

Chemical Engineering Chemistry Questions with Solutions

Q1. What is the internal energy change over an entire cycle in a cyclic process?

- (a) Zero
- (b) Positive
- (c) Dependent on the path
- (d) Can't be determined
- (e) None of the above

Answer: (a), The internal energy change over an entire cycle in a cyclic process is zero.

Q2. Which of the following is not an intensive property?

- (a) Chemical potential
- (b) Surface tension
- (c) Heat capacity
- (d) None of these

Answer: ©, Heat capacity is not an intensive property.

Explanation: An intensive property is a property of matter whose value does not depend on the quantity of the substance. Quantities like chemical potential and surface tension do not rely on the amount of the substance and therefore are intensive properties. In contrast, heat capacity depends on its mass and chemical composition and, therefore, is an extensive property.

Q3. One Newton is equal to _____ dynes.

- (a) 10^5
- (b) 10^4
- (c) 10^3
- (d) 10^2

Answer: (a), One Newton equals 10^5 dynes.

Q4. Which of the following is generally considered an opaque surface toward radiations?

- (a) Solids
- (b) Liquids
- (c) Gases
- (d) Both (a) and (b)
- (e) Both (b) and ©

Answer: (d), Both solids and liquids are generally considered an opaque surfaces toward radiations.

Q5. Which of the following will give maximum gas conversion?

- (a) Semi-fluidised bed reactor
- (b) Plug-flow catalytic reactor

- (c) Fixed bed reactor
- (d) Fluidised bed reactor

Answer: (a), A semi-fluidised bed reactor gives maximum gas conversion.

Q6. What is Gibbs free energy?

Answer: Gibbs free energy is a thermodynamic quantity used to determine the maximum amount of work done when the temperature and pressure are constant. It is also known as the Gibbs function or free enthalpy. It is denoted by the sign 'G'.

It is equivalent to

$$\Delta G = \Delta H - T \Delta S$$

Q7. What is an isochoric process?

Answer: In thermodynamics, an isochoric process is a process in which the volume remains constant. It is also referred to as a constant-volume process or isometric process.

As the volume is constant, the work done in an isochoric process is zero.

$$W = P \Delta V$$

$$\text{Here, } \Delta V = 0$$

$$\text{So, } W = 0$$

Q8. What happens when the paint dries?

Answer: While manufacturing paints, additives are added to make paint thin. After the application of paint, the additives get evaporated, and the pigments and resins are converted to a hard, tough, cross-linked film that persists in hardening forever.

Q9. What is carbon sequestration?

Answer: Carbon sequestration is a method for grabbing and storing atmospheric carbon dioxide. The primary objective of carbon sequestration is to reduce global climate change.

Q10. What is the black body?

Answer: A black body is an ideal object competent for absorbing all electromagnetic radiation it receives without reflecting anything.

Q11. What are the disadvantages of PFR?

Answer: PFR is the abbreviation of plug flow reactor. It is used to illustrate chemical reactions in a continuously flowing system.

Disadvantages of PFR:

- Temperature is hard to control in the PFR model.
- Undesirable temperature gradients are observed while handling the PFR model.
- The maintenance of the PFR model is much more than the CSTR model

Q12. What is quicklime? Mention a few applications of quick lime.

Answer: Quicklime is the common name for calcium oxide (CaO).

There is a lot of application of quicklime. Few of them are enlisted below.

- It is used in the production of iron and steel.
- It is used in the production of paper and pulp.
- It is used in the treatment of water and flue gases.
- It is used in whitewashing.

Q13. What are the laws of thermodynamics?

Answer: There are three laws of thermodynamics. It states that

- **Law One:** Energy can neither be created nor be destroyed. It can only be transmitted from one form to another.
- **Law Two:** The entropy of an isolated system is increasing continuously.
- **Law Three:** The entropy of a system approaches a constant value as the temperature approaches its absolute zero.
- **Zereth Law:** If two bodies are in thermal equilibrium with a third body. Then they are in thermal equilibrium with each other.

Q14. Differentiate between unit operation and unit process.

Answer:

S. No.	Unit Operation	Unit Process
1.	In the unit operations, only physical changes occur.	In the unit process, both physical and chemical changes occur.
2.	Mixing, Crushing, Blending, and Distillation is unit operation.	Bromination, Halogenation, Nitration and Sulphonation is a unit processes.

Q15. What are scales and sludge?

Answer: In the boiler, evaporation and concentration of dissolved salts rise constantly. On reaching the point of saturation, they are precipitated on the internal walls of the boiler. If the sediment is loose and skimmy, it is known as sludge. In contrast, if the residue is hard adhering crust, it is known as scales. Sludge is slimy, soft and lose residue formed in the colder portions of the boiler. It is formed by substances that have greater solubility in hot water. Example: Magnesium carbonate, magnesium chloride, calcium chloride and magnesium sulphate.

Practise Questions on Chemical Engineering

Q1. If the pH value of an acidic solution is decreased from 5 to 2, then the increase in its hydrogen ion concentration is _____ times.

- (a) 10
- (b) 100
- (c) 1000
- (d) 10000

Answer: ©, If the pH value of an acidic solution is decreased from 5 to 2, then the increase in its hydrogen ion concentration is 1000 times.

Explanation: We know that,

$$\text{pH} = -\log [\text{H}^+]$$

$$[\text{H}^+] = 10^{-\text{pH}}$$

Given, pH = 5

$$[\text{H}^+] = 10^{-5}$$

The pH of the solution is decreased to 2.

$$[\text{H}^+] = 10^{-2}$$

The change in concentration of $[\text{H}^+]$ is $10^{-2} / 10^{-5}$
 $= 10^3 = 1000$

Hence the hydrogen ion concentration is increased by thousand times.

So, option © is correct.

Q2. What are the disadvantages of sludge formation?

Answer: In the boiler, evaporation and concentration of dissolved salts rise constantly. On reaching the point of saturation, they are precipitated on the internal walls of the boiler. If the sediment is loose and skimmy, it is known as sludge.

Disadvantages of sludge:

- Sludges are insulators of heat. They waste the portion of the heat generated.
- If sludges and scales are formed together, the former gets trapped in the latter, and both get deposited as scales.
- Extreme sludge formation troubles the working of the boiler.
- Sludge settles in the regions of poor water circulation, such as pipe connection, plug opening, and gauge-glass connection.
- Sludge chokes the pipes of the boiler.

Q3. Give an example of negative work?

Answer: When brakes are applied to a moving vehicle, the work done by the brake force is negative.

Q4. What are PCBs?

Answer: PCB is the abbreviation of Poly Chlorinated Biphenyls. It is primarily utilised for disposal issues, usually in the chemical industry.

Q5. What is the primary function of a three-way catalytic converter?

Answer: The primary function of the three-way catalytic converter is nitrogen oxide reduction, carbon monoxide oxidation, and uncombusted hydrocarbon oxidation.

