"REVIEW QUESTIONS FOR CHAPTER 4"

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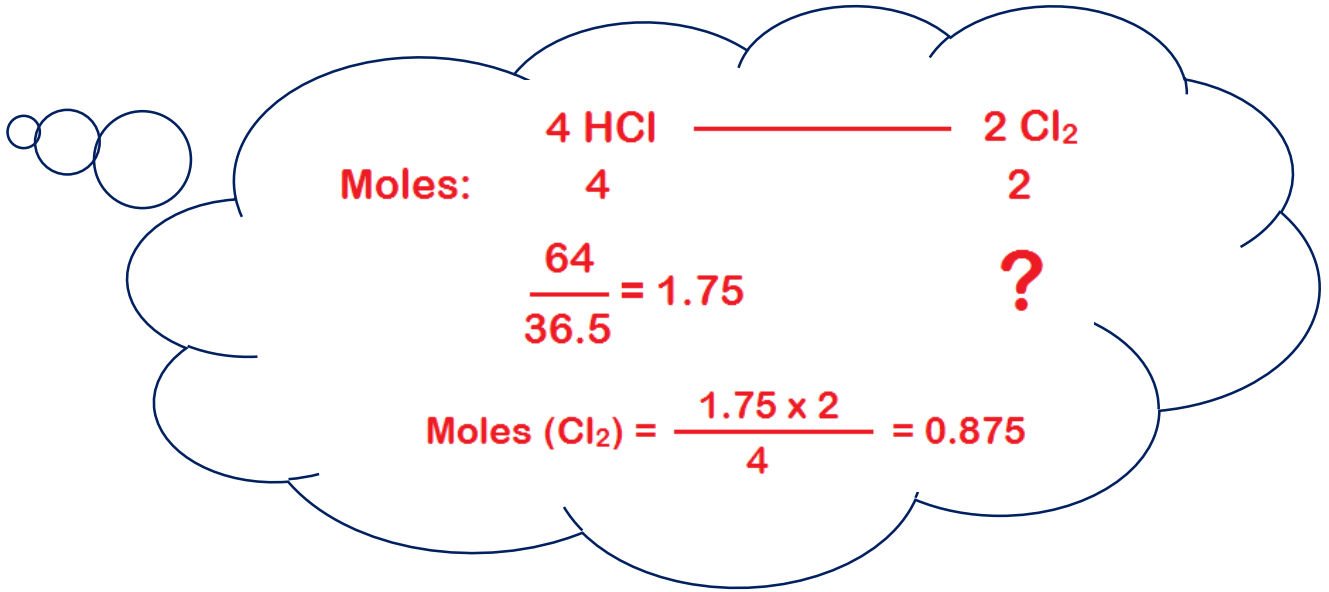
Q 1. For the reaction shown,

$$4\,HCl_{(g)} + O_{2(g)} \rightarrow 2\,H_2O_{(g)} + 2\,Cl_{2(g)}$$

calculate the expected amount of Cl_2 (in moles) that are formed from 64 g HCl? (Given that: H = 1.00 g/mol, Cl = 35.5 g/mol)

A. 2.00 mol
B. 4.00 mol
C. 1.75 mol
D. 0.88 mol



Q 2. For the combustion reaction of ethanol,

$$C_2H_6O_{(g)} + O_{2(g)} \rightarrow 2\,CO_{2(g)} + 3\,H_2O_{(g)}$$

calculate the CO_2 molecules formed if 23 g of ethanol was burnt? (C = 12, H = 1, O = 16).

A. 6.02 x 10^{23} molecules.
B. 3.01 x 10^{23} molecules.
C. 1.00 molecules.
D. 2.00 molecules.

C_2H_6O ——— 2 CO_2

Moles: 1 2

$\frac{23}{46} = 0.5$?

