1. * see glossary *

2. a) $O^{2-} \quad 1s^2 \cdot 2s^2 \cdot 2p^6 \quad -2$
   b) $F^{-} \quad 1s^2 \cdot 2s^2 \cdot 2p^6 \quad -1$
   c) $Ne \quad 1s^2 \cdot 2s^2 \cdot 2p^6$
   d) $Na^{+} \quad 1s^2 \cdot 2s^2 \cdot 2p^6$
   e) $Mg^{2+} \quad 1s^2 \cdot 2s^2 \cdot 2p^6 \quad +2$

3. isoelectric

4. stable ion is isoelectric to a noble gas. You can recognize this by a full s i p orbital (He is $^2$s$^2$)

5. stable ions include $Ca^{2+} \quad P^{3-} \quad Na^{+} \quad Cl^{-}$

6. noble gas have the rest I.E. b/c they are already in a stable e\textsuperscript{-} arrangement \therefore do NOT want to become unstable so their pull on valence e\textsuperscript{-} is strong.

7. Noble gases are stable \because they do not need to gain (anions) or lose (cations) e\textsuperscript{-}.

8. The most stable ion would have a charge of +2 so that it could be isoelectric with Ne full s i p orbitals.

9. # of p\textsuperscript{+} \uparrow as you move left to right across a period \because the Zeff \uparrow causing valence e\textsuperscript{-} to be held more tightly which will require more E\textsuperscript{+} to remove them.

10. Be $[He]$ 2s\textsuperscript{2} vs. Li $[He]$ 2s\textsuperscript{1}. Be has a full 2s orbital which is a more stable e\textsuperscript{-} arrangement
than a half-full s orbital. So more $\varepsilon$ would be required to remove an e$^-$ from a full orbital than to remove an $\varepsilon^-$ from a half-full orbital.

11. a) lowest 1E = $\text{II} 1s^22s^22p^6 3s^1$ n=3 i half-full 
   b) inert gas = II $1s^22s^22p^6$ $3s^1$ valence has full s and p 
   c) increasing 1st 1E = II $1s^22s^22p^6$ III $1s^22s^22p^6$ IV $1s^22s^22p^6$ results in $\text{Ne}$ 
   d) highest 2nd 1E = III $1s^22s^22p^6$ II $1s^22s^22p^6$ results in $\text{Ne}$ 
   e) lowest 2nd 1E = III $1s^22s^22p^6$ II $1s^22s^22p^6$ results in half-full $p$ (2p$^3$)

Atomic Radius Questions

1. Size of an atom is determined by first the principal quantum number (n), and second by Zeff.

2. a) Across a period atomic radius ↓ 
   b) Down a group atomic radius ↑

3. a) An atom with n=2 will be smaller than an atom with n=3 
   b) Zeff is used to determine differences in size 
   c) When determining the size of an atom you need to know n and Zeff (i.e. sub-level info $s^1$ vs $s^2$ etc)

4. a) Mg is larger b/c its Zeff is less than Al so its valence e$^-$ will be located further from the nucleus than Al. 
   b) Mg is larger than Be b/c Mg valence e$^-$ are located in the 3s orbit vs Be which is in the 2s. As n ↑ A.R. ↑
5. Cations are smaller than their neutral atoms. b/c cations will have a greater Z_eff as they have lost e^- but +p^+ so the ratio p^+ : e^- causing valence e^- to be pulled closer to the nucleus (i.e. smaller)

6. Anions are larger than their neutral atoms. b/c anions will have a smaller Z_eff as they have gained e^- but not p^+ so the ratio is p^+ : e^- causing valence e^- to move further away from the nucleus (i.e. larger)

7. a) Na is larger than Li b/c Na=[Ne]3s^1 vs Li=[He]

b) Both Na and Mg are n=3 but Na has 11p^+ vs Mg has 12p^+. so Na has a lower Z_eff so it will be larger.

c) Na will be larger than Na^+ b/c Na^+ valence e^- is now 2p^6 vs Na 3s^1

8. a) Ne smaller than Na b/c Ne n=2 vs Na n=3

b) Ne would be larger than Na^+ b/c they both have e^- in the same energy level (n=2) but Na^+ would have more p^+ in its nucleus so its Z_eff would be higher causing Na^+ to be slightly smaller than Ne.