

## Aerogel Worksheet **Answers**

1. What is the difference between transparent, translucent and opaque?

Explain and give examples of each.

Transparent means light is permitted to pass through without diffusion. Some examples of transparent objects are glass, windows, some aerogels, etc. Translucent means some light passes through, but it is diffused. Some examples of translucent materials are stained glass, foggy windows, etc. Opaque means no light passes through (or materials that are not transparent or translucent). Examples are mirrors, desks, doors, pencils, etc.

2. Explain what it means for light waves to be absorbed, reflected or transmitted.

Also explain how this relates to transparency.

When light is absorbed, it is incorporated or taken up by a surface. When light is transmitted, it is sent through or sent to a destination/recipient. When light is reflected, it is cast back from a surface, such as a mirror. These behaviors of light are related to transparency because light can be transmitted through translucent items, reflected by some reflective opaque items, and absorbed by other opaque items. Translucent items transmit some of the light, but often diffuse the light.

3. What is a “composite” aerogel? What advantage might composite aerogels have over basic silica aerogels?

Composite aerogels are aerogels that are mixed with other materials, such as polymers. Composite aerogels can be stronger, lighter, less expensive or of a different transparency, depending on what characteristics they are designed to have.

4. Why is the sky blue?

The sky is blue because of Rayleigh scattering. Rayleigh scattering is the elastic scattering of light by particles much smaller than the wavelength of light. The highest percentage of scattering due to sunlight is in the blue range (explained on slide 12).

5. Design an application that takes advantage of at least two properties of aerogels or composite aerogels: high surface area, low density, low thermal conductivity, mechanical robustness, transparency, hydrophobicity, etc. *Open your mind to the possibilities!*

Write the design specifications and provide a sketch of your design. Include details such as estimated price and/or weight, targeted consumer audience, and which aerogel properties are being exploited. If it is a novel invention, include the research that may still need to be done before the product is ready for the marketplace.

Answers will vary. Be open to creative ideas. Look for the incorporation of at least two aerogel properties that are pertinent to the invention’s purpose. Look for completeness in logic and explanation. Bonus points for novel ideas with potential.