

Multiple Choice

- 1) A 155.0 g piece of a certain metal was heated to 120.0°C and then plunged in a constant pressure coffee-cup calorimeter, of negligible heat capacity, containing 250.0 g of water at 22.0°C. The temperature of the system (the metal and the water) became 28.0°C. Assuming that there was no heat energy transferred to the surrounding and knowing that the specific heat of water is 4.184 J/g °C, calculate (in J/g °C) the specific heat of this metal.

A) 0.47 B) 0.44 C) 0.41 D) 0.38

- 2) Find (in kJ) the standard enthalpy of formation of NO gas $\Delta H_f^\circ[\text{NO(g)}]$, given the following data:



A) -85.0 B) -88.0 C) +88.0 D) +91.0

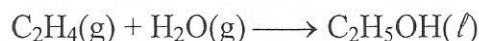
- 3) How much heat energy (in kJ) is released when 5.10 g of liquid octane "C₈H₁₈" is burned completely according to?:



given that: $\Delta H_f^\circ[\text{CO}_2(\text{g})] = -393.5 \text{ kJ}$,
 $\Delta H_f^\circ[\text{H}_2\text{O}(\text{l})] = -285.8 \text{ kJ}$ and
 $\Delta H_f^\circ[\text{C}_8\text{H}_{18}(\text{l})] = -210.0 \text{ kJ}$

A) -246 B) -249 C) -253 D) -257

- 4) Calculate (in kJ) the standard change in the internal energy ΔE° (ΔU°) for the following reaction:



knowing that: $\Delta H_f^\circ[\text{C}_2\text{H}_5\text{OH}(\text{g})] = -278 \text{ kJ}$,
 $\Delta H_f^\circ[\text{C}_2\text{H}_4(\text{g})] = +51.8 \text{ kJ}$ and
 $\Delta H_f^\circ[\text{H}_2\text{O}(\text{g})] = -241.8 \text{ kJ}$

A) -88 B) -85 C) -83 D) -81

- 5) At 20°C, the maximum mass of chlorine gas "Cl₂" that could be dissolved in 40.0 L of water under chlorine gas pressure of 1.25 atm is 283.6 g. What is the Henry's law constant (in mol/L.atm) for Cl₂ gas at 20°C?

A) 0.11 B) 0.08 C) 0.06 D) 0.04

- 6) The vapor pressure of a solution containing 18.5 g glycerin "C₃H₈O₃" in 36.9 g ethanol "C₂H₅OH" is 108.72 torr at 40.0°C. Calculate (in torr) the vapor pressure of pure ethanol at 40.0°C knowing that glycerin is a nonvolatile, nonelectrolyte solute in ethanol.

A) 136 B) 132 C) 128 D) 124



- 7) What mass (in g) of fructose " $C_6H_{12}O_6$ " (a nonvolatile, nonelectrolyte solute), must be dissolved in 500.0 g of water to give a solution that freezes at -2.5°C (The freezing point of pure water is zero $^\circ\text{C}$ and its $K_f = 1.86^\circ\text{C}/m$).

☐ A) 127 B) 124 C) 121 D) 118

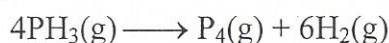
- 8) The osmotic pressure of a 0.02 M NiSO_4 (an electrolyte solute) solution at 40.0°C is 488.25 torr. What is the van't Hoff factor for NiSO_4 in this solution?

☐ A) 1.22 B) 1.25 C) 1.27 D) 1.29

- 9) Given two separate aqueous solutions at room temperature. The first solution contains 20% by mass glucose " $C_6H_{12}O_6$ " as the solute while the other contains 20% by mass sucrose " $C_{12}H_{22}O_{11}$ " as the solute. Which of the following statements is correct (knowing that both solutes are nonvolatile and nonelectrolyte)?

☐ A) The glucose solution should have the highest boiling point, the highest vapor pressure, the highest freezing points and the highest osmotic pressure.
B) The sucrose solution should have the highest boiling point, the highest vapor pressure, the highest freezing points and the highest osmotic pressure.
C) The glucose solution should have the lowest boiling point, the highest vapor pressure, the highest freezing points and the lowest osmotic pressure.
D) The sucrose solution should have the lowest boiling point, the highest vapor pressure, the highest freezing points and the lowest osmotic pressure.

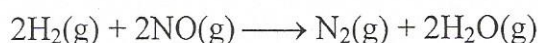
- 10) Consider the following reaction:



if in a certain experiment, over a specific time period 0.0048 mole of PH_3 is consumed in a 2.0 L reaction vessel each second of reaction. What is the rate of production of $\text{H}_2(\text{g})$ (in mol/L.s) in this experiment for the same time period?

☐ A) 7.2×10^{-2} B) 4.8×10^{-3} C) 3.6×10^{-3} D) 3.2×10^{-3}

- 11) The following data were collected for the reaction between hydrogen gas and nitric oxide gas at 700°C :



Experiment	$[\text{H}_2]$ mol/L	$[\text{NO}]$ mol/L	Initial rate (mol/L.s)
1	0.01	0.025	2.4×10^{-6}
2	0.005	0.025	1.2×10^{-6}
3	0.01	0.0125	6.0×10^{-7}

☐ A) rate = $k[\text{H}][\text{OH}]$ B) rate = $k[\text{H}]^2[\text{NO}]$
C) rate = $k[\text{NO}]^2$ D) rate = $k[\text{H}_2][\text{NO}]^2$

- 12) A certain first-order reaction is 45% complete in 64.7 s. what is the value of the half-life period (in s) for this reaction?

☐ A) 81 B) 78 C) 75 D) 72

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- 13) The activation energy for a certain first-order reaction is 114.0 kJ/mol. By what factor (how many times) will the rate constant increase when the temperature is raised from 37°C to 52°C?



A) 7.7

B) 7.5

C) 7.3

D) 7.1
