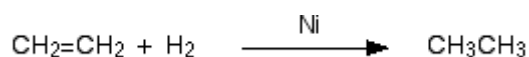


Chemguide – questions

TYPES OF CATALYSIS

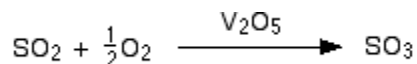
1. a) Explain what is meant by *homogeneous* and *heterogeneous* as applied to catalysts.
- b) If you have answered part (a) properly, you will have used the word *phase*. Explain with examples how *phase* differs from *physical state*.
2. a) Many gas reactions are catalysed by solids, and the process starts with the gas molecules being adsorbed on to the metal surface. Explain the difference between the words *adsorbed* and *absorbed*.
- b) Silver and tungsten aren't very good catalysts, but platinum and nickel can be excellent catalysts. Explain why this is in terms of the strength of the adsorption of gases to their surfaces.

3. a) Nickel catalyses the hydrogenation of a carbon-carbon double bond. For example, with ethene:



Draw a series of labelled diagrams to show the mechanism for this reaction, showing clearly the role of adsorption.

- b) In the Contact Process, the reaction between sulphur dioxide and oxygen is catalysed by vanadium(V) oxide:

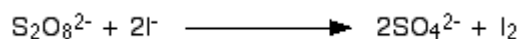


Write equations to show the mechanism of this reaction.

4. a) Catalytic converters use metals such as platinum, palladium and rhodium deposited in thin layers on a ceramic honeycomb. Explain the reasons for making the catalytic converter in this way.
- b) Write an equation to show how a catalytic converter might remove carbon monoxide and nitrogen monoxide from exhaust gases.
- c) Why is it essential not to use leaded petrol with a catalytic converter?
5. a) Explain the importance of ozone in the high atmosphere.
- b) Molecules such as CFCs (chlorofluorocarbons) generate free radicals which destroy atmospheric ozone. State the nature of the ozone-destroying free radicals, and write equations to help you to explain how these radicals destroy ozone.

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6. The reaction between persulphate ions and iodide ions is very slow in the absence of a catalyst.



It can be speeded up considerably by the presence of either iron(II) ions or iron(III) ions in the solution.

- What type of catalysis is this?
 - Why is the reaction so slow in the absence of a catalyst?
 - Use equations to help you to explain what happens in the presence of iron(II) ions.
7. The reaction between ethanedioic acid and a solution of potassium manganate(VII) acidified with dilute sulphuric acid is a good example of *autocatalysis*.



- Using this reaction as an example, explain what is meant by *autocatalysis*.
- If you plotted the concentration of the manganate(VII) ions against time as the reaction happened, sketch the graph you would expect to get.
- You can get similar curves in cases which don't involve autocatalysis. Suggest one other situation where you might get a similar curve.