24) Suppose a buffer solution is made from formic acid, $HCHO_2$, and sodium formate, $NaCHO_2$. What is the net ionic equation for the reaction that occurs when a small amount of sodium hydroxide is added to the buffer?

a) $NaOH(aq) + H_3O^+(aq) \rightarrow Na^+(aq) + 2H_2O(l)$
b) $H_3O^+(aq) + OH^-(aq) \rightarrow 2H_2O(l)$
c) $OH^-(aq) + HCHO_2(aq) \rightarrow CHO_2^-(aq) + H_2O(l)$
d) $NaOH(aq) + HCHO_2(aq) \rightarrow NaCHO_2(aq) + H_2O(l)$
e) $Na^+(aq) + HCHO_2(aq) \rightarrow NaH(aq) + HCO_2^+(aq)$

25) In titrating 0.20 *M* hydrochloric acid, HCl, with 0.20 *M* NaOH at 25°C, the solution at the equivalence point is

a) 0.20 *M* NaCl
b) very acidic
c) slightly acidic
d) 0.10 *M* HCl and 0.20 *M* NaOH
e) 0.10 *M* NaCl

26. Write balanced net ionic equations for the following reactions and identify what type of reaction it is:

A. The neutralization of hydrochloric acid with sodium hydroxide.

$H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$

Acid-Base reaction

B. The reaction of iron copper metal with silver (I) ions to produce copper (II) ions and silver metal.

$Cu(s) + 2Ag^+(aq) \rightarrow Cu^{2+}(aq) + 2Ag$

Redox reaction

C. The mixture of a 20 mL of a 2 M solution of lead (II) nitrate with 15 mL of a 1.5 M solution of sodium sulfate.

$Pb^{2+}(aq) + SO_4^{2-}(aq) \rightarrow PbSO_4(s)$

Precipitation reaction

D. A mixture is made of 50 mL of 0.5 M sodium chloride and 20 mL of 0.15 M potassium nitrate.

NR

28) (a) Explicitly state the difference between electron affinity and electronegativity. Use a chemical reaction if possible.

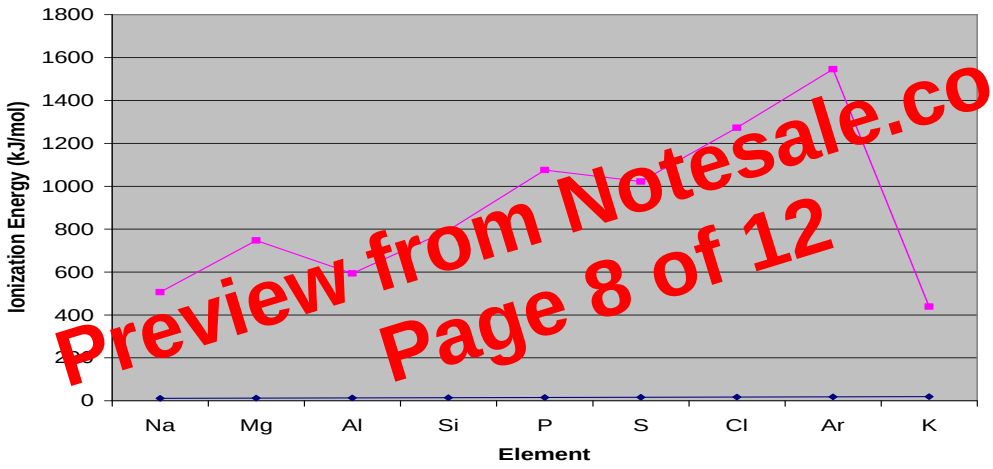
Electron affinity is the energy released when an atom accepts an electron. A chemical reaction for this process for generic element X is ($X(g) + e^- \rightarrow X^-(g)$).

Electronegativity is a more general term about how attracted an electron is to an atom.

(b) Why is it useful to state the trend of electron affinity as becoming more negative as we move from left to right across the periodic table?

The electron affinity is an energy released, exothermic processes have negative values of energy. As we move to the right, nuclear charge increases and the atom will reach a lower energy state when it accepts an electron, releasing more energy (more negative).

Consider the graph below to help answer the following questions:



(b) Explain why there is an general increase in ionization energy from sodium to argon.

Ans: Argon has the highest ionization energy because the electrons in the valence shell are more tightly bound due to the higher nuclear charge. (NOTE: A common misconception among students is to say that argon has the highest ionization energy because it has a "filled outer valence shell.")

(c) Explain the ionization energy difference between sodium and potassium.

Electron shielding has increased, so there is a weaker pull on the valence electrons in potassium, which leads to decreased ionization.

(d) Use electron configuration to rationalize why sulfur has a lower ionization energy than phosphorous.

P:$[Ne]2s^2 2p^3$, S:$[Ne]2s^2 2p^4$ – the 4^{th} electron in S's valence shell must be paired in an orbital which increases repulsion reducing ionization energy even with a rise in nuclear charge.

(e) Which element, sodium or potassium will have a larger radius? Why? Which has a larger ionic radius for the most common ion for sodium and potassium? Why?

Potassium will have the larger atomic and ionic radii. The reason for both is electronic shielding.