

1. Which of the following metals requires the highest energy to raise the temperature of 1.00 g of it by 1.00 °C?

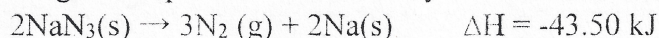
Specific Heat Capacities in J/g °C are: Ni = 0.440, Cu = 0.385, Pb = 0.160, Al = 0.900

A) Cu B) Al C) Pb D) Ni

2. Which of the following is an exothermic process?

A) melting B) evaporating
C) condensing D) boiling

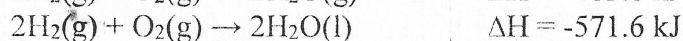
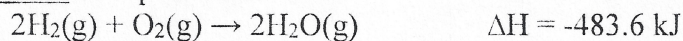
3. The following decomposition reaction may occur in a car air bag.



What is the heat of formation, ΔH_f (in kJ/mol) for NaN_3 ?

A) -43.50 B) 21.75 C) -21.75 D) 43.50

4. Given the following thermochemical equations, what is the energy (in kJ) required to evaporate one mole of liquid water?



A) 1055.2 B) 88.0 C) 527.6 D) 44

5. We allowed a gas sample to expand from 4.0 L to 44.0 L against an external pressure of 50.66 kPa. During this expansion, the gas absorbs 2400.5 J of heat from the surrounding. Calculate ΔE (in J) of this gas system. (1 L atm = 101.33 J)

A) -4427.1 B) +4427.1 C) -374.1 D) -374.1

6. The vapour pressure of pure water at some given temperature is 39 kPa. Which of the following values is most likely to be the vapour pressure (in kPa) of an aqueous solution of sucrose at the same temperature?

A) 37 B) 39 C) 41 D) zero

7. The osmotic pressure, at 300 K, of an aqueous solution obtained by dissolving 2.0 g of nonelectrolyte substance in water to make 200 mL solution is 23 torr. The molar mass (in g mol⁻¹) of this substance is:

A) 8.13×10^3 B) 1.38×10^4 C) 8.13×10^4 D) 3.18×10^4

8. Which of the following has the lowest vapor pressure?

A) water B) 0.5 M NaCl (aq)
C) 0.1M glucose solution D) 0.1 M NaCl (aq)

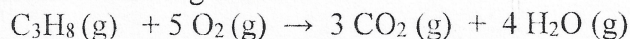
9. What is the van't Hoff factor of CrCl_3 salt, if 0.15 m CrCl_3 (aq) freezes at -0.91 °C? ($K_f(\text{water}) = 1.86 \text{ °C kg mol}^{-1}$)

A) 4 B) 1 C) 3.26 D) 1.7

10. We dissolved 5.0 g of nonvolatile and nonelectrolyte compound in 100.0 g of water. The solution obtained has a boiling point of 100.068 °C? What is the molar mass (g/mol) of this compound? ($K_b(\text{water}) = 0.512 \text{ } ^\circ\text{C kg mol}^{-1}$)
- A) 376 B) 190 C) 37 D) 88

11. A compound decomposes by a first-order process. If 75.0 % of the compound decomposes in 60.0 seconds, the rate constant, in s^{-1} , equals:
- A) 2.31×10^{-2} B) 3.12×10^{-2} C) 1.23×10^{-2} D) 3.21×10^{-3}

12. According to the following reaction:

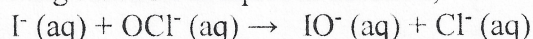


When the rate of formation of CO_2 is $2.1 \times 10^{-3} \text{ M/s}$, the rate of formation of H_2O (in M/s) is:

- A) 1.1×10^{-3} B) 2.1×10^{-3} C) 2.8×10^{-3} D) 4.4×10^{-3}

13. The rate constant $2.4 \times 10^{-4} \text{ M}^{-2} \text{ s}^{-1}$ belongs to a reaction that its order is:
- A) 0 B) 1 C) 2 D) 3

14. Consider the following reaction in aqueous solution,



and the following initial concentration and initial rate data for this reaction:

$[\text{I}^-], \text{M}$	$[\text{OCl}^-], \text{M}$	initial rate, M s^{-1}
0.100	0.0500	3.05×10^{-4}
0.200	0.0500	6.10×10^{-4}
0.300	0.0100	1.83×10^{-4}
0.300	0.0200	3.66×10^{-4}

Which of the following is the correct rate law for this reaction?

- A) Rate = $k[\text{I}^-]$ B) Rate = $k[\text{I}^-]^2$
C) Rate = $k[\text{I}^-][\text{OCl}^-]$ D) Rate = $k[\text{I}^-]^2[\text{OCl}^-]$

15. The rate constant for a certain chemical reaction is 0.00250 s^{-1} at 25.0 °C and 0.0125 s^{-1} at 50.0 °C. What is the activation energy for the reaction, expressed in kJ?

- A) 25.1 B) 51.6 C) 37.6 D) 45.3