Molar mass (C_2H_6O) = 2(12) + 6(1) + 1(16) = 46

Moles (Cl_2) = $\frac{0.5 \times 2}{1} = 1$

CO_2 molecules = moles x 6.02 x 10^{23}

= 1 x (6.02 x 10^{23}) = 6.02 x 10^{23} molecules

Q 3. **For the following reaction,**

$$2\,Al_{(s)} + 3\,Cl_{2(g)} \rightarrow 2\,AlCl_{3(s)}$$

calculate the theoretical yield (in grams) if 1 mole of each reactant is used? (molar mass $AlCl_3$ = 133.34 g/mol)

A. 133.34 g.
B. 89.34 g.
C. 266.68.
D. None.

	2 Al ——— 2 $AlCl_3$		3 Cl_2 ——— 2 $AlCl_3$	
Moles:	2	2	3	2
Given moles:	1	?	1	?

moles ($AlCl_3$) = 1 mol

moles ($AlCl_3$) = 0.67 mol

Less moles

Cl_2 is the limitimg reactant

Theoritical yield ($AlCl_3$) = moles x molar mass

= 0.67 x 133.34 = 89.34 g

Q 4. For the following reaction,

$$Ti_{(s)} + 2\,Cl_{2(g)} \rightarrow TiCl_{4(g)}$$

determine the limiting reactant if 20.1 g Ti was mixed with 29.8 g Cl_2? (Ti = 47.88, Cl = 35.5)

A. Ti.
B. Cl_2.
C. $TiCl_4$.
D. None.

	Ti		$TiCl_4$
Moles:	1		1
Given moles:	$\frac{20.1}{47.88} = 0.42$		?

moles ($TiCl_4$) = 0.42 mol

	$2\,Cl_2$		$TiCl_4$
	2		1
	$\frac{29.8}{71} = 0.42$		?

moles ($TiCl_4$) = 0.21 mol

Less moles

Cl_2 is the limitimg reactant

Q 5. Which one of the following compounds gives a solution that doesn't conduct the electricity?

HCl – CH_3COOH – NaCl – Sugar

A. HCl.
B. CH_3COOH.
C. NaCl.
D. Sugar.

NaOH: $NaOH_{(s)} \longrightarrow Na^+_{(aq.)} + OH^-_{(aq.)}$ strong electrolyte

CH_3COOH: $CH_3COOH_{(aq.)} \rightleftharpoons CH_3COO^-_{(aq.)} + H^+_{(aq.)}$ Weak electrolyte

NaCl: $NaCl_{(s)} \longrightarrow Na^+_{(aq.)} + Cl^-_{(aq.)}$ strong electrolyte

sugar: $C_{12}H_{22}O_{11\,(s)} \longrightarrow C_{12}H_{22}O_{11\,(aq.)}$ nonelectrolyte

Q 6. Find the molarity of a solution that was formed by dissolving 51.5 g of sodium bromide in 500 ml solution? (Na = 23 g/mol, Br = 80 g/mol)

A. 0.001.
B. 0.50 M.
C. 1.00 M.
D. None.

$$\text{Moles}_{NaBr} = \frac{\text{Mass}}{\text{Molar mass}} = \frac{51.5}{103} = 0.5 \text{ mol}$$

$$M = \frac{\text{Moles (solute)}}{\text{Volume (solution), L}}$$

$$V_L = \frac{500}{1000} = 0.5 \text{ L}$$

$$\therefore M = \frac{0.5}{0.5} = 1 \text{ mol/L}$$

Q 7. How many moles of KCl are in 100 mL of 1.50 M KCl solution?

A. 0.15 moles.
B. 150 moles.
C. 1.5 moles.
D. None.

$$M = \frac{\text{Moles (solute)}}{\text{Volume (solution), L}}$$

? → Moles (solute)

1.5 M → M

$$V_L = \frac{100}{1000} = 0.1 \text{ L}$$

$$\text{moles(KCl)} = M \times V_L = 1.5 \times 0.1 = 0.15 \text{ mol}$$

Q 8. What is the required mass of KNO_3 to make a 500 mL solution of 1.0 M KNO_3 solution? (KNO_3 = 101 g/mol)

A. 20.0 g.
B. 50.5 g.
C. 80.5 g.
D. 101.0 g.

$$M = \frac{\text{Moles (solute)}}{\text{Volume (solution),L}}$$

? = Moles (solute)

