temperature.

After solving the above equation, it gives another useful equation, which is:

$$\ln(k) = \ln(k_0) - E_a/RT$$

Q9. What is Gibbs free energy?

Gibbs energy was given by Josiah Williard Gibbs, after which the name was given. Gibbs free energy, which is denoted by the symbol G, is equal to the addition of enthalpy and the product of temperature and entropy of the

system. ΔG represents the change in Gibbs free energy. If the parameter, i.e., temperature and pressure, are constant, then the Gibbs energy equation can predict the chemical reaction's direction. It tells about the amount of energy that can be used to do work in a chemical reaction.

$$G = H - TS \text{ or } \Delta G = \Delta H - T\Delta S$$

Where G represent the Gibbs Energy

H is enthalpy

T is temperature and

S is entropy

Gibbs free energy has the same unit as energy, i.e., joule or kilojoules.

Positive Gibbs energy: - If the Gibbs energy of a reaction is positive, it means the reaction is non-spontaneous. This reaction cannot occur by applying the external force. If the external force is stopped, then the reaction will also stop.

Negative Gibbs energy: - If the Gibbs energy of a reaction is negative, it means the reaction is spontaneous. This reaction can proceed without using any external process. All the natural reactions are spontaneous because it proceeds without external action. If the Gibbs energy is equal to zero, it means the reaction is at equilibrium.

Q10. What is an isochoric process?

In a closed system, an isochoric is a process in which the volume remains constant. As the volume is constant, work is not done. Therefore, heat transfer only changes the temperature of the system.

Q11. What is a CSTR?

CSTR /Continuous stirred-tank reactor (CSTR) is also known as a vat or back mix reactor, continuous-flow stirred-tank reactor, and mixed flow reactor. It is a chemical reactor in environmental engineering and chemical engineering. It is an open reactor where the material can enter or exit the system. The condition in the reactor never changes with time. From the entry point, reactants are continuously added, and the product is removed from the exit point. CSTR has uniform Properties like temperature, density, pressure, etc. throughout the reactor. The CSTR model works for all three phases, i.e., solid, liquid, and gas.

Q12. What is entropy?

The term entropy was given by a scientist named Rudolf Clausius. In thermodynamics, entropy is defined as the amount of the system's thermal energy unavailable for doing any work. It tells about the randomness of the system. Entropy helps in predicting the direction of the reaction. Entropy is directly proportional to change in

heat and inversely proportional to the temperature of the system.

Q13. What is the critical radius of insulation?

It is the outer radius that allows the maximum heat transfer. Simply put, it is defined as the radius of insulation at which the transfer of heat occurs maximum.

Q14. What is driving force in mass transfer?

The driving force in the mass transfer is the potential chemical difference, which means the transfer of chemical place occurs from higher chemical potential to lower chemical potential. Chemical potential depends on various parameters like concentration, pressure, and temperature.

Q15. What is the firetriangle?

Fire triangle is consists of fuel, heat and oxygen. It tells if any of the element among these is absent then the fire will not take place.

Q16. What are the name plates on Ammonia Tankers?

The nameplates on Ammonia Tankers are Amno4.

Q17. What is Flocculation?

In chemistry, Flocculation is defined as a process in which colloids come out from the suspension in floc form after a clarifying agent. In this process, the particles of clay joined and aggregated to form a clot-like mass. Flocculation occurs due to the reaction between the clay particles and other substances like saltwater.

Q18. What is carbon sequestration?

Carbon sequestration is defined as how carbon is stored in plants, geological formations, soils, and the ocean. Carbon is stored in either solid or dissolved form—carbon stored either through natural processes or through anthropogenic activities that tend to convert to carbon dioxide gas. As climate change is exacerbated by excess carbon dioxide gas in the atmosphere, interest has been growing in carbon sequestration recently. More and more carbon is sequestered by changing land use, forestry, and geoengineering techniques.

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