Q1: What is turn over frequency TOF?

A1: The turnover frequency TOF quantifies the specific activity of a catalytic centre for a special reaction under defined reaction conditions by the number of molecular reactions or catalytic cycles occurring at the centre per unit time. For heterogeneous catalysts the number of active centres is derived usually from sorption methods .

$$TOF = \frac{\text{volumetric rate of reaction}}{\text{number of centers/volume}} = \frac{\frac{\text{moles}}{\text{volume.time}}}{\frac{\text{volume}}{\text{moles}}} = \text{time}^{-1}$$

For most relevant industrial applications the TOF is in the range 10^{-2}–10^{2} s^{-1} (enzymes10^{3}–10^{7} s^{-1}).

Q2: What is turn over number (TON)?

A2: The turnover number specifies the maximum use that can be made of a catalyst for a special reaction under defined conditions by a number of molecular reactions or reaction cycles occurring at the reactive centre up to the decay of activity.

Q3: What is the relation between TON and TOF?

A3: TON = TOF [$time^{-1}$] *lifetime of the catalyst [time]
For industrial applications the TON is in the range 10^{6}–10^{7}.

Q4: What is selectivity of a catalyst?

A4: The selectivity of a reaction is the fraction of the starting material that is converted to the desired product . It is expressed by the ratio of the amount of desired product to the reacted quantity of a reactant and therefore gives information about the course of the reaction.

Q5: What is the stability of a catalyst?

A5: The chemical, thermal, and mechanical stability of a catalyst determines its lifetime in industrial reactors. Catalyst stability is influenced by numerous factors, including decomposition, coking, and poisoning. Catalyst deactivation can be followed by measuring activity or selectivity as a function of time. Catalysts that lose activity during a process can often be

regenerated before they ultimately have to be replaced. The total catalyst lifetime is of crucial importance for the economics of a process.