Periodic Table of the Elements

1A 1	2A 2	3B 3	4B 4	5B 5	6B 6	7B 7	8B 8	8B 9	8B 10	1B 11	2B 12	3A 13	4A 14	5A 15	6A 16	7A 17	8A 18
1 H 1.0079																	2 He 4.0026
3 Li 6.941	4 Be 9.0122											5 B 10.811	6 C 12.011	7 N 14.0067	8 O 15.9994	9 F 18.9984	10 Ne 20.1797
11 Na 22.9898	12 Mg 24.3050											13 Al 26.9815	14 Si 28.0855	15 P 30.9738	16 S 32.066	17 Cl 35.4527	18 Ar 39.948
19 K 39.0983	20 Ca 40.078	21 Sc 44.9559	22 Ti 47.88	23 V 50.9415	24 Cr 51.9961	25 Mn 54.9380	26 Fe 55.847	27 Co 58.9332	28 Ni 58.69	29 Cu 63.546	30 Zn 65.39	31 Ga 69.723	32 Ge 72.61	33 As 74.9216	34 Se 78.96	35 Br 79.904	36 Kr 83.80
37 Rb 85.4678	38 Sr 87.62	39 Y 88.9059	40 Zr 91.224	41 Nb 92.9064	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.9055	46 Pd 106.42	47 Ag 107.8682	48 Cd 112.411	49 In 114.82	50 Sn 118.710	51 Sb 121.75	52 Te 127.60	53 I 126.9045	54 Xe 131.39
55 Cs 132.9054	56 Ba 137.327	57 La 138.9055	72 Hf 178.49	73 Ta 180.9479	74 W 183.85	75 Re 186.207	76 Os 190.2	77 Ir 192.22	78 Pt 195.08	79 Au 196.9665	80 Hg 200.59	81 Tl 204.3833	82 Pb 207.2	83 Bi 208.9804	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89 Ac (227)	104 Rf (261)	105 Db (262)	106 Sg (263)	107 Bh (262)	108 Hs (265)	109 Mt (266)									

58 Ce 140.115	59 Pr 140.9076	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.965	64 Gd 157.25	65 Tb 158.9253	66 Dy 162.50	67 Ho 164.9303	68 Er 167.26	69 Tm 168.9342	70 Yb 173.04	71 Lu 174.967
90 Th 232.0381	91 Pa 231.0359	92 U 238.0289	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (260)

This print-out should have 8 questions. Multiple-choice questions may continue on the next column or page – find all choices before answering. The due time is Central time.

Mlib 00 6041

13:07, general, multiple choice, > 1 min, fixed.

001

The specific heat of liquid water is 4.184 J/g·°C, and of steam 2.03 J/g·°C. The heat of vaporization of water (ℓ) is 2.26 kJ/g and its boiling point is 100°C.

What is the total heat flow when 18 grams of water at 12°C are heated to become steam at 109°C?

1. 47.6 kJ **correct**

2. 40.7 kJ

3. 31.7 kJ

4. 48.9 kJ

5. over 55 kJ

6. 44.4 kJ

7. under 28 kJ

Explanation:

$$\underset{12^\circ\text{C}}{\overset{18\text{ g}}{H_2O(\ell)}} \xrightarrow{\text{step 1}} \underset{100^\circ\text{C}}{\overset{18\text{ g}}{H_2O(\ell)}} \xrightarrow{\text{step 2}} \underset{100^\circ\text{C}}{\overset{18\text{ g}}{H_2O(g)}} \xrightarrow{\text{step 3}} \underset{109^\circ\text{C}}{\overset{18\text{ g}}{H_2O(g)}}$$

$$\text{Step 1: } \frac{4.184\text{ J}}{\text{g}\cdot^\circ\text{C}} \cdot (18\text{ g}) \cdot (100 - 12)^\circ\text{C} = 6{,}627\text{ J}$$

$$\text{Step 2: } \frac{2.26\text{ kJ}}{\text{g}} \cdot (18\text{ g}) \cdot \frac{1000\text{ J}}{1\text{ kJ}} = 40{,}680\text{ J}$$

$$\text{Step 3: } \frac{2.03\text{ J}}{\text{g}\cdot^\circ\text{C}} \cdot (18\text{ g}) \cdot (109 - 100)^\circ\text{C} = 329\text{ J}$$

