

Answer Key to Questions in Chapter 12 Notes

1. Many bathtubs are made of acrylic and fibreglass. The two materials are combined so well that they appear as one. That is why people often say that bathtubs are made of fibreglass, even though their main component is really acrylic.

a) Which category of material does the bathtub material described above belong to?

Composites

b) What is the matrix made of?

Plastic

c) What is the reinforcement made of?

Fibreglass

d) Given that acrylic softens enough when heated to be remoulded and retains its shape once cooled, which subcategory of plastics does acrylic belong to?

It belongs to the subcategory of thermoplastics.

2. In toasters with slots, the electric current flows through heating filaments. Part of the electrical energy is converted into thermal energy, which toasts the bread. Refer to different properties of materials to explain why it is dangerous to use a metal utensil to remove toast that is stuck in the toaster while the appliance is plugged into an outlet.

It is dangerous because metals are usually good conductors of electricity. If a person inserts a metal utensil into the slot of a toaster through which current is flowing, he or she may receive a serious electrical shock.

3. Ian's grandfather's cottage has been neglected and needs extensive repairs. The wooden siding has started to rot, and the abandoned metallic flagpole is flaking due to corrosion. In addition, the plastic around the south-facing windows has turned yellow in the sun.

a) How could Ian's grandfather have delayed the degradation of the metal flagpole? Suggest two means of protection.

Answers will vary. Examples: by coating it in grease or resin, by enamelling or painting it or by using a corrosion-resistant metal.

b) What could have been added to the plastic during manufacture to make the material more sun-resistant?

Pigments that absorb ultraviolet rays.

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4. Your cousin, who is developing an interest in cooking, asks you what is meant by the expression *hardened steel*, which is often used in connection with knives.

a) First, you need to explain what quench hardening is. What do you tell her?

Quench hardening is a process in which the temperature of the steel is raised to over 800°C and then rapidly lowered.

b) Next, you need to explain that quench hardening is often followed by tempering. Explain what tempering is.

Tempering is the elevation of the steel temperature, but to a lower degree than for quench hardening.

c) Your cousin then wonders why such thermal treatments are useful for kitchen knives. What would you tell her?

The heat treatments enhance certain mechanical properties of the steel. It becomes harder, which is a desirable property in kitchen knives.
