

# CHEMISTRY



QUESTION CATALOGUE

# Chemistry

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# I. ATOMIC STRUCTURE

## 4. Electron Location/Energy

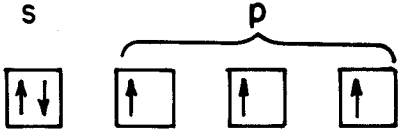



1476. In an atom of lithium in the ground state, what is the total number of orbitals that contain only 1 electron?

- (1) 1 (3) 3  
(2) 2 (4) 4

1435. A fluoride ion ( $F^-$ ) has the same electron configuration as

- (1) Na (3) Cl  
(2)  $Na^+$  (4)  $Cl^-$

1432. Which orbital notation correctly represents the outermost principal energy level of a sulfur atom in the ground state?

- (1) 
- (2) 
- (3) 
- (4) 

1386. Which atom may form a negative ion with the electron configuration  $1s^2$ ?

- (1) H (3) Li  
(2) He (4) Be

1371. Which is the electron configuration of an atom in the ground state?

- (1)  $1s^2 2s^1 2p^2$  (3)  $1s^2 2s^2 3s^1$   
(2)  $1s^2 2s^2 2p^5 3s^2$  (4)  $1s^2 2s^2 2p^6 3s^1$

1272. A  $K^+$  ion is similar to a  $Cl^-$  ion in that they both have the same

- (1) nuclear charge (3) number of protons  
(2) atomic number (4) **number of electrons**

1269. Which atom in the ground state has three electrons in the  $3p$  sublevel?

- (1) B (3) N  
(2) Al (4) **P**

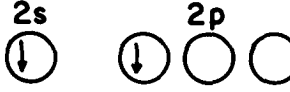

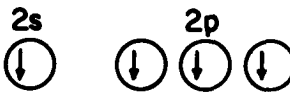
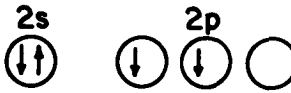
1210. What is the total number of orbitals in the third principal energy level?

- (1) 1 (3) **9**  
(2) 16 (4) 4

# C. \*Orbital Model

## 2. \*Electron Configurations

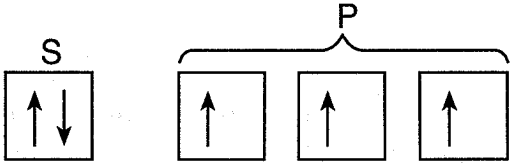
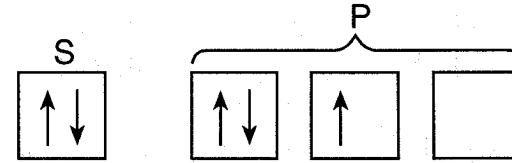
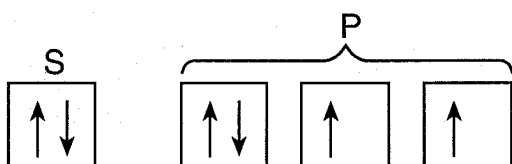
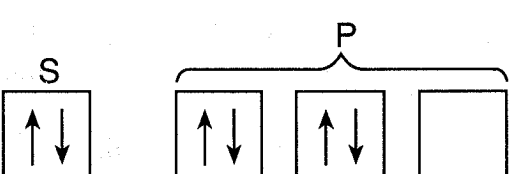
1328. Which is the correct orbital notation for the electrons in the second principal energy level of a beryllium atom in the ground state?

- (1) 
- (2) 
- (3) 
- (4) 

1095. Which electron configuration represents a potassium atom in the excited state?

- (1)  $1s^2 2s^2 2p^6 3s^2 3p^3$  (3)  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$   
(2)  $1s^2 2s^2 2p^6 3s^1 3p^4$  (4)  $1s^2 2s^2 2p^6 3s^2 3p^5 4s^2$

1038. Which orbital notation correctly represents the outermost principal energy level of a nitrogen atom in the ground state?

