

Practice Questions:

1) John wants to build a go-cart in order to enter a race taking place this summer. What material(s) should he use for each of the parts listed below? Explain your answer.

a) Tire:

b) Body Frame:

c) Seat:

- a) Rubber → Needs to adhere to road surface (adhesion) for grip.
Needs to have some elasticity (bounce) to reduce the feeling of bouncing/bumps
- b) Metal → Needs to be strong in the event of an accident/collision.
- c) Metal → Can be used to make the interior shape/structure.
Foam, vinyl, cloth, leather → Seat covering (for comfort)

2) Hockey sticks are made from a material that can resist indentation and shock when coming into contact with a puck or the ice. The material also has to be lightweight to be easily handled by the player. Here is a list of possible materials to choose from:

Materials	Properties
Steel	Hardness Resilience Ductility High density High thermal conductivity
Carbon fibre	Low density Hardness Resilience Electrical conductivity Resistant to corrosion Rigidity

Materials	Properties
Polymethyl (acrylic)	Hardness Rigidity Comes in a variety of colours Malleability Brittleness
Polyamide (nylon)	Resilient Medium hardness Flexible High moisture absorbance

Which of the materials in the given table would be the best material to use for a hockey stick? Explain your choice by using the properties of the materials.

Carbon Fiber:

Low Density means light weight

Hardness and resilience means it will not dent or break due to shocks

Resistance to Corrosion means it will not deteriorate when in contact with water

Rigidity means it will resist the application of constraints

3) What mechanical properties should materials for a hard-hat have? Explain your answer.



To protect the wearer from dangers, the hard-hat must have the following:

Hardness (to avoid scratches and dents)

Resilience (in case of shocks/impacts, the hard-hat will not break)

Stiffness (the hard-hat needs to hold its shape when confronted with constraints)

Non-Electrically conductive (in case head comes into contact with electrical wires)

4) Why would a homeowner choose a ceramic floor in the kitchen and bathroom rather than a wooden floor?

Ceramic Floors are ideal because these rooms deal with water. Wood would rot in these environments over time. Ceramic floors do not absorb water, can easily be cleaned.

5) You are thinking of building of a deck in your backyard. You look at a neighbor's deck and see that it is discolored and rotten in certain places.

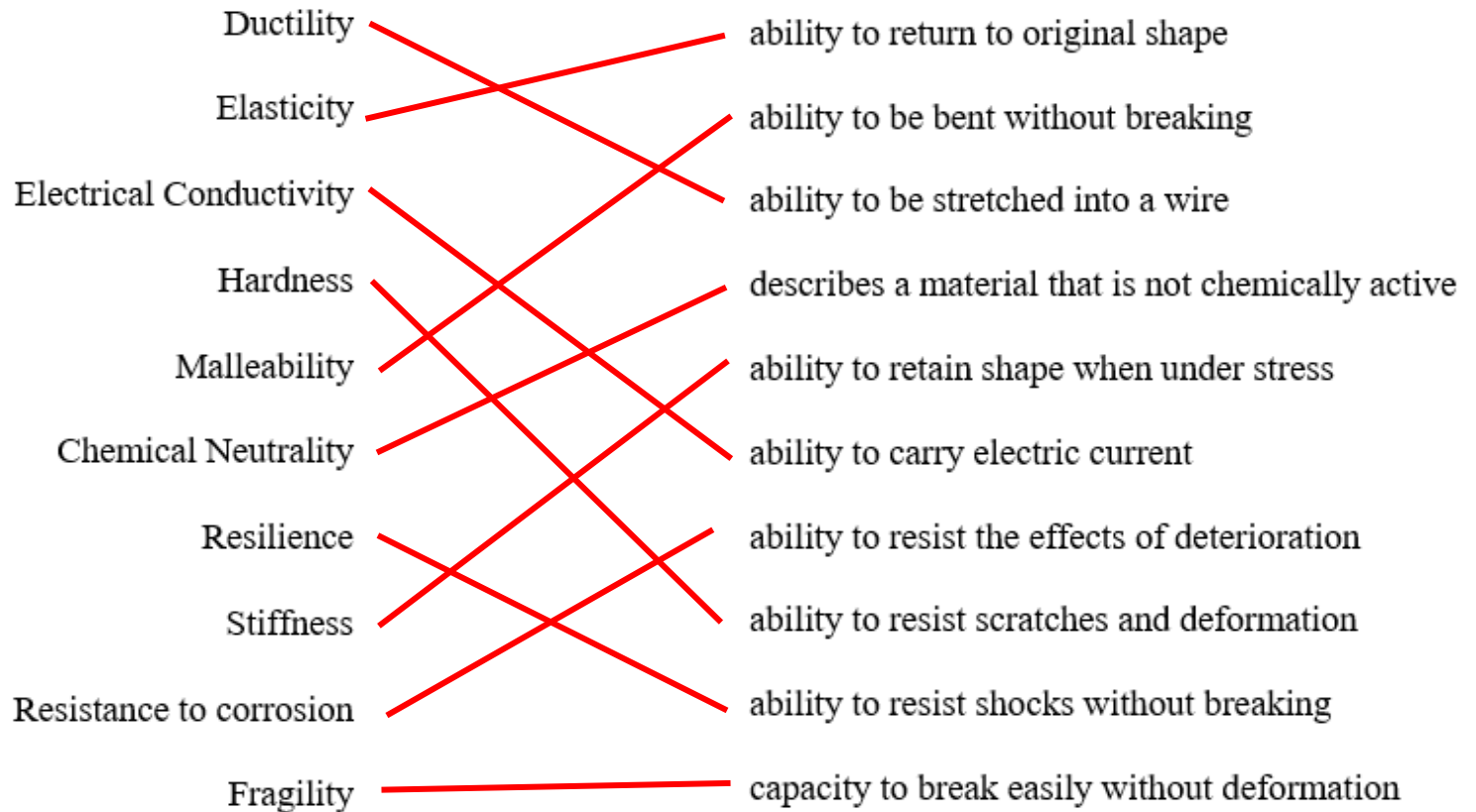
a) How can you explain the state of your neighbor's deck?

The neighbor's deck is rotten/dicoloured because the wood was not treated to prevent degradation.

b) How could you prevent your deck from looking like your neighbor's?

Use pressure treated wood (has preservatives) in order to prevent rot
Use chemical sealent on prolong life span of wood

6) Match each property with its correct definition.



7) What type of material am I ? *(Based on: Observatory 4, Second Edition, 2018, Activity Book)*

- a) I am the result of a metal mixed with another metal or other substance Alloy
- b) I am a material made from long chains of polymers derived from petroleum Plastic
- c) I am a solid material made from heating/baking inorganic materials Ceramic
- d) I am harvested by cutting living material. Wood
- e) I am shiny and conduct electricity Metal / Alloy
- f) I can change form when heated, and thus can be molded into different shapes Thermoplastic
- g) I do not conduct electricity very well and made of plentiful inorganic materials Ceramic
- h) I am made of combined materials that give me enhanced properties Composite
- i) I am obtained by binding of organic material often using glue and pressure. Modified Wood
- j) I am a plastic that keeps my shape even when heated Thermosetting Plastic
- k) I am ductile and malleable. I originate from ores mined from beneath. Metal
- l) I am often used as an insulator because I do not conduct electricity well. Ceramic