

Density: $d = m/v$ Measurement: d = density; abbreviated units: g/ mL or g/cm³Measurement: m = mass; abbreviated unit: gMeasurement: v = volume; abbreviated unit: mL or cm³**Heat Capacity: $q = mc\Delta T$** q = heat; unit: calories (cal) or Joules (J) m = mass; unit: gram (g) c = specific heat; units: [cal/ g °C] or [J / g °C] T = Temperature; unit: °C ΔT = change in temperature: Formula: $\Delta T = T_f - T_i$ Unit: °CCommon Conversion Factors: 1 mL = 1 cm³ 1 calorie (cal) = 4.184 Joules (J)

You may also need to look up information in your text book.

1. If 75.0 g of a liquid has a volume of 62.4 mL, what is the liquid's density in units of kg/mL?
Ans. 1.20×10^{-3} kg/mL

2. Aluminum is used to make some kitchen pots and utensils. The specific heat of Al is 0.901 J/g °C. How much heat is required to raise the temperature of a 235-gram pan by 15.0°C?
Ans. 3.18×10^3 J

3. What is the density of a substance that takes up 150.6 cm³ of space, and has a mass of 235.147 grams. Calculate the density in units of g / L.
Ans. 1.561×10^3 g/L.

4. What is the volume of 5.20 micrograms of oxygen gas. The density of pure oxygen is 0.00133 grams per cubic centimeter at 1 atmosphere pressure.
Ans. 3.91×10^{-3} cm³.

5. Ethanol (drinking alcohol) has a specific heat of 2.43 J/g °C. If 1071 J of heat is added to 36.0 grams of ethanol, what is the increase in temperature of the liquid?
Ans. 1.22×10^1 °C

6. What is the mass of 0.065 liters of copper, if the density of copper is 8.96 g / cm³.
Ans. 5.8×10^2 g

7. An 18.9-gram sample of manganese metal is warmed by adding 151.5 J of heat to it. If the temperature increases from 23.2°C to 39.9°C, what is the specific heat of manganese?
Ans. 4.80×10^{-1} J/g°C

8. A sample of nickel, with a mass of 16.8 centigrams, is heated by adding 104 J of heat to it. If the specific heat of nickel is 0.444 J/g °C, what is the change of temperature of the nickel sample?
Ans. 1.39×10^3 °C

9. If 75 milligrams of a substance occupies a volume of 325 microliters, what is its density in g / L ?
Ans. 2.3×10^2 g/L
10. Liquid ethanol (drinking alcohol) has a density of 0.785 g/mL. What is the mass, in grams, of one liter of ethanol?
Ans. 7.85×10^2 g or 8×10^2 g, assuming that "one liter" has 1 significant figure.
11. Liquid mercury has a very high density for a liquid: 13.6 g / mL. What is the mass of a liter of mercury...compare this mass to that of ethanol in the previous problem: mercury has much more mass per unit volume.
Ans. 1.36×10^4 g or 1×10^4 g, assuming that "one liter" has 1 significant figure.
12. 451.1 calories of heat is added to a piece of copper, and its temperature is raised from 25°C to 58°C. If the specific heat of copper is 0.384 J/g °C, what is the mass of the piece of copper?
Ans. 1.5×10^2 g
13. 32 grams of silver takes up how much space, in cubic centimeters? The density of silver is 10.5 g/mL.
Ans. 3.0×10^0 cm³
14. Calculate the amount of energy required (in Joules) to heat 2.5 kg of liquid water from 18.5°C to 55.0°C. See your textbook for extra information, 1st ed. p. 39, 2nd ed. p.41.
Ans. 3.8×10^5 J
15. The specific heat of quartz is 0.741 J/g °C. How much heat is required to raise the temperature of a 65.4-gram container made of quartz, from 20.0°C to 38.5°C?
Ans. 8.97×10^2 J
16. The temperature of an iron block is raised from room temperature, 25°C, to 85°C when 164.8 calories are added to the sample. The specific heat of iron is 0.449 J/g°C. What is the mass of the iron block, in kilograms?
Ans. 2.6×10^{-2} kg
17. Iron has a density of 7.87 g/cm³. What volume, in cL, will 52.4 grams of iron occupy?
Ans. 6.66×10^{-1} cL
18. What is the mass, in megagrams, of a gold ring which has a density of 19.32 g / cm³ and a volume of 0.259 mL.
Ans. 5.00×10^{-6} Mg
19. A sample of isopropanol (rubbing alcohol) absorbs 1628 J of heat. What is the mass of the sample, in grams, if the change in temperature of the sample is 13.34°C, and the specific heat is 0.600 cal/g °C.
Ans. 4.86×10^1 g
20. A 28.3-g sample of tin metal is warmed by adding 189.5 J of heat to it. If the temperature of the metal increases from 24.8°C to 55.7°C, what is the specific heat of tin, in kcal/g °C?
Ans. 5.18×10^{-5} kcal/g °C