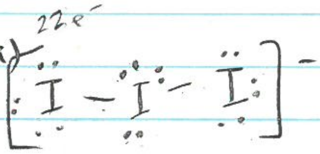
Electrons & Molecular Forces Homework

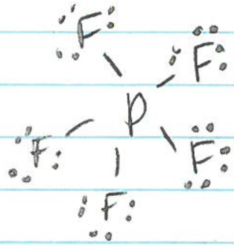
1. (a) Be $1s^2 2s^2$
   (b) Xe $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6$
   (c) Pd $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^8$
   (d) Fe $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^6$
   (e) C $1s^2 2s^2 2p^2$
   (f) Mn $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3p^5$
   (g) U $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3p^6 4p^6 5s^2 4d^{10} 5p^6 6s^2$ –
   – $4f^{14} 5d^{10} 6p^6 7s^2 5f^4$
   (h) Pb $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2$ –
   – $4f^{14} 5d^{10} 6p^2$
   (i) W $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2$ –
   – $4f^{14} 5d^4$
   (j) Er $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} 5p^6 6s^2 4f^{12}$

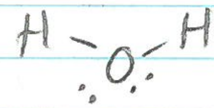
2. (a) [He] $2s^2$
   (b) [Kr] $5s^2 4d^{10} 5p^6$
   (c) [Kr] $5s^2 4d^8$
   (d) [Ar] $4s^2 3d^6$
   (e) [He] $2s^2 2p^2$
   (f) [Ar] $4s^2 3p^5$
   (g) [Rn] $7s^2 5f^4$
   (h) [Xe] $6s^2 4f^{14} 5d^{10} 6p^2$
   (i) [Xe] $6s^2 4f^{14} 5d^4$
   (j) [Xe] $6s^2 4f^{12}$

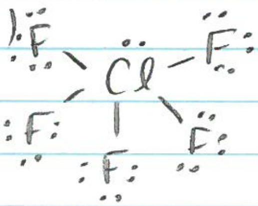
3. (a) Cd [Kr] $5s^2 4d^{10}$ → 2 v.e⁻
   (b) Ba [Xe] $6s^2$ → 2 v.e⁻
   (c) Br [Ar] $4s^2 3d^{10} 4p^5$ → 7 v.e⁻
   (d) Ne $1s^2 2s^2 2p^6$ → 8 v.e⁻
   (e) Sn [Kr] $5s^2 4d^{10} 5p^2$ → 4 v.e⁻
   (f) P [Ne] $3s^2 3p^3$ → 5 v.e⁻

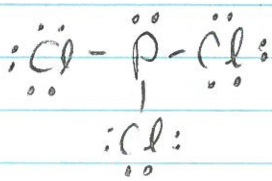
4. (a) +2 (loses 2 from 5s)
   (b) +2 (loses 2 from 6s)
   (c) −1 (gains 1 in 4p)
   (d) no ion – all orbitals full
   (e) +2 (loses 2 from 5p)
   +4 (loses 4 from 5p & 5s)
   (f) −3 (gains 3 in 3p)

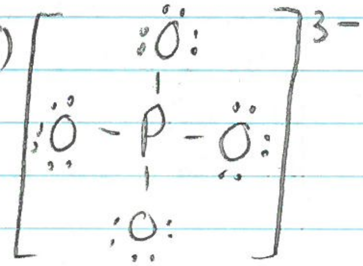
5. (a) 

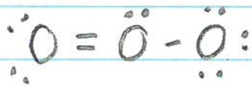
(b) 

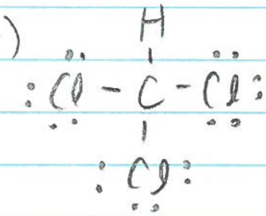
(c) 

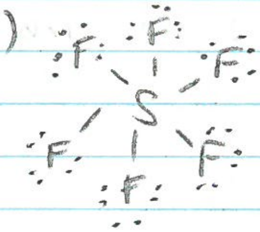
(d) 

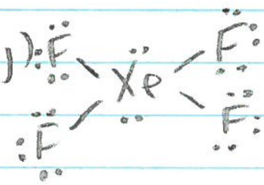
(e) 

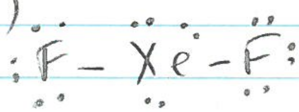
(f) 

(g) 

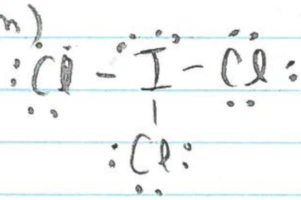
(h) 