- (1) 
- (2) 
- (3) 
- (4) 

**III. MOLE/STOICHIOMETRY****7. \*Molar Number or Volume**

4391. What is the total volume occupied by 132 grams of  $\text{CO}_2(\text{g})$  at STP?
- (1) 22.4 L (3) 44.8 L  
(2) 33.6 L (4) **67.2 L**
4303. What will be the new volume of a 1.00-mole sample of a gas at STP if the pressure remains constant and the Kelvin temperature is halved?
- (1) **11.2 L** (3) 33.6 L  
(2) 22.4 L (4) 44.8 L
4276. At STP,  $3 \times 10^{23}$  molecules of  $\text{SO}_2(\text{g})$  occupy the same volume as
- (1) 1 mole of  $\text{H}_2(\text{g})$   
(2)  $6 \times 10^{23}$  molecules of  $\text{H}_2(\text{g})$   
(3) **0.5 mole of  $\text{H}_2(\text{g})$**   
(4) 4 grams of  $\text{H}_2(\text{g})$
4208. What is the volume, in liters, of 576 grams of  $\text{SO}_2$  gas at STP?
- (1) 101 (3) 216  
(2) **202** (4) 788
4072. At STP, a 22.4-liter sample of  $\text{NH}_3(\text{g})$  contains the same number of molecules as
- (1) 11.2 L of  $\text{H}_2(\text{g})$  (3) 33.6 L of  $\text{CH}_4(\text{g})$   
(2) **22.4 L of  $\text{CO}_2(\text{g})$**  (4) 44.8 L of  $\text{O}_2(\text{g})$
4043. At STP, what is the total volume occupied by a 2.00-gram sample of  $\text{H}_2(\text{g})$ ?
- (1) 1.00 L (3) 11.2 L  
(2) 2.00 L (4) **22.4 L**
3811. The volume occupied by  $9.03 \times 10^{23}$  molecules of  $\text{N}_2$  gas at STP is closest to
- (1) 0.500 liter (3) 22.4 liters  
(2) 1.50 liters (4) **33.6 liters**
3424. What is the volume occupied by 2.00 moles of  $\text{Ar}(\text{g})$  at STP?
- (1) 22.4 L (3) 89.6 L  
(2) **44.8 L** (4) 179 L
3199. At STP, 5.6 liters of  $\text{CH}_4$  contains the same number of molecules as
- (1) 1.4 L of oxygen (3) **5.6 L of hydrogen**  
(2) 2.5 L of ammonia (4) 11.2 L of neon
2983. A sample of neon gas at STP has a mass of 20. grams. An equal volume of argon gas at STP will have a mass of
- (1) 10. g (3) 30. g  
(2) 20. g (4) **40. g**

**A. Atoms or Molecules in Mole****2. \*Molar Volume of a Gas**

3336. The table below shows the temperature, pressure, and volume of five samples.

| Sample | Substance    | Temperature (K) | Pressure (atm) | Volume (L) |
|--------|--------------|-----------------|----------------|------------|
| A      | He           | 273             | 1              | 22.4       |
| B      | $\text{O}_2$ | 273             | 1              | 22.4       |
| C      | Ne           | 273             | 2              | 22.4       |
| D      | $\text{N}_2$ | 546             | 2              | 44.8       |
| E      | Ar           | 546             | 2              | 44.8       |

Which sample contains the same number of molecules as sample A?

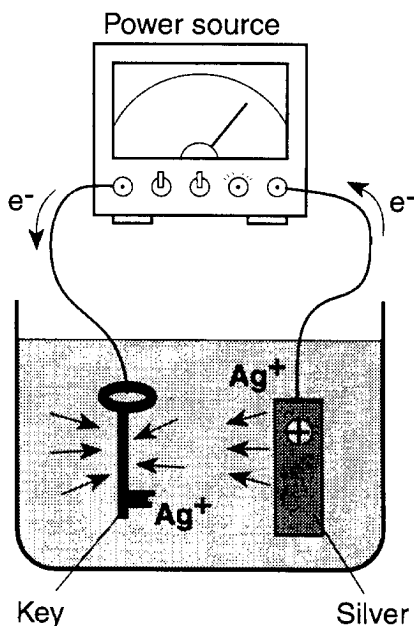
- (1) E (3) C  
(2) **B** (4) D
2911. Which contains the same number of molecules as 22.4 liters of  $\text{N}_2$  at STP?
- (1) 8.00 grams of oxygen (3) 10.0 grams of nitrogen  
(2) 20.0 grams of argon (4) **4.00 grams of helium**
2854. Which quantity represents 1.00 mole at STP?
- (1) 16.0 grams of  $\text{O}_2(\text{g})$  (3) **22.4 liters of  $\text{O}_2(\text{g})$**   
(2) 16.0 grams of  $\text{H}_2\text{O}(\text{g})$  (4) 22.4 liters of  $\text{H}_2\text{O}(\text{g})$
2576. At standard temperature, 1.0 liter of  $\text{O}_2(\text{g})$  at 760 torr contains the same number of molecules as
- (1) **2.0 L of  $\text{O}_2(\text{g})$  at 380 torr** (3) 0.50 L of  $\text{O}_2(\text{g})$  at 380 torr  
(2) 2.0 L of  $\text{O}_2(\text{g})$  at 760 torr (4) 0.50 L of  $\text{O}_2(\text{g})$  at 760 torr
2540. One mole of an ideal gas occupies a volume of 22.4 liters at
- (1) **273 K and 760 torr** (3) 760° C and 273 torr  
(2) 273 K and 0 torr (4) 0° C and 273 torr
2472. The volume of 1 mole of an ideal gas at 25°C and 1 atmosphere of pressure is
- (1)  $22.4 \text{ liters} \times \frac{1}{25}$  (3)  $22.4 \text{ liters} \times \frac{298}{273}$   
(2)  $22.4 \text{ liters} \times \frac{25}{1}$  (4)  $22.4 \text{ liters} \times \frac{273}{298}$

