

Colligative Properties Homework

Explain what happens when a substance dissolves in water. Be sure to mention the forces involved as the substance goes into solution.

Why does oil not dissolve in water?

What do you know to be true about a substance that does dissolve in water?

How can we be sure that a substance that dissolves in water will decrease its freezing point and increase its boiling point?

Why does a solute cause the boiling point of water to increase?

Why does a solute cause the freezing point of water to decrease?

Why do we spread salt on our icy roads in the winter time? At a molecular level, why does this work?

The radiator in your car is filled with a solution of water and ethylene glycol (anti-freeze). Explain why adding the antifreeze provides advantages over filling your radiator with pure water.

Given the chart at right (from the back of an antifreeze container) how much antifreeze must be added to a 16 quart cooling system to protect the radiator down to -19°F ?

Given the chart at right, does antifreeze (along with the 15psi pressure cap mentioned) provide greater protection from freezing or boiling?

What roles does the 15psi pressure cap play in your car's cooling system?

PEAK® ANTIFREEZE & COOLANT MEANS MAXIMUM SEVERE CONDITIONS PROTECTION										
Cooling System Capacity In Quarts	Quarts of Antifreeze Required for Protection to Temperatures (°F) Shown									
	3	4	5	6	7	8	9	10	11	
8	-7	-34	-69							
9	0	-21	-50	-70						
10	4	-12	-34	-62						
11	8	-6	-23	-47	-65					
12	10	0	-15	-34	-57					
13		3	-9	-25	-45	-64				
14		6	-5	-18	-34	-54	-68			
15		8	0	-12	-26	-43	-62			
16		10	2	-8	-19	-34	-52	-64		
17			5	-4	-14	-27	-42	-58	-69	
18			7	0	-10	-21	-34	-50	-62	
19			9	2	-7	-16	-28	-42	-56	
20			10	4	-3	-12	-22	-34	-48	

For best overall protection, solution strengths within the yellow color band are recommended.

FREEZE/BOIL PROTECTION CHART	% of Cooling System Capacity	PROTECTS FROM	
		Freezing Down to	Boiling Up to*
	50	-34°F	265°F
	60	-62°F	270°F
	70	-84°F	276°F

*Using a 15 PSI Pressure Cap