Q1: What is surface catalysis?

A1: Many important industrial processes rely on heterogeneous catalysis, in which the catalyst is in a different phase. Usually the catalyst is a solid and the reactants are gases, and so the rate-limiting step occurs at the solid surface. Thus heterogeneous catalysis is also referred to as surface catalysis.

Q2: What are the industrial application of heterogeneous catalysis?

A2: Heterogeneous catalysts are used extensively in the petroleum industry. One example is the combination of SiO_2 and Al_2O_3 used to speed up cracking of long-chain hydrocarbons into the smaller molecules needed for gasoline. Another is the Pt catalyst used to reform hydrocarbon chains into aromatic ring structures. This improves the octane rating of gasoline, making it more suitable for use in automobile engines.

Q3: What is the main difference between heterogeneous and homogeneous catalysis?

A3: For heterogeneous catalysts, phase boundaries are always present between the catalyst and the reactants, in homogeneous catalysis, catalyst, starting materials, and products are present in the same phase. Homogeneous catalysts have a higher degree of dispersion than heterogeneous catalysts since in theory each individual atom can be catalytically active. In heterogeneous catalysts only the surface atoms are active

Q4: What is activity of the catalyst?

A4: Activity is a measure of how fast one or more reactions proceed in the presence of the catalyst. Activity can be defined in terms of kinetics. In a formal kinetic treatment, it is appropriate to measure reaction rates in the temperature and concentration ranges that will be present in the reactor.
Activity of a catalyst depends on the texture and electronic structure. Activity of a catalyst can be explained by:

- Active centers on the surface of the catalyst
- Geometry of surface
- Electronic structure
- Formation of surface intermediates