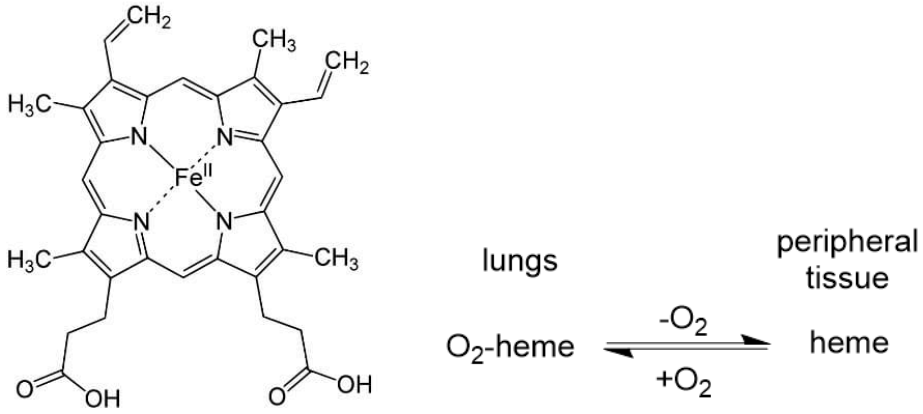
SchoolNova Chem 2 Worksheet 1:

Use the information provided to answer the following questions.



1. Identify and name two functional groups on the heme molecule.

2. Heme consists of an iron atom at its center. Iron (II) or a ferrous cation is typical. Iron can also get oxidized to a ferric cation. Will the charge be more positive or negative compared to the natural state?

3. The equation depicts the movement of oxygen by heme throughout the body. How does equilibria allow for oxygen to disperse?

4. The binding affinity of oxygen is lower than the binding affinity of some other gases, like carbon monoxide. Why might it be beneficial for oxygen to have a lower binding affinity? Why can a higher binding affinity be harmful? (Hint: think about #3 first)

5. Other metals can also chelate (bind) to the center of heme. Predict two ways that this could alter the properties of the complex.

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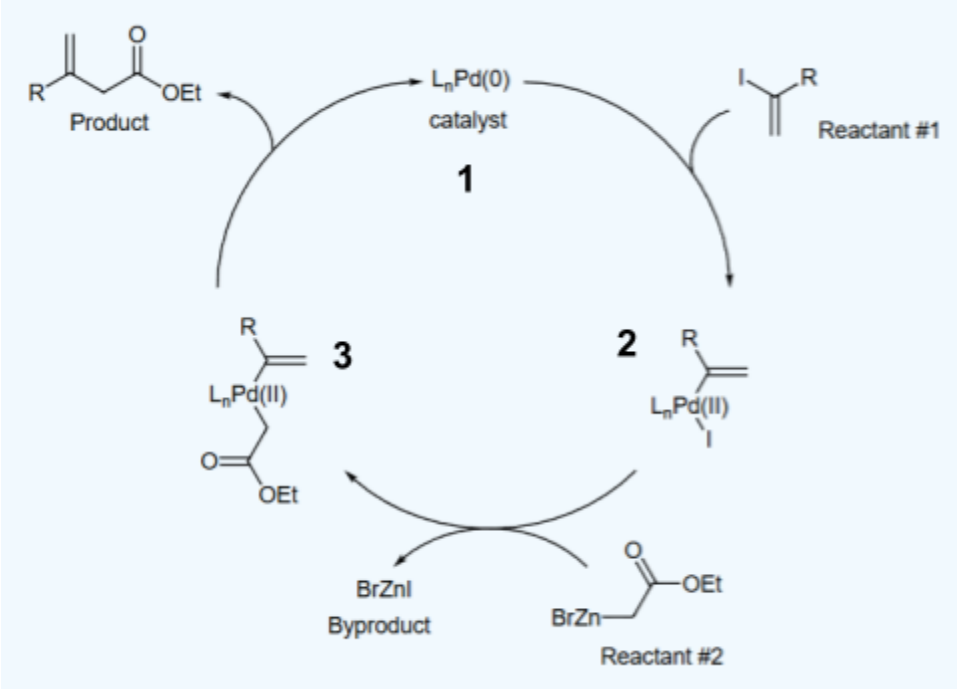

The Negishi reaction uses Palladium (Pd) as a catalyst to create carbon-carbon bonds. A halogen (in this case iodide) and zinc are crucial for this reaction to occur. Don't worry about L_n.

