Name: ANSWERS Date: _____

BCI SCIENCE

SCH 4CI

Matter and Qualitative Analysis Review

A. **Fill in the blanks** (use the following list)

applied chemistry	*chemistry*	*combustion*	*conductivity*	*covalent bond*
decomposition	*dipole-dipole*	*dispersion*	*dissociate*	*double displacement*
electronegativity	*frequency*	*inference*	*ground state*	*intermolecular forces*
ionic bond	*Lewis structure*	*line spectrum*	*matter*	*model*
net ionic equation	*non-polar molecule*	*observation*	*polar molecule*	*pure chemistry*
qualitative	*single displacement*	*solubility*	*solubility table*	*spectator ion*
stable octet	*synthesis*	*theory*	*total ionic equation*	*visible spectrum*
wavelength				

1. A statement based on your five senses is referred to as a(n) __OBSERVATION____.
2. _LEWIS STRUCTURE__ is a representation of covalent bonding using dot diagrams with shared electron pairs shown as lines and lone pairs shown as dots.
3. The number of cycles of light waves that pass a point in one second is called __FREQUENCY__.
4. _APPLIED CHEMISTRY__ is the use of chemistry for practical purposes.
5. An electron found in its lowest possible energy level is said to be in its' __GROUND STATE_____.
6. _QUALITATIVE_ analysis is the process of determining the composition of a sample from its physical and chemical properties.
7. A _LINE SPECTRUM_ is produced when light is emitted by an element and then directed through a diffraction grating .
8. Light waves with a wave length of 400 nm to 700 nm with which the human eye can detect is known as the __VISIBLE SPECTRUM___.
9. A(n) _INFERENCE___ is a judgment or opinion that is based on an observation.
10. All molecules experience __DISPERSION___ intermolecular forces.

B. **True or False** (If the statement is false, rewrite the statement to make it true)

11. A polar molecule must have at least one polar covalent bond and be ~~symmetrical~~ in shape.

F ASYMMETRICAL

12. A tetrahedral shape has four bonded atoms and no lone pairs around the central atom.

T

13. A ~~pyramidal~~ shape has two bonded atoms and two lone pairs around the central atom.

F BENT

14. Dipole-dipole forces exist between ~~non-polar~~ molecules.

F POLAR

15. In a single displacement reaction, a metal will displace a cation in a compound.

T

16. Spectator ions appear in a ~~net~~ ionic equation.

F TOTAL

17. In order to determine the products of a double displacement reaction, you must refer to the ~~electronegativity~~ chart.

F SOLUBILITY TABLE

18. A ΔEN value of zero indicates a ~~non-polar~~ covalent bond.

F PURE

19. Complete combustion of a hydrocarbon makes $CO_{2(g)}$ and $H_2O_{(g)}$

T

20. Ionic compounds will dissociate when dissolved in water.

T

Similarities/Differences (describe similarities/differences between each pair)

21. empirical knowledge / theoretical knowledge

EK: knowledge coming directly from observations

TK: knowledge based on ideas that are created to explain observations.

19. Continuous spectrum / line spectrum

CS: uninterrupted pattern of colours that are observed when a narrow beam of white light passes through a prisim

LS: discontinuous spectrum that is produced when light is emitted by an element is directed through diffraction gratting

20. ground state / excited state

GS: electrons in their lowest possible energy levels

ES: electrons that have been energized and have moved to higher energy levels.

21. ionic bond / covalent bond

IB: electrons are lost/gained by metals & non-metals to become stable. Cations and Anions are formed.

22. cation / anion

C: positive ion formed from losing electron(s), usually a metal.

A: negative ion formed from gaining electron(s), usually a non-metal.

23. polar covalent bond / pure covalent bond

Polar: unequal sharing of electrons in a covalent bond. ΔEN difference between 0.4-1.7. Partial charges and dipole-moments are required on the diagram.

Pure: equal sharing of electrons in a covalent bond.

