Chemistry 141 Name key

Dr. Cary Willard

Quiz 1a (20 points) August 31, 2010

All work must be shown to receive credit

1. (5 points) Indicate whether each of the following properties is a physical or chemical property of sodium

|  |  |
| --- | --- |
| * 1. Its density is greater than that of kerosene and less than that of water.
 | Physical |
| * 1. It is soft and can be easily cut with a knife.
 | Physical |
| * 1. Freshly cut sodium is shiny, but it rapidly tarnishes in contact with air.
 | Chemical |
| * 1. It reacts very vigorously with water to form hydrogen gas and sodium hydroxide.
 | Chemical |
| * 1. It is an excellent conductor of heat and electricity.
 | Physical |

1. (8 points) A farmer applies 2840 kg of a fertilizer that contains 14.5% nitrogen to his fields each year. 9.75% of the fertilizer washes into a river that runs through the farm. If the river flows at an average rate of 0.35 cubic feet per second, what is the additional concentration of nitrogen (expressed in milligrams of nitrogen per liter) in the river water due to the farmer’s yearly application of fertilizer?

? mg nitrogen washed into river

$$?mg N=2840 kg Fert on field×\frac{9.75 kg in river}{100 kg on field}×\frac{14.5 kg N in river}{100 kg in river}×\frac{1000 g N}{1 kg N}×\frac{1000 mg N}{1 g N}=4.01×10^{7}mg N$$

Amount of water running through farm

$$?L water=1 yr×\frac{365 day}{1 yr}×\frac{24 hr}{1 day}×\frac{3600 sec}{1 hr}×\frac{0.35 ft^{3}}{1 sec}×\left(\frac{12 in}{1 ft} ×\frac{2.54 cm}{1 in}\right)^{3}×\frac{1 L}{1000 cm^{3} }=3.1×10^{8}L water$$

Added Nitrogen

$$\frac{4.02×10^{7}mg N}{3.1×10^{8}L water}=^{0.13 mg N}/\_{L water}$$

1. (7 points) A new temperature scale has been developed in which the boiling point of water is 715oN and the freezing point of water is 345oN. Using this data, convert 58oC to oN. Draw pictures to illustrate your reasoning.

1st determine how many oN above the freezing point

$$58℃×\frac{370^{o}N}{100℃}=215^{o}N above FP$$

2nd adjust for the zero point

$$215^{o}N+345^{o}N=560.^{o}N$$

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Quiz 1b (20 points) August 31, 2010

All work must be shown to receive credit

1. (5 points) Indicate whether each of the following properties is a physical or chemical property of sodium

|  |  |
| --- | --- |
| * 1. Its density is greater than that of kerosene and less than that of water.
 | Physical |
| * 1. It is soft and can be easily cut with a knife.
 | Physical |
| * 1. Freshly cut sodium is shiny, but it rapidly tarnishes in contact with air.
 | Chemical |
| * 1. It reacts very vigorously with water to form hydrogen gas and sodium hydroxide.
 | Chemical |
| * 1. It is an excellent conductor of heat and electricity.
 | Physical |

1. (8 points) A farmer applies 2450 kg of a fertilizer that contains 12.5% nitrogen to his fields each year. 8.75% of the fertilizer washes into a river that runs through the farm. If the river flows at an average rate of 0.35 cubic feet per second, what is the additional concentration of nitrogen (expressed in milligrams of nitrogen per liter) in the river water due to the farmer’s yearly application of fertilizer?

? mg nitrogen washed into river

$$?mg N=2450 kg Fert on field×\frac{8.75 kg in river}{100 kg on field}×\frac{12.5 kg N in river}{100 kg in river}×\frac{1000 g N}{1 kg N}×\frac{1000 mg N}{1 g N}=2.68×10^{7}mg N$$

Amount of water running through farm

$$?L water=1 yr×\frac{365 day}{1 yr}×\frac{24 hr}{1 day}×\frac{3600 sec}{1 hr}×\frac{0.35 ft^{3}}{1 sec}×\left(\frac{12 in}{1 ft} ×\frac{2.54 cm}{1 in}\right)^{3}×\frac{1 L}{1000 cm^{3} }=3.12×10^{8}L water$$

Added Nitrogen

$$\frac{2.68×10^{7}mg N}{3.25×10^{8}L water}=^{0.0859 mg N}/\_{L water}$$

1. (7 points) A new temperature scale has been developed in which the boiling point of water is 715oN and the freezing point of water is 345oN. Using this data, convert 38oC to oN. Draw pictures to illustrate your reasoning.

1st determine how many oN above the freezing point

$$38℃×\frac{370^{o}N}{100℃}=141^{o}N above FP$$

2nd adjust for the zero point

$$141^{o}N+345^{o}N=486^{o}N$$