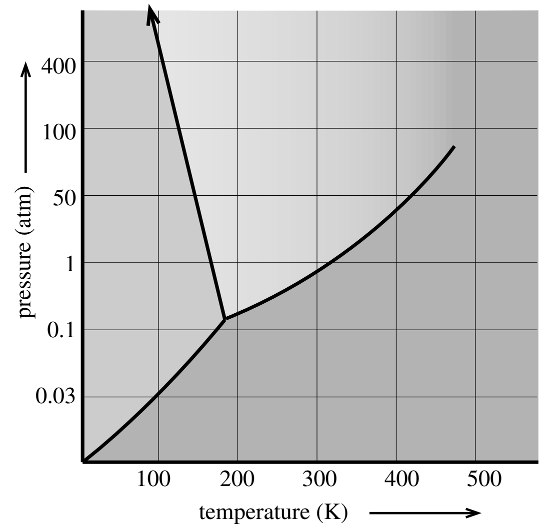
$$\text{Total} = 6627\text{ J} + 329\text{ J} + 40,680\text{ J} = 47{,}636\text{ J} = 47.636\text{ kJ}$$

DAL 0301 12

13:08, general, multiple choice, < 1 min, fixed.

002

Consider the phase diagram for water.



How is the PT phase diagram for water different from PT phase diagrams of other common chemicals?

1. The slope of the phase transition line between solid and liquid is negative. **correct**

2. The triple point occurs near the boiling point of water.

3. It is not possible to produce supercritical H_2O.

4. Sublimation does not occur.

5. Water as a liquid is less dense than water as a solid.

Explanation:

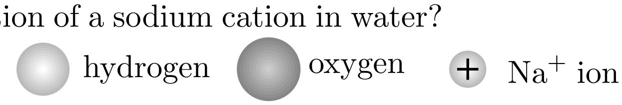
Water is unique in that the slope of the phase trasition line between solid and liquid is negative. Solid water is less dense than liquid water, where most other solids are more dense than their liquids.

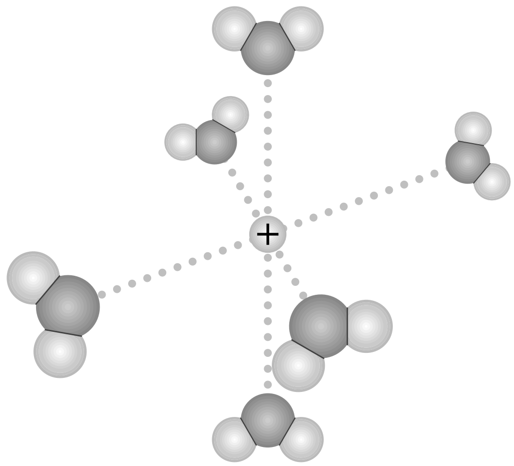
CIC T05 24

14:01, basic, multiple choice, < 1 min, fixed.

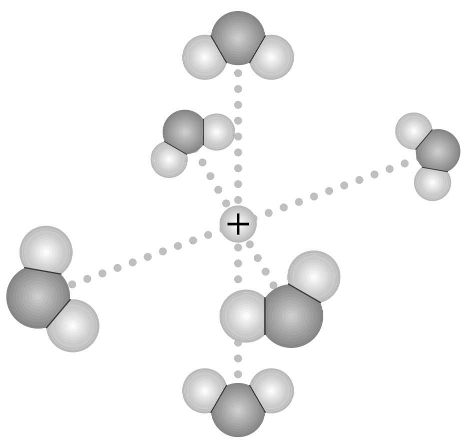
003

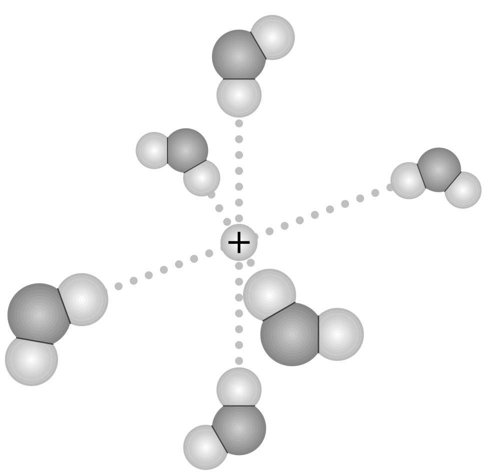
Which is the best representation of the solvation of a sodium cation in water?

