**Latent Heat Calculations**

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| **Substance** | **Latent Heat of Fusion**  **(kj/kg)** | **Latent Heat of Vaporization**  **(kj/kg)** |
| water | 334 | 2260 |
| aluminum | 399 | 10530 |
| copper | 207 | 4730 |
| hydrogen | 58 | 455 |
| lead | 23 | 859 |
| mercury | 11 | 295 |
| nitrogen | 26 | 200 |
| oxygen | 14 | 213 |
| silver | 111 | 2356 |
| gold | 63 | 1647 |

1. How much heat energy is needed to change 2000. g of solid ice at 0.00°C to liquid water at 0.00°C?

2. How much heat energy is needed to change 500. g of liquid water at 100.°C to complete steam at 100.°C?

3. A 25 gram ice cube is placed on the counter. After a while it completely melts. How much energy was required to melt it?

4. A 25 gram block of gold is heated to its melting point. More energy is put it and the gold melts. How much energy was required to melt it?

5. A beaker of water is heated to boiling. The water has a mass of 400. grams. How much energy will be needed to boil it?

6. 191 joules were needed to melt a substance that had a mass of 25 grams. What is the Heat of Fusion of the substance?

7. 162,680 joules were needed to boil 1250 grams of a liquid at its boiling point. What is the Heat of Vaporization of the liquid?

8. How many grams of copper could be melted if 750. J were used to heat it at its melting point?

9. The melting point of gold is 1064°C. Once a 200. g sample of gold has reached 1064°C, how much heat would be needed to melt it?

10. Mercury is a neurotoxin that when inhaled can be highly dangerous. Calculate the amount of energy required to boil 14 g of liquid mercury into a gas when it is already at 357°C, mercury’s boiling point.

11. How much energy in joules is required to heat 25 g of ice from -10.0°C to 0.0°C and completely change it to water? The specific heat of ice is 2.09 J/g°C.

12. A 1450 g sample of silver was at room temperature (25.0°C). How much heat would the sample need to change from the solid at room temperature into a complete liquid? The melting point of silver is 962°C. The specific heat capacity of solid silver is 0.232 J/(g°C).

13. How much heat does a refrigerator need to remove from 1,500. g of water at 20.0°C to completely make ice at 0.00°C? The specific heat of water is 4.186 J/g°C.

14. Calculate the energy transferred in joules when 29.5 g of liquid water decreases from 14°C to 0.0°C and then totally freezes at 0.0°C.

15. Calculate the energy transferred in joules when 12 g of liquid water rises from 22°C to 100.0°C and then completely boils away?

16. How much energy in joules does it take to raise 50.0 g of solid ice at 0.0°C to 100.0°C and then boil completely into a gas?

17. How much energy in joules does it take to raise 50.0 g of liquid ethanol at 25.0°C to 78.0°C (ethanol’s boiling point) and then evaporate completely into a gas? The specific heat of liquid ethanol is 2.44 J/g°C and its latent heat of vaporization is 846 J/g.

18. How much energy in joules does 28.5 g of liquid sulfur lose when it lowers from 120°C to 115°C (sulfur’s freezing point), then change completely into a solid? The specific heat of liquid sulfur is 0.71 J/g°C and the latent heat of fusion for sulfur is 54 J/g.

19. How much energy is required to heat 25 g of liquid water from 25°C to 100.0°C and change it completely into steam at 100.0°C.

20. Water leaves a hose at 20.0°C and is converted by the heat from a fire into steam where it reaches 300.°C. What amount of heat is removed from the fire by 1.00 tonne (1.00 × 106 g) of water? The specific heat of water is 4.186 J/g°C and the specific heat of water vapor is 2.09 J/g°C.

**Answers (in random order)**

-627000 -12000 -1600 3.62 7.6 130. 1600 4100 8400 8900 12600 31000 48800 64000 150000 476000 668000 904000 1130000 3010000000

g J J J J J J J J J J J J J J J J J J/g J/g