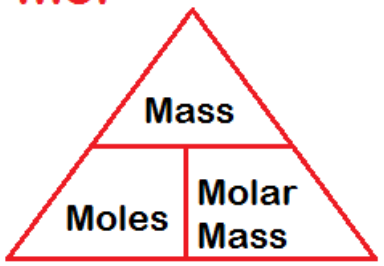
1.0 M = M

$$V_L = \frac{500}{1000} = 0.5\ L$$

$$\text{moles } (KNO_3) = M \times V_L = 1.0 \times 0.5 = 0.5 \text{ mol}$$

But Mass = moles x molar mass

= 0.5 x 101 = 50.5 g



Q 9. If you dilute 300 mL of a 1.5 M solution of LiCl to 1.0 L, the new concentration of the solution will be .

A. 4.5 M.
B. 0.45 M.
C. 450 M.
D. None.

For dilution problems: $M_1 \times V_1 = M_2 \times V_2$

$M_1 = 1.5$, $V1 = 300$ mL
$M_2 = ?$, $V_2 = 1$ L $= 1000$ mL

$$1.5 \times 300 = M_2 \times 1000$$

$$M_2 = \frac{1.5 \times 300}{1000} = 0.45 \text{ M}$$

Q 10. Which of the following substances gives weak electrolyte when it is dissolved in water ..... .

A. NaCl. $NaCl_{(s)} \longrightarrow Na^{+}_{(aq.)} + Cl^{-}_{(aq.)}$

B. Sugar. $C_{12}H_{22}O_{11\ (s)} \longrightarrow C_{12}H_{22}O_{11\ (aq.)}$

C. Acetic acid (CH_3COOH). $CH_3COOH_{(aq.)} \rightleftharpoons CH_3COO^{-}_{(aq.)} + H^{+}_{(aq.)}$ 

D. None.

Q 11. The oxidation state of sulfur atom in HSO_4^- ion is

…… .

A. -2.

B. +2.

C. -6.

D. +6. 

For HSO_4^-

H (group 1A), H has +1
O (group 6A), O has -2

Sum of oxidation states = charge of ion

$1(+1) + 1(X) + 4(-2) = -1$

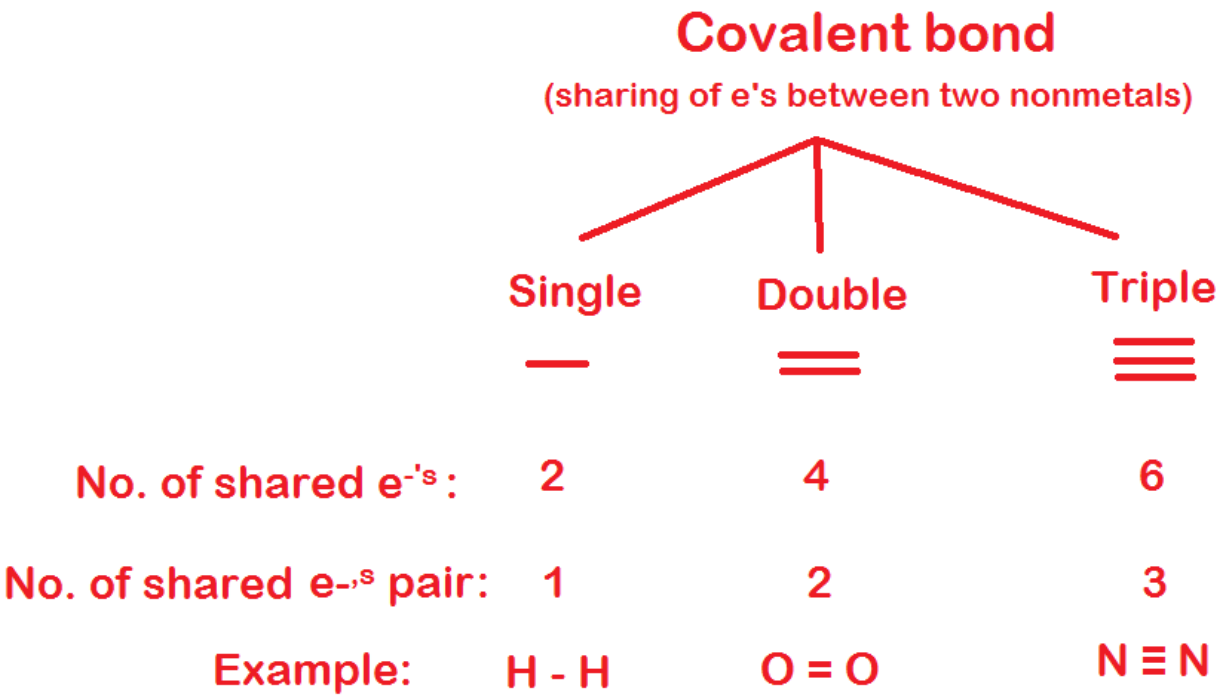
$1 + X - 8 = -1 \Rightarrow X = +6$

Q 12. ..... atoms can form ..... bond through sharing of electrons between the two atoms.

A. Two metal, covalent.
B. Two metal, ionic.
C. Two nonmetal, covalent.
D. Two nonmetal, ionic.

Q 13. Triple covalent bonding involves sharing of ..... electrons.

A. 2.
B. 3.
C. 4.
D. 6.



Q 14. Lewis structure of P – atom contains ……. dots.

A. 1.
B. 3.
C. 5.
D. 7.

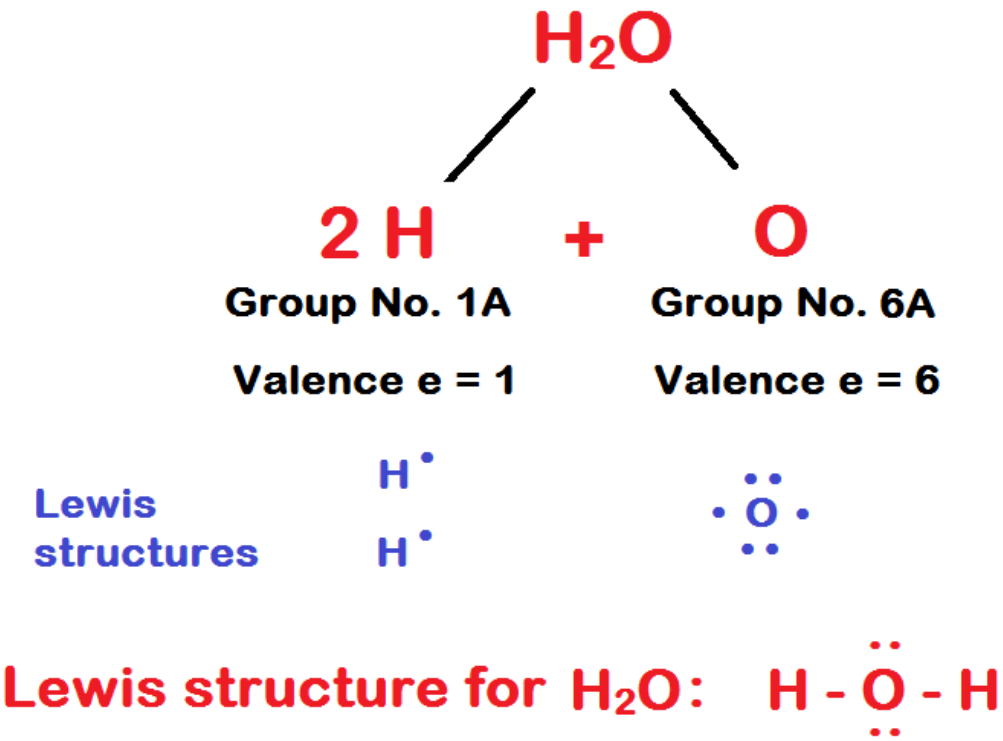
P in group 5A in the periodic table

P has 5 valence electrons

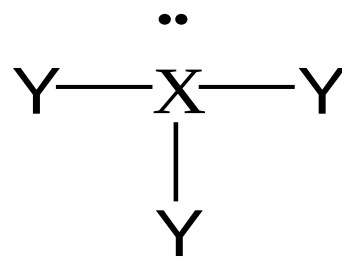
Lewis structure of P is : ·· · P · ·

Q 15. Lewis structure of water molecule shows the presence of ..... bonding pair(s) and ..... lone pair(s) of electrons.

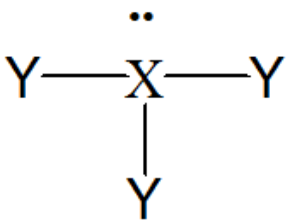
A. two, two.
B. two, one.
C. one, two.
D. one, one.



Q 16. The following Lewis structure can be used to describe the ..... molecule.



A. BF_3.
B. AlCl3.
C. NH_3.
D. NCl_3.



Central atom has 3 bonds + lone pair (2 electrons) , has 5 valence electrons. so, it is located at group 5.

Y without lone pairs, so Y = atoms are H atoms.

Q 17. According to the periodic table trends, the correct electronegativity order for the following elements is:

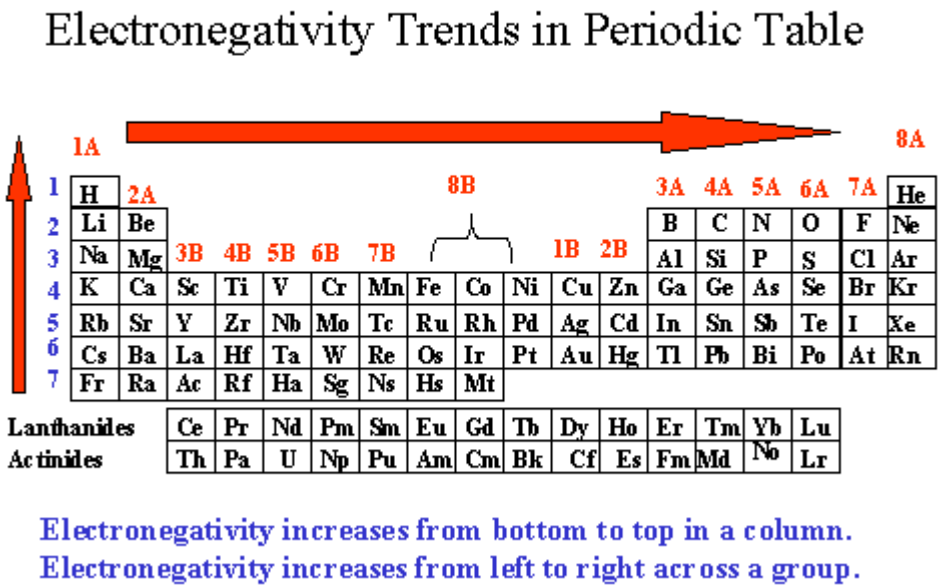
Rb, F, Na, Cl

A. Cl > F > Rb > Na.

B. F > Cl > Rb > Na.

C. F > Cl > Na > Rb.

D. Cl > F > Na > Rb.



Q 18. Two atoms with 0.9 electronegativity difference, form ..... type of bonding.

A. Pure covalent.
B. Nonpolar covalent.
C. Polar covalent.
D. Ionic.

Type of bond vs. Electronegativity difference

1. Δ EN = 0 ——— Pure covalent bond
2. Δ EN = 0.1 - 0.4 Nonpolar covalent bond
3. Δ EN = 0.5 - 1.9 Polar covalent bond
4. Δ EN > 2 Ionic bond

Q 19. Which pair of elements is most likely to form an ionic compound if allowed to react together.

A. Al and Si.
B. C and F.
C. Fe and Ca.
D. K and Br. 

Q 20. The following order of bonds is well describing the bond ..... trend among the elements of periodic table.

C≡C < C = C < C - C

A. Strength.
B. Length.
C. Energy.
D. none.

Order of bond strength: C≡C > C = C > C - C

Order of bond length: C≡C < C = C < C - C

Q 21. For the following halogens, the order of increasing the bond energy is ..... F-F, Cl-Cl, Br-Br, I-I

A. $I_2 > Br_2 > Cl_2 > F_2$.

B. $F_2 > Cl_2 > Br_2 > I_2$. 

C. $F_2 > Cl_2 > I_2 > Br_2$.

D. $Cl_2 > F_2 > Br_2 > I_2$.

With my best wishes

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