1. Why are metals able to readily make and break bonds?

2. Focusing on the organic molecules, what are some functional groups present?

3. Focusing on the catalyst, what step depicts oxidation and which depicts reduction? (Hint: Pd(II) indicates Pd^{2+})

4. Step **1** to **2** is an addition reaction. Describe how Reactant #1 is changing based on **2**.

5. The step from **2** to **3** is called transmetallation. Based on the figure, describe what is changing. What bonds are being made/broken?

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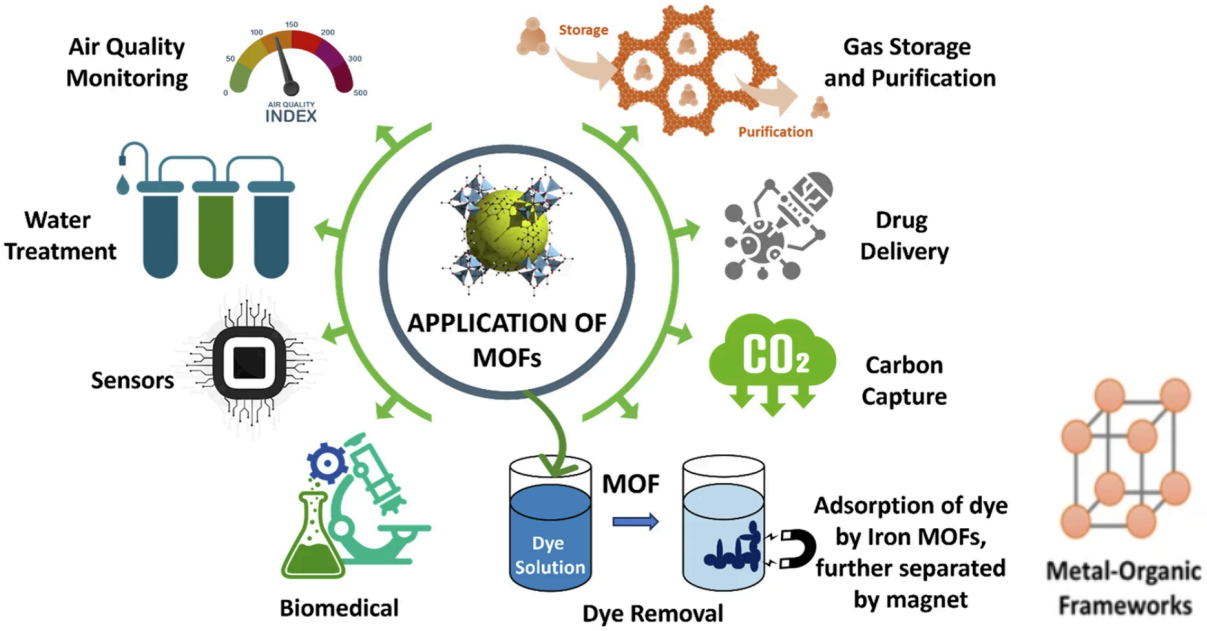
The winners of the Nobel Prize in Chemistry for 2025 study metal organic frameworks (MOFs). These are metal cations coordinated to each other using organic molecules to form porous crystalline networks with tunable properties. Based on the organic molecules, metals used, and dimensions, they can differ in pore size, hardness, stability, thermal properties, etc. Because of their porous nature, they are typically used as means of absorbing or filtering other materials. Some applications include electrocatalysis, semiconductive materials, carbon or hydrogen storage, luminescent imaging, and more! MOFs source (if you'd like to learn more)



1. Choose three different applications that are appealing to you. Based on the description provided, why might porous materials be advantageous for that field?