C. Multiple choice (Choose the best answer)

24. Which of the following was contributed to atomic theory by Neils Bohr?

a) Raisin Bun Model
b) Discovery of the proton
c) Discovery of the neutron
d) Energy levels

25. What 3-D shape does carbon tetrahydride, CH_4, have?

a) linear
b) bent
c) pyramidal
d) tetrahedral

26. The ΔEN for a carbon – hydrogen bond is

a) 0
b) 0.35
c) 0.84
d) 1.26

27. A carbon – hydrogen bond would have

a) partial charges
b) partial charges and dipole moments
c) square brackets with full charges
d) no charges at all

28. The shape of SiO_2 is

a) linear
b) pyramidal
c) v-shaped
d) tetrahedral

29. The shape of PF_3 is

a) linear
b) pyramidal
c) v-shaped
d) tetrahedral

30. The ΔEN for a non-polar covalent bond is

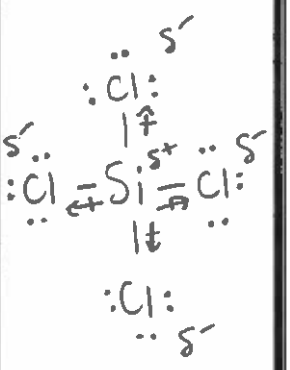
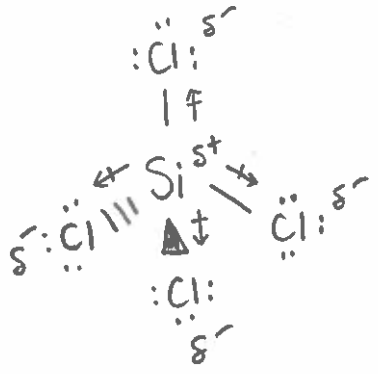
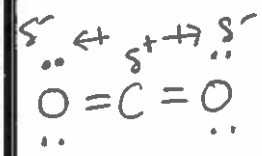
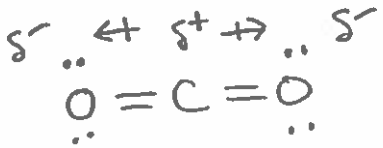
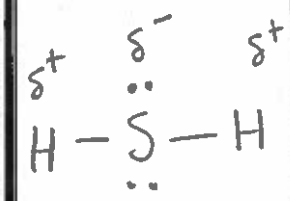
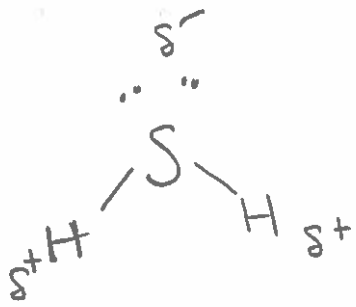
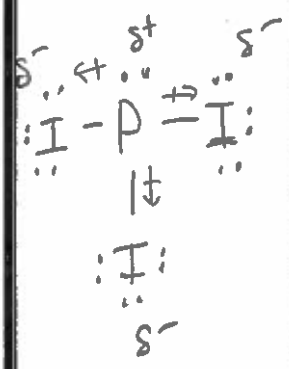
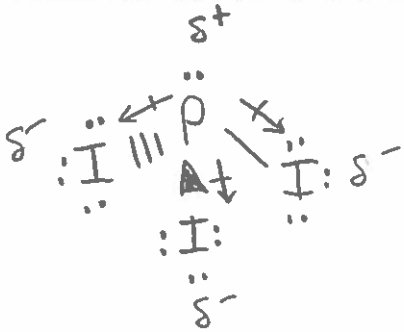
a) 0
b) 1.7 – 0.4
c) 3.3 – 1.7
d) 0.1 – 0.4

31. The number of electrons in $^{27}_{13}Al^{3+}$ is

a) 27
b) 13
c) 14
d) 10

E. Drawing

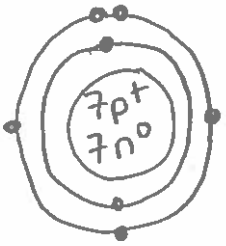
32. Complete the following table.

