Name: _____ Date: _____

BCI SCIENCE

SCH 3U

Matter and Bonding Review

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

accuracy	atomic radius	chemical change	compound	covalent bond
electron affinity	electronegativity	element	intermolecular forces	intramolecular forces
ionic bond	ionization energy	isoelectronic	isotope	matter
mixture	physical change	polar molecule	precision	pure substance
significant digits				

1. intermolecular forces must be overcome during a physical change in state.
2. intramolecular forces must be overcome during a chemical change
3. The trend that increases down a group and decreases across a period is atomic radius.
4. $NO_{2(g)}$ is held together by covalent bonds.
5. When a scientist records a **target** value, this demonstrates accuracy.
6. The air we breathe is classified as a mixture.
7. Both O^{2-} and Ne are considered to be isoelectric.
8. Significant digits are an indication of the level of precision of the equipment used.
9. The change in energy when an electron is added to an atom is a measure of electron affinity in kJ/mol.
10. $^{7}_{3}Li$ and $^{6}_{3}Li$ are considered isotopes of lithium.

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

11. Ionization energy is a measure of atomic size from the nucleus to the valence electrons in pm.
F, I.E. is the amount of energy (kJ/mol) required to remove a valence e^-
12. Accuracy is a synonym for precision.
F, accuracy & precision have different meanings
13. Malleability is a physical property that describes matter's ability to stretch into a wire.
F, malleability is a physical property that describes the ability to be hammered into a sheet.
14. 6.78 mL has 3 significant digits.
T
15. 5789 kg is 5.8×10^6 mg when expressed with 2 significant digits.
T
16. The precision rule is used when calculating with multiplication or division.
F, the certainty rule is used when calculating $\times \div$
17. An ionic bond occurs when the ΔEN value is between 3.3 and 1.7.
T

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

18. accuracy / precision
- both are indicators of measurement
- accuracy = was the target value achieved?
- precision = level of significant digits
  - repeated measures

19. physical change / chemical change
- both involve altering the substance
- physical = change in state or form
- chemical = new substance created

20. ionization energy / electron affinity
- both have units of kJ/mol
- I.E. = energy required to remove valence e^-
- E.A. = Δ energy when e^- is added to an atom

21. ionic bond / covalent bond
- both used to achieve a stable octet
- ionic = metal + non-metal, gain/lose e^-
- covalent = non-metals, share e^-

22. cation / anion
- both are a result of ionic bonding
- cation = positively charged ion
- anion = negatively charged ion

23. polar covalent bond / pure covalent bond
- both involve sharing of e^-
- polar = unequal sharing, ΔEN = 1.7 - 0.5
- pure = equal sharing, ΔEN = 0

D. Multiple choice (Choose the best answer)

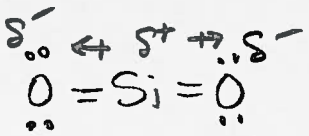
24. Which of the following was contributed to atomic theory by Neils Bohr?
    a) Raisin Bun Model
    b) Discovery of the proton
    c) Discovery of the neutron
    (d) Energy levels

25. Place the following atoms in order of increasing size (smallest to biggest) S, P, Se, K.
    a) P, S, Se, K
    b) P, K, Se, S
    c) S, P, K, Se
    (d) S, P, Se, K

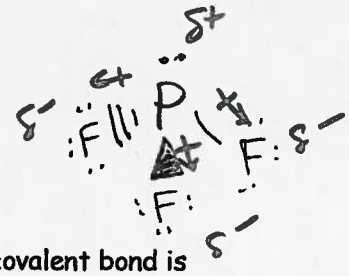
26. Place the following atoms in order of increasing ionization energy (smallest to biggest) Hg, Cu, Au, Ag
    a) Hg, Cu, Au, Ag
    b) Cu, Ag, Au, Hg
    c) Hg, Au, Ag, Cu
    (d) Au, Hg, Ag, Cu

27. Place the following atoms in order of increasing electron affinity (smallest to biggest)
    (a) Fr, Ti, Zn, F
    b) Zn, Ti, Fr, F
    c) F, Ti, Fr, Zn
    d) F, Zn, Ti, Fr

