Chemical Bonding

As two atoms approach each other attractive forces between the electrons surrounding both atoms and the protons in the nuclei of both atoms come into play. Repulsive forces between the 2 sets electrons and the two sets of protons are also active. If the attractive forces exceed the repulsive forces, a chemical bond forms and the atoms join together to form a single unit. When the atomic nuclei are close together, electrons are attracted to both nuclei and are thus shared between the two atoms. The nature of the sharing depends on the relative electronegativity (tendency to attract electrons) of the atoms involved. If both atoms have similar electronegativity (difference < 0.2) then the electrons are shared equally and the bond is termed *covalent*. If one atom is significantly more electronegative than the other (difference > 1.7), then electrons are, for all practical purposes removed from the least electronegative atom and captured by the most electronegative atom. This type of bond is called an *ionic* bond. Elements whose electronegativities differ by amounts from 0.3 to 1.6 inclusive exhibit unequal sharing of electrons. This unequal sharing of electrons is called *polar covalent* bonding.

Consider the following examples: (See Fig. 12-4, p. 333)

HCl = 3.0 (for Cl) - 2.1 (for H) = 0.9 (bond is polar covalent)
PbO_2 = 3.5 (for 0) - 1.8 (for Pb) = 1.7 (bond is ionic)
KBr = 2.8 (for Br) - 0.8 (for K) = 2.0 (bond is ionic)
CS_2 = 2.5 (for C) - 2.5 (for S) = 0.0 (bond is covalent)

Predict the bond type for the following:

MgO =
O_2 =
$NaBr$ =
AsH_3 =
PbI_2 =
PCl_3 =
$CsCl$ =
F_2 =
HI =
CsF =