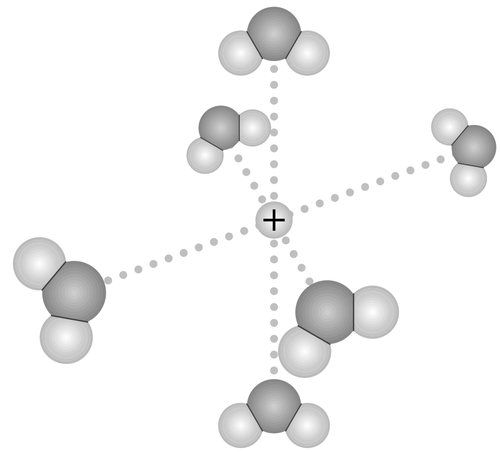


1. 

correct

2. 

3. 

4. 

Explanation:

Mlib 04 4055

14:01, general, multiple choice, > 1 min, fixed.

004

Which of the following alcohols would be the least miscible with water?

1. hexanol ($CH_3CH_2CH_2CH_2CH_2CH_2OH$) **correct**

2. pentanol ($CH_3CH_2CH_2CH_2CH_2OH$)

3. propanol ($CH_3CH_2CH_2OH$)

4. ethanol (CH_3CH_2OH)

5. methanol (CH_3OH)

Explanation:

The polar OH group is miscible with water but as the nonpolar hydrocarbon chain lengthens, solubility decreases.

ChemPrin3e T08 77

14:05, basic, multiple choice, < 1 min, fixed.

005

The normal boiling point of ethanol is 78° C.

If the vapor pressure of ethanol is 13.3 kPa at 34.9° C, calculate the enthalpy of vaporization of ethanol.

1. 42.4 kJ/mol **correct**

2. 54.3 kJ/mol

3. 68.1 kJ/mol

4. 84.7 kJ/mol

5. 95.3 kJ/mol

Explanation:

Mlib 04 5049

14:06, basic, multiple choice, > 1 min, fixed.

006

What is the boiling point of a 0.800 molal solution of sugar in water? $K_\mathrm{b} = 0.512\,°\mathrm{C}/m$ for water. Sugar does not dissociate in solution and pure water boils at 100°C.

1. 0.41°C

2. 100.82°C

3. 99.59°C

4. 100.41°C **correct**

5. 100.00°C

Explanation:

Mlib 04 5009

14:08, general, multiple choice, > 1 min, fixed.

007

Consider the solutions

Z1) 0.5 M Na_2SO_4
Z2) 0.6 M NaCl
Z3) 1.0 M sugar

What answer gives the expected order of increasing osmotic pressure?

1. lowest Z1 < Z2 < Z3 highest

2. lowest Z2 < Z1 < Z3 highest

3. lowest Z3 < Z2 < Z1 highest **correct**

4. lowest Z3 < Z1 < Z2 highest

5. lowest Z2 < Z3 < Z1 highest

Explanation:

The osmotic pressure of a liquid increases as the number of moles of solute particles or ions increases. 0.5 mol/L Na_2SO_4 means 0.5 mol of SO_4 ions and 1 mol of Na ions for a total of 1.5 ions. 0.6 mol/L NaCl means 0.6 mol of each Na and Cl ions for a total of 1.2 mol of ions. 1.0 mol/L of sugar means 1 mol of sugar molecules. Therefore, since Na_2SO_4 has the highest concentration of particles or ions, it will have the highest osmotic pressure. NaCl is next, followed by sugar.

ChemPrin3e T08 61

14:05, basic, multiple choice, < 1 min, fixed.

008

The vapor pressures of pure carbon disulfide and carbon tetrachloride are 360 and 99.8 torr, respectively, at 296 K.

What is the vapor pressure of a solution containing 50.0 g of each compound?

1. 241 torr

2. 33.0 torr

3. 260 torr

4. 274 torr **correct**

5. 460 torr

Explanation: