

Multiple Choice

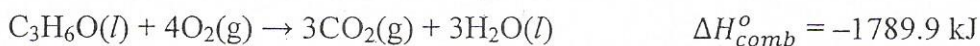
- 1) A 250.0 g plate of pure gold metal "Au" absorbs 903.0 J of heat energy as its temperature rises from 25°C to 53.0°C. The molar heat capacity (in J/mol °C) of pure gold is:

☐ A) 25.4 B) 28.2 C) 27.5 D) 26.3

- 2) A piece of 0.865 g of magnesium metal "Mg" is completely combusted in a constant-volume bomb calorimeter containing 1000.0 g of water. The heat capacity of the calorimeter alone (excluding the water) is 1.5 kJ/°C and the specific heat of water is 4.184 J/g °C. Knowing that the molar heat of combustion of magnesium metal is -602.0 kJ/mol, the temperature rise (in °C) of the calorimeter and its water is:

☐ A) 2.33 B) 4.25 C) 3.77 D) 2.88

- 3) Given the following thermal equation for the complete combustion of acetone "C₃H₆O":



And knowing that:

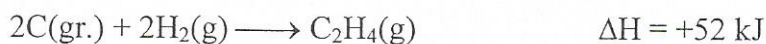
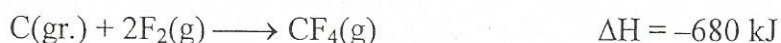
$$\Delta H_f^\circ[(\text{CO}_2)_g] = -393.5 \text{ kJ/mol}$$

$$\text{and } \Delta H_f^\circ[(\text{H}_2\text{O})_l] = -285.8 \text{ kJ/mol}$$

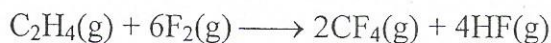
the heat of formation (in kJ) of acetone, $\Delta H_f^\circ[(\text{C}_3\text{H}_6\text{O})_l]$ is:

☐ A) -328 B) -226 C) +226 D) -248

- 4) From the enthalpies of the following reactions:

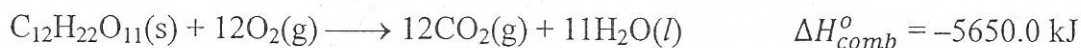


The magnitude of ΔH (in kJ) for the reaction of ethylene with fluorine is:



☐ A) -2538 B) -2486 C) -2382 D) -2330

- 5) The enthalpy change for the complete combustion of sucrose (table sugar) "C₁₂H₂₂O₁₁" is represented as:



the mass (in g) of sucrose which should be combusted in order to obtain 198.0 kJ of heat energy is:

☐ A) 10 B) 16 C) 14 D) 12

- 6) A certain gas absorbs 1555.9 J of heat energy as it expands in volume from 2.0 L to 10.0 L against a pressure of 1.5 atm. The change in the internal energy ΔE " ΔU " (in J) of this gas system is:

☐ A) +340 B) -275 C) -36 D) +36

- 7) At 17°C, the solubility of acetylene gas in acetone liquid is 6.75 g/L when the partial pressure of acetylene is 190 mmHg. The solubility (in g/L), at 17°C, of acetylene in acetone when the partial pressure of acetylene becomes 4.0 atm is:

☐ A) 96 B) 114 C) 108 D) 102

- 8) The vapor pressure of pure water at 20°C is 17.5 mmHg. At the same 20°C temperature, the vapor pressure (in mmHg) of water over a solution prepared from 90.1 g of urea " $(\text{NH}_2)_2\text{CO}$ " (a nonvolatile and nonelectrolyte solute) in 180.2 g of water is:

☐ A) 15.2 B) 16.8 C) 16.2 D) 15.7

- 9) An aqueous solution prepared from 7.5 g of a compound dissolved in 100.0 g of water, whereby the solution has a freezing point of -1.5°C. Knowing that for water $K_f = 1.86^\circ\text{C/m}$, the molar mass (in g/mol) of the solute compound is:

☐ A) 82 B) 93 C) 96 D) 87

- 10) An aqueous solution prepared from 22.0 g sodium chloride " NaCl " (an electrolyte) and enough water to make 750.0 mL of solution at 25°C. Knowing that the vant' Hoff factor for NaCl in this solution is 1.55, the osmotic pressure (in atm) of this solution is:

☐ A) 17 B) 11 C) 14 D) 19

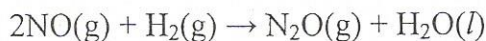
- 11) When heated above 500°C, potassium nitrate " KNO_3 " decomposes according to:



If at a certain period of time, the rate of disappearance of KNO_3 is $0.24 \text{ mol.L}^{-1}.\text{s}^{-1}$, the rate of appearance (in $\text{mol.L}^{-1}.\text{s}^{-1}$) of O_2 at the same period of time should be:

☐ A) 0.096 B) 0.48 C) 0.3 D) 0.12

- 12) Nitric oxide " NO " reacts with hydrogen " H_2 " according to:



The following initial rates of reaction (in $\text{mol.L}^{-1}.\text{min}^{-1}$) have been measured for the given reagent concentrations (in mol.L^{-1})

Exp.	$[\text{NO}]_0$	$[\text{H}_2]_0$	Initial rate
1	0.021	0.065	1.46
2	0.021	0.260	1.46
3	0.042	0.065	5.84

The initial rate (in $\text{mol.L}^{-1}.\text{min}^{-1}$) for this reaction when $[\text{NO}]_0 = 0.084 \text{ mol.L}^{-1}$ and $[\text{H}_2]_0 = 0.13 \text{ mol.L}^{-1}$ is:

☐ A) 23.36 B) 3.04 C) 55.96 D) 36.16

0

13) A certain first order reaction $A \rightarrow B$ is 25% complete in 42 min at 25°C . The half life period " $t_{1/2}$ " (in min) of A at 25°C is:

☐

A) 101.2

B) 131.4

C) 121.5

D) 111.3

14) At 770 K, the rate constant for the isomerization reaction of cyclopropane to propane which follows a first order kinetics is $2.4 \times 10^{-2} \text{ min}^{-1}$. The time (in min) required for this isomerization reaction to be 80% complete at 770 K is:

☐

A) 88

B) 67

C) 74

D) 82

15) A certain exothermic reaction has $\Delta H^{\circ} = -95 \text{ kJ/mol}$ and its activation energy is 25 kJ/mol. The activation energy (in kJ/mol) for its reverse reaction is:

☐

A) 120

B) 25

C) 70

D) 95