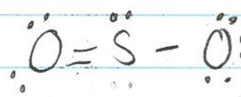
(i) 

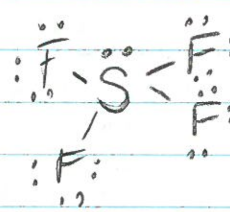
(j) 

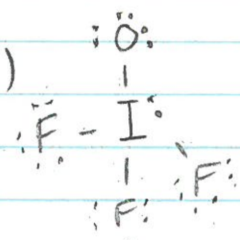
(k) 

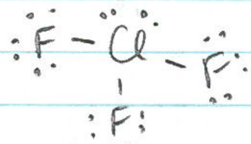
(l) 

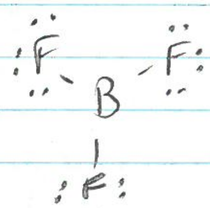
(m) 

(n) 

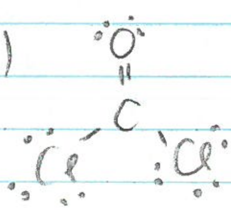
(o) 

(p) 

(q) 

(r) 

(s) 

(t) 

6. electronegativity increases when atomic radius decreases
- when the nucleus is more "accessible", the electrons are pulled in closer / more attracted

7. (a) Cs (b) Re (c) C (d) Xe (e) Te (f) Mn

8. ionic EN > 2.0
polar covalent 0.5 ≤ EN ≤ 2.0
non-polar covalent EN < 0.5

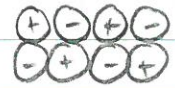
9. skip this question

10. (a) 0.4 non-polar
(b) 0 non-polar
(c) 2.4 ionic
(d) 1.6 ionic (has a metal)
(e) 0.6 polar covalent
(f) 0.8 polar covalent
(g) no question ?!
(h) 0.5 polar covalent
(i) 0 non-polar
(j) 0 non-polar
(k) 1.2 polar covalent

11. (c) K - Cl (δ^+ δ^-)
(d) Fe - O (δ^+ δ^-)
(f) N - H (δ^- δ^+)
(h) I - Cl (δ^+ δ^-)
(k) O - H (δ^- δ^+)

12. ionic compounds - full charge separation, so stronger attraction than covalent, where there is only (partial (or no) charge separation → between particles

13. a solid is electrically neutral; in a solution the charged ions are pulled apart, so +ve ions can attract electricity

14.  → lattice is very unflexible because ions are "locked" in place based on other ions charges

15. (a) not ionic - boiling point is low
(b) not ionic - ionic compounds are not ductile for making wires, and do not conduct

(c) not ionic - generally tough/brittle, not gelatinous

16. (a) linear
(b) tetrahedral
(c) trigonal bipyramid
(d) angular
(e) octahedral
(f) angular
(g) trigonal pyramid
(h) trigonal planar
(i) linear

17. (a) non-polar
(b) non-polar
(c) non-polar
(d) polar
(e) non-polar
(f) polar
(g) polar
(h) non-polar
(i) polar * weird case

18. (a) answers will vary - see notes
(b) London forces, dipole-dipole, hydrogen bonding, ion-dipole

19. (a) dipole-dipole
(b) London forces
(c) dipole-dipole
(d) London forces
(e) hydrogen bonds
(f) hydrogen bonds
(g) hydrogen bonds
(h) London forces
(i) London forces
(j) dipole-dipole

20. (a) HBr, HCl, HI } polar covalent
(b) HBr, HCl, HI } dipole-dipole
(c) HCl has the strongest dipoles (biggest EN diff), so it will have more attractions between molecules than the others

21. (a) Cl_2 - non-polar covalent
NaCl - ionic
HCl - polar covalent
(b) Cl_2 - London forces
NaCl - ionic attraction
HCl - dipole-dipole
(c) Cl_2 - weakest forces/easiest to break apart
(d) NaCl - most interaction with polar water due to larger charge separation

22. (a) CH_4, C_2H_6, C_3H_8 } non-polar covalent

(b) CH_4, C_2H_6, C_3H_8 } London forces

(c) C_3H_8 - largest molar mass (more surface area to attract)
(d) CH_4 - smallest molar mass, less attraction
(e) C_3H_8 - harder for molecules to move past each other because they are bigger (+ more attracted)

23. Br_2 only has London forces (non-polar) and ICl is slightly polar, so it has dipole-dipole forces - harder to break apart = higher BP

24. based on attraction due to molar mass - iodine has highest mass, so holds together more tightly.