Tutorials 1-5

What is the wavelength of the photon emitted when an electron drops from a 4d orbital to a 2p orbital in a hydrogen atom?

A. 656 nm
B. 365 nm
C. 2.06×10^{-3} nm
D. 120 nm
E. 486 nm

When is the work done on the system always positive?

A. $\Delta E > 0$
B. $\Delta V > 0$
C. $\Delta V = 0$
D. $\Delta V < 0$
E. $\Delta E < 0$

53.5 g of an ideal gas of molecular weight 30.5 g/mol is confined at a pressure of 133 mmHg. The density of the gas is 0.228 g/L. Calculate the temperature of the gas.

A. 261 °C
B. 12 °C

Tutorials 6-9

The reaction below is at equilibrium.

$$CS_2(g) + 4H_2(g) \rightleftharpoons CH_4(g) + 2H_2S(g)$$

How will the system behave if the partial pressure of hydrogen gas (H_2) is doubled?

A. The partial pressure of $H_2S(g)$ will decrease
B. The partial pressure of $CH_4(g)$ will decrease
C. The partial pressure of $CS_2(g)$ will decrease
D. The partial pressure of all gases will decrease
E. The partial pressure of all gases will increase

The K_p for the reaction below is 4.18×10^{-9} at 425 °C. If 0.200 atm HBr is added to an empty flask at 425 °C, what is the partial pressure of H_2 at equilibrium?

$$2HBr(g) \rightleftharpoons H_2(g) + Br_2(g)$$

A. 4.18×10^{-9} atm
B. 2.00×10^{-1} atm
C. 5.87×10^{-4} atm
D. 3.74×10^{-6} atm
E. 1.29×10^{-5} atm

Which of the following has no effect on the rate of a reaction?

A. the value of ΔH° for the reaction
B. The activation energy of the reaction
C. Presence of a catalyst
D. The temperature of the reactants

Thermodynamics

Arrange the following in order of increasing boiling point.

F_2, H_2O, SO_2, Br_2

A. $H_2O < SO_2 < Br_2 < F_2$
B. $SO_2 < F_2 < Br_2 < H_2O$
C. $Br_2 < F_2 < H_2O < SO_2$
D. $F_2 < Br_2 < SO_2 < H_2O$
E. $Br_2 < F_2 < SO_2 < H_2O$

The equilibrium constant for a reaction is 1.7×10^{-4} at 100 °C and 4.6×10^{-2} at 600 °C, which of the following statements must be **TRUE**?

A. The reaction is exothermic
B. The reaction always proceeds spontaneously from reactants to products
C. The reaction is endothermic
D. The products contain more moles of gas than the reactants
E. $Q < K$

The figure below is a cooling curve, showing the transformation of a gas into a liquid and a solid as it cools. Which of the statements below is **FALSE**?

A. The gas condenses into a liquid in region B of the curve
B. In region C as heat is removed, the liquid cools and the molecules move more slowly

Electrochemistry

Consider the unbalanced equation shown:
$C_2O_4^{2-}(aq) + MnO_4^-(aq) \rightarrow CO_2(aq) + Mn^{2+}(aq)$
How many moles of electrons are transferred per mole of reducing agent?

A. 1
B. 2
C. 3
D. 5
E. 10

Consider this galvanic cell:

$Pt(s)|H_2(1\ atm)|H^+(1\ M)\ ||\ Hg^+(aq)|Hg(l)\ |Pt(s)$

Which of the following changes to the cell would cause the cell potential to increase (become more positive)?

A. Increase the mass of Pt
B. Increase the pH
C. Decrease the mass of Pt
D. Decrease the pH

Which of the following statements is **TRUE**?

A. In a galvanic cell, electrical energy forces a non-spontaneous reaction to occur
B. The oxidation half-reaction occurs at the cathode
C. For a spontaneous reaction, the cell