CHE 2060 Review problems: expected prior knowledge

1.1 How many neutrons do the following isotopes have?
(a) ^{31}P, the most common isotope of phosphorus
(b) ^{32}P, a radioactive isotope of phosphorus used often in the study of DNA and RNA.
(c) ^{37}Cl, one of the two common isotopes of chlorine.
(d) tritium (^{3}H), a radioactive isotope of hydrogen, used often by biochemists as a 'tracer' atom.
(e) ^{14}C, a radioactive isotope of carbon, also used as a tracer in biochemistry.

1.2 The electron configuration of a carbon atom is $1s^2 2s^2 2p^2$, and that of a sodium cation (Na^{+1}) is $1s^2 2s^2 2p^6$. Show the electron configuration for:
(a) a nitrogen atom
(b) an oxygen atom
(c) a fluorine atom
(d) a magnesium atom
(e) a magnesium cation (Mg^{+2})
(f) a potassium atom
(g) a potassium ion (K^{+1})
(h) a chloride anion (Cl^{-1})
(i) a sulfur atom
(j) a lithium cation (Li^{+1})
(k) a calcium cation (Ca^{+2})

1.3 Draw Lewis structures for the following species (use lines to denote bonds, dots for lone-pair electrons). All atoms should have a complete valence shell of electrons. For now, do not worry about showing accurate bond angles.
(a) ammonia, NH_3
(b) ammonium ion, NH_4^{+1}
(c) amide ion, NH_2^{-1}
(d) formaldehyde, HCOH
(e) acetate ion, CH_3COO
(f) methylamine, CH_3NH_2
(g) ethanol, CH_3CH_2OH
(h) diethylether, $CH_3CH_2OCH_2CH_3$
(i) cyclohexanol (molecular formula $C_6H_{12}O$, with six carbons bonded in a ring and an OH group)
(j) propene, CH_2CHCH_3
(k) pyruvic acid, CH_3COCO_2H