28. The shape of SiO_2 is
    (a) linear
    b) pyramidal
    c) v-shaped
    d) tetrahedral



29. The shape of BF_3 is
    a) linear
    (b) pyramidal
    c) v-shaped
    d) tetrahedral

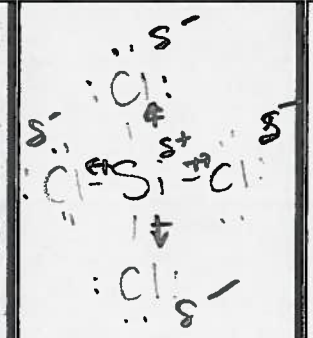
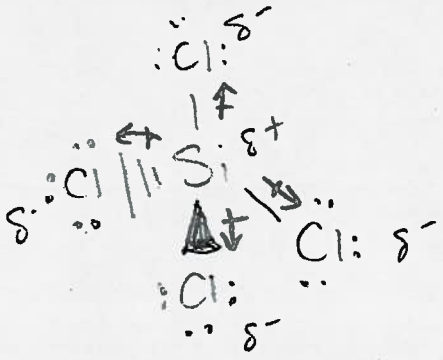
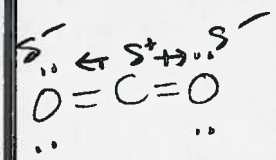
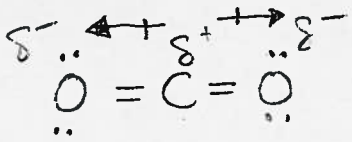
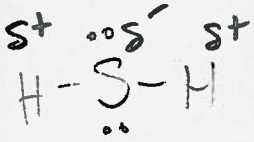
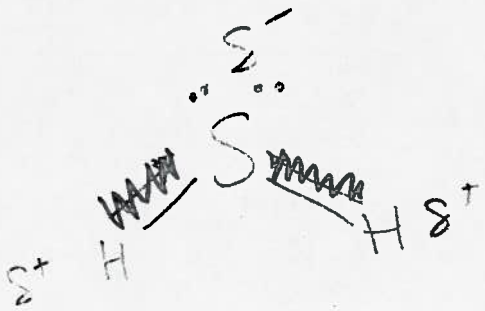
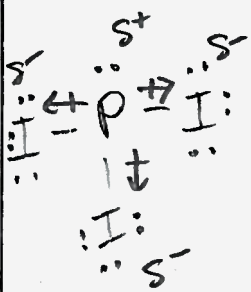
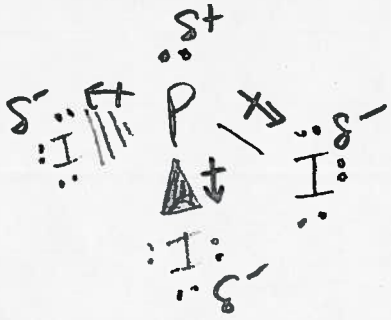


30. The ΔEN for a non-polar covalent bond is
    a) 0
    b) 1.7 - 0.5
    c) 3.3 - 1.7
    (d) 0.1 - 0.5

31. The number of electrons in $^{27}_{13}Al^{3+}$ is
    a) 27
    b) 13
    c) 14
    (d) 10

E. Drawing

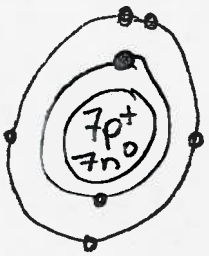
32. Complete the following table.

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			V-shaped/ bent	non-polar
PI_3 I 2.66 P 2.19 0.47			pyramidal	polar

F. Diagrams

33. Draw a Bohr-Rutherford Diagram for nitrogen.

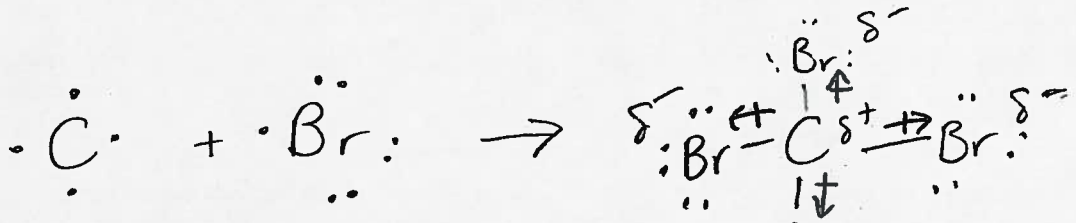
$^{14}_{7}N$



34. a. Using Lewis dot diagrams, show the bonding between lithium and chlorine.

b. The cation is isoelectric with ___He___ and the anion is isoelectric with ___Ar___.

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



EN: C = 2.55 Br = 2.96 ΔEN = 0.41

non-polar covalent

36. Summarize the properties of ionic, polar covalent, non-polar covalent and pure covalent compounds and include an example of each type of compound.

IONIC	POLAR COVALENT	NON-POLAR COVALENT	PURE COVALENT
- crystalline solid - high melting point - conducts electricity in liquid state - high solubility in water	- solid, liquid - highest of covalent melting points - mild condu - high solubility in water	- solid, liquid or gas - low melting point - low solubility in water	gas - lowest melting point - poor/non-soluble