Q1: What is the main difference between chemisorption and physical adsorption?

A1: Physical adsorption involves the forces of molecular interaction which embrace permanent dipole, induced dipole, and quadruple attraction. For this reason it is often termed van der

Waals adsorption. Chemisorption, on the other hand, involves the rearrangement of the electrons of the interacting gas and solid, with consequential formation and rupture of chemical bonds. Physical adsorption is characterised by enthalpy changes that are small, typically in the range -10 to -40 kJ mol^{-1} (heats of adsorption of 10- 40 kJ mol^{-1}), whereas heats of chemisorption are rarely less than 80 kJ mol^{-1} and often exceed 400 kJ mol^{-1}.

Q2: What is the significance of chemisorption in catalysis?

A2: Chemisorption is a kind of adsorption which involves a chemical reaction between the surface and the adsorbate. New chemical bonds are generated at the adsorbent surface. An important example of chemisorption is in heterogeneous catalysis which involves molecules reacting with each other via the formation of chemisorbed intermediates. After the chemisorbed species combine (by forming bonds with each other) the product desorbs from the surface.

Q3: <u>What makes zeolites special when compared with other inorganic oxide materials?</u>

A3: The combination of many properties, among them: the microporous character of the uniform pore dimensions, the ion exchange properties, the ability to develop internal acidity, the high thermal stability, the high internal surface area. These make zeolites unique among inorganic oxides.

Q4: **<u>Are zeolites stable?</u>**

A4: Many zeolites are thermally stable up to 500 °C. Some are stable in an alkaline environment, and some are stable in acidic media. They are also stable to ionizing radiation and can be used to adsorb radioactive cations.

Q5: What quantitative information can be obtained from TPD?

A5: The area under a TPD curve is proportional to the initial coverage of the adsorbate before desorption. If these areas can be calibrated, e.g. against ordered patterns in LEED, or against a known saturation coverage, TPD can be used to determine the surface coverage. A set of TPD curves contains highly valuable information on the concentration or surface coverage of species, and determining these, such that they can be combined with structures, vibrations or reactivity patterns, is one of the most useful applications of the technique.

Q6: What is meant by the term “texture” of a catalyst support?
A6: Specific surface area, pore volume, pore structure.