7.0 Practice Test

SECTION 1: A, B, or C. Determine whether each description refers to an endothermic process, exothermic process, or either. (1 point each)

1. CaCl₂ (s), when dissolved in water, warms up. (A) Endothermic (B) Exothermic (C) Either
2. Energy is absorbed in a reaction process. (A) Endothermic (B) Exothermic (C) Either
3. 2 KClO₃(s) + energy → 2 KCl (s) + 3 O₂(g) (A) Endothermic (B) Exothermic (C) Either
4. The following potential energy graph:

   [Diagram of a potential energy graph showing Reactant and Products]

   (A) Endothermic (B) Exothermic (C) Either
5. The reaction mixture has a temperature of 200°C. (A) Endothermic (B) Exothermic (C) Either
6. Q = - 250 J (A) Endothermic (B) Exothermic (C) Either

SECTION 2: MULTIPLE CHOICE. Select the best answer choice for each question. (2 points each)

7. Which of the following is true about the freezing of water?
   I. H₂O (l) → H₂O (s) + heat
   II. Q > 0
   III. Molecular attractions are weakened.
   (A) I only. (B) I and II only. (C) II and III only. (D) I, II and III.

8. The units for specific heat are:
   (A) J (B) J/°C (C) J/g (D) J/g·°C

9. Which of the following is true for an endothermic process?
   (A) Heat is a product. (B) Q < 0 (C) The reaction mixture may increase in temperature. (D) The reaction releases heat.

10. A substance with high specific heat:
    (A) Is a conductor. (B) Is exothermic (C) Metals are typical examples. (D) Requires more energy to raise the temperature than a substance with lower specific heat.
11. Which of the following is an example of an endothermic process?
   (A) The combustion of methane, CH₄, releasing heat.
   (B) The dissolving of CaCl₂, which feels warmer.
   (C) The freezing of water at 0°C.
   (D) The vaporization of ethanol, C₂H₅OH, when heated.

12. 30.0 g samples of liquid ethanol and water are heated at their respective boiling points. Which sample will take longer to vaporize completely? (∆H_vap: ethanol = 200 cal/g, water = 540 cal/g)
   (A) Ethanol
   (B) Water
   (C) Both will take the same amount of time.
   (D) It cannot be determined from the information given.

13. Which of the following is the correct equation for the condensation of water?
   (A) heat + H₂O (l) → H₂O (g)
   (B) H₂O (l) → H₂O (g) + heat
   (C) heat + H₂O (g) → H₂O (l)
   (D) H₂O (g) → H₂O (l) + heat

14. Which of the following takes place initially when heat is added to a block of ice at 0°C?
   I. The temperature increases.
   II. The ice melts.
   III. Molecular attractions strengthen.
   (A) I only.
   (B) II only.
   (C) I and II only.
   (D) II and III only.

15. Blocks A and B are made from different metals and have the same mass. When they are heated with 500 J of energy, block A increases 15°C, while block B increases 90°C. Which has a larger specific heat?
   (A) Block A
   (B) Block B
   (C) They have the same specific heat.
   (D) There is not enough information to compare.

16. When a 20-g of a metal is heated with 140 J of energy, the temperature increases from 20.0°C to 50.8°C. Which of the following could be the metal?
   (A) Aluminum C_p = 0.897 J/g·°C
   (B) Tin C_p = 0.227 J/g·°C
   (C) Titanium C_p = 0.523 J/g·°C
   (D) Tungsten C_p = 0.134 J/g·°C
SECTION 3: FREE RESPONSE. Show all your work to receive full credit.

17. When a piece of glass was heated with 360 J of energy, the temperature of the glass increased from 33.5°C to 46.5°C. What is the mass of this piece of glass? \(C_p = 0.84 \text{ J/g·°C}\)

18. What is the final temperature when a 32.0 g piece of diamond at 33.5°C is heated with 360 J of energy? \(C_p = 0.509 \text{ J/g·°C}\)

19. What is the value of \(Q\) when 55.0 g of ice is melted at 0°C? \(\Delta H_{\text{fus}} = 333 \text{ J/g}\)

20. What is the value of \(\Delta H_{\text{vap}}\) of methanol, \(\text{CH}_3\text{OH}\), if 27,050 J is released when 24.5 g of methanol condenses?

21. Explain why it feels cold when \(\text{NH}_4\text{Cl}\) is dissolved in water.

Answers:

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<td>17.</td>
<td>33.0 g</td>
<td>18.</td>
<td>55.6°C</td>
<td>19.</td>
<td>18315 J</td>
<td>20.</td>
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21. The process is endothermic, so when the system absorbs heat, the energy (temperature) from the surroundings (your fingers) decreases.