# VIII. OXIDATION-REDUCTION

## 2. Electrochemical Cells

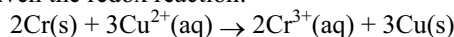
## B. Electrolytic Cells 1. Identify and Label Parts/Electron Flow

4109. Which statement best describes the key?



- (1) **It acts as the cathode and is negative.**
- (2) It acts as the cathode and is positive.
- (3) It acts as the anode and is negative.
- (4) It acts as the anode and is positive.

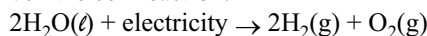
3875. Given the redox reaction:



Which reaction occurs at the cathode in an electrochemical cell?

- (1) **reduction of  $Cu^{2+}(aq)$**
- (2) reduction of  $Cu(s)$
- (3) oxidation of  $Cr^{3+}(aq)$
- (4) oxidation of  $Cr(s)$

3876. Given the cell reaction:



This cell is best described as

- (1) an electrolytic cell in which an exothermic reaction occurs
- (2) **an electrolytic cell in which an endothermic reaction occurs**
- (3) a chemical cell in which an exothermic reaction occurs
- (4) a chemical cell in which an endothermic reaction occurs

3759. In an electrolytic cell, the negative electrode is called the

- (1) anode, at which oxidation occurs
- (2) anode, at which reduction occurs
- (3) cathode, at which oxidation occurs
- (4) **cathode, at which reduction occurs**

1923. In an electrolytic cell, which ion would migrate through the solution to the positive electrode?

- (1) a hydrogen ion
- (2) **a chloride ion**
- (3) an ammonium ion
- (4) a hydronium ion

3258. In an electrolytic cell, oxidation takes place at the

- (1) **anode, which is positive**
- (2) anode, which is negative
- (3) cathode, which is positive
- (4) cathode, which is negative

2610. Which half-reaction occurs at the negative electrode in an electrolytic cell in which an object is being plated with silver?

- (1)  $Ag^0 + 1e^- \rightarrow Ag^+$
- (2)  $Ag^0 \rightarrow Ag^+ + 1e^-$
- (3)  **$Ag^+ + 1e^- \rightarrow Ag^0$**
- (4)  $Ag^+ \rightarrow Ag^0 + 1e^-$

2384. In both the electrochemical cell and the electrolytic cell, the anode is the electrode at which

- (1) reduction occurs and electrons are lost
- (2) reduction occurs and protons are lost
- (3) **oxidation occurs and electrons are lost**
- (4) oxidation occurs and protons are lost

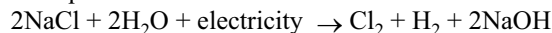
2336. What occurs when an electrolytic cell is used for silver-plating a spoon?

- (1) A chemical reaction produces an electric current.
- (2) **An electric current produces a chemical reaction.**
- (3) An oxidation reaction takes place at the cathode.
- (4) A reduction reaction takes place at the anode.

2039. If fused silver chloride is electrolyzed, the  $Ag^+$  ions are

- (1) **reduced at the negative electrode**
- (2) reduced at the positive electrode
- (3) oxidized at the negative electrode
- (4) oxidized at the positive electrode

1239. Which statement best describes the reaction represented by the equation below?



- (1) The reaction occurs in a chemical cell and releases energy.
- (2) The reaction occurs in a chemical cell and absorbs energy.
- (3) The reaction occurs in an electrolytic cell and releases energy.
- (4) **The reaction occurs in an electrolytic cell and absorbs energy.**

1123. Which atom forms an ion that would migrate toward the cathode in an electrolytic cell?

- (1) F
- (2) I
- (3) **Na**
- (4) Cl

1009. In an electrolytic cell, to which electrode will a positive ion migrate and undergo reduction?

- (1) the anode, which is negatively charged
- (2) the anode, which is positively charged
- (3) **the cathode, which is negatively charged**
- (4) the cathode, which is positively charged