Molecule	Lewis Structure	3-D Diagram (include partial charges and dipole moments)	Name of Shape	Polar or non-polar molecule
$SiCl_4$ ΔEN Cl 3.16 Si 1.90 1.26			tetrahedral	non-polar
CO_2 ΔEN O 3.44 C 2.55 0.89			linear	non-polar
H_2S ΔEN S 2.58 H 2.20 0.38			bent	non-polar
PI_3 ΔEN I 2.66 P 2.19 0.47			pyramidal	polar

F. Diagrams

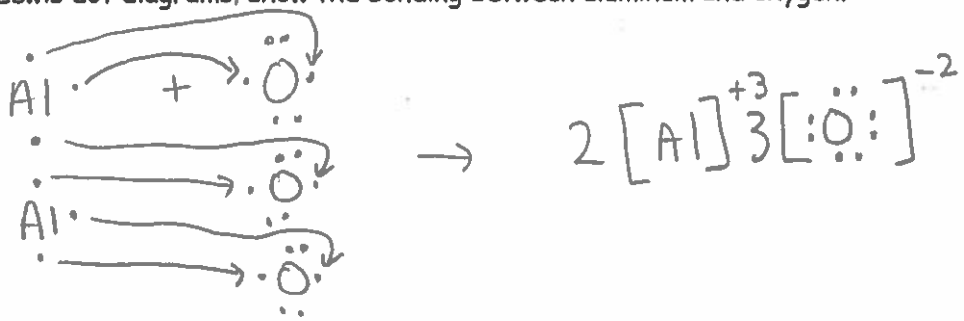
33. Draw a Bohr-Rutherford Diagram for nitrogen.

$p^+ = 7 \quad e^- = 7 \quad n^\circ = 7$



OR $5e^- \; 7p^+ \; 2e^- \; 7n^\circ$

34. a. Using Lewis dot diagrams, show the bonding between aluminum and oxygen.



b. List three physical properties you would expect for aluminum oxide.

- high melting point
- conducts electricity in water
- white crystalline solid

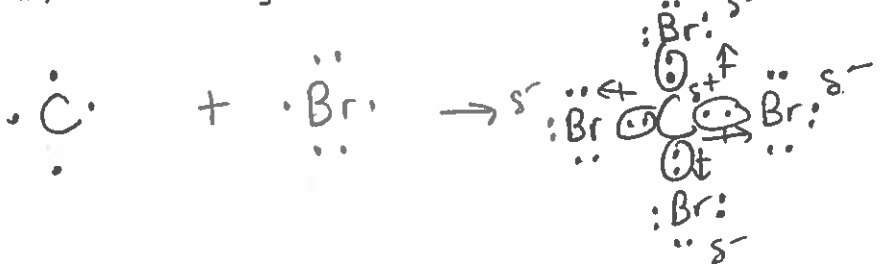
35. Using Lewis dot diagrams, show the bonding between carbon and bromine. Make sure to include partial charges.

ΔEN

Br 2.96

C 2.55

0.41



36. Write a) molecular equations, b) total ionic equations, and c) net ionic equations for the following word equations.
** include states from your solubility table**

i) Aqueous barium nitrate plus aqueous sodium sulphate yields barium sulphate and sodium nitrate.

a) $Ba(NO_3)_{2(aq)} + Na_2SO_{4(aq)} \rightarrow BaSO_{4(s)} + 2NaNO_{3(aq)}$
b) $Ba^{2+}_{(aq)} + 2NO_3^{-1}{}_{(aq)} + 2Na^{+1}_{(aq)} + SO_4^{2-}{}_{(aq)} \rightarrow BaSO_{4(s)} + 2Na^{+1}_{(aq)} + 2NO_3^{-1}{}_{(aq)}$
c) $Ba^{2+}_{(aq)} + SO_4^{2-}{}_{(aq)} \rightarrow BaSO_{4(s)}$

ii) Aqueous magnesium chloride plus aqueous sodium hydroxide yields magnesium hydroxide and sodium chloride.

a) $MgCl_{2(aq)} + 2NaOH_{(aq)} \rightarrow Mg(OH)_{2(s)} + 2NaCl_{(aq)}$
b) $Mg^{2+}_{(aq)} + 2Cl^{-1}{}_{(aq)} + 2Na^{+1}_{(aq)} + 2OH^{-1}{}_{(aq)} \rightarrow Mg(OH)_{2(s)} + 2Na^{+1}_{(aq)} + 2Cl^{-1}{}_{(aq)}$
c) $Mg^{2+}_{(aq)} + 2OH^{-1}{}_{(aq)} \rightarrow Mg(OH)_{2(s)}$