

Unit Review: Matter and Qualitative Analysis

Multiple Choice:

- Which of the following ions has the same number of electrons as an argon atom, Ar?
a. S^{2+} b. Mg^{2+} c. K^- d. P^{3-}
- Which of the following bonds is the most polar?
a. H-F b. F-F c. H-Cl d. Cl-Cl
- Who stated that electrons can only jump between fixed energy levels?
a. Bohr b. Chadwick c. Dalton d. Rutherford
- Which of the following properties is typical of an ionic compound?
a. colourless b. insoluble in water c. nonelectrolyte d. high melting point
- The methane molecule, $CH_4(g)$, consists of a carbon atom bonded to four hydrogen atoms. Its shape is
a. linear b. bent c. pyramidal d. tetrahedral
- An atom can form a positive ion by
a. losing electrons b. gaining electrons c. losing protons d. gaining protons
- Which of the following statements is not considered to be an observation?
a. the colour of the cabinet is black
b. the height of the desk is 96 cm
c. the temperature of the solution is $26^\circ C$
d. the temperature of a substance is the measure of the kinetic energy of the molecules that comprise it
- An electron in an excited state must have
a. released energy in the form of light c. paired with another electron from another atom
b. absorbed energy d. been ejected from an atom by absorbing light energy
- Which of the following is an example of qualitative analysis?
a. identifying a substance by comparing its physical and chemical properties to known properties
b. identifying a substance by the colour it emits during a flame test
c. identifying a substance by its line spectrum
d. all of the above

Completion:

- Briefly outline the contributions of the following to the modern atomic theory:
a. Dalton

Matter is made up of indivisible atoms.

Each element is made up of its own kind of atom.

Atoms are featureless spheres.

b. Thomson

Discovered the electrons.

Atoms are positive spheres with negative electrons embedded in it.

c. Rutherford (include the gold foil experiment)

Discovered protons.

Atoms made up of mostly empty space.

A positively charged, dense, centrally located nucleus.

Electrons spinning around the nucleus.

d. Bohr

Electrons move around the nucleus in specific orbits around the nucleus.

11. What is the difference between an ionic bond and a covalent bond?

Ionic: bond formed from the attraction of positive and negative ions.

Covalent: bond formed when electrons are shared.

12. What are three properties of an ionic compound? Three properties of a covalent compound?

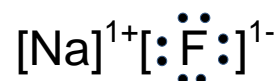
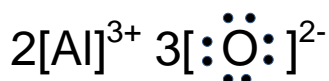
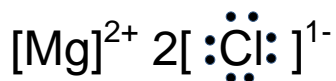
Ionic	Covalent
High mp and bp	Low mp and bp
Solids at room temperature	Solids, liquids and gases at room temperature
Conductors when melted or dissolved in water	Non conductors
Hard and brittle	Soft and flexible

13. Draw Lewis structures how the following **ionic** compounds form:

a. MgCl_2

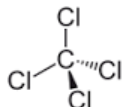
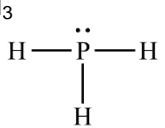
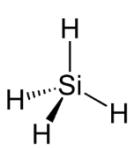

b. Al_2O_3

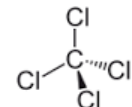
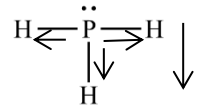
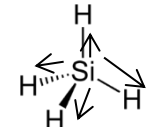
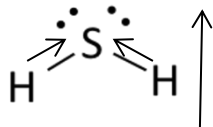
c. NaF



14. Draw Lewis structures for the following **covalent** compounds:

15. Redraw the Lewis structures in question 14, to include their proper shape. State the shape, bond polarity, molecular polarity and the intermolecular forces that would be present (DDF, HB, LDF).

a. CCl_4 	b. PH_3 
c. C_2H_2 $\text{H}-\text{C}\equiv\text{C}-\text{H}$	d. Br_2 $\text{:}\ddot{\text{Br}}-\ddot{\text{Br}}\text{:}$
e. SiH_4 	f. H_2S 

a.  polar bonds, nonpolar molecule, tetrahedral, LDF	b.  slightly polar bonds, polar molecule, pyramidal, LDF and DDF
c. $\text{H}-\text{C}\equiv\text{C}-\text{H}$ slightly polar and nonpolar bonds, nonpolar molecule linear, LDF	d. $\text{:}\ddot{\text{Br}}-\ddot{\text{Br}}\text{:}$ nonpolar bonds, nonpolar molecule linear, LDF
e.  slightly polar bonds, nonpolar molecule tetrahedral, LDF	f.  slightly polar bonds and polar molecule, bent, LDF and DDF

15. What type of bonding would be found between the following atoms (Calculate ΔEN):
- | | | | |
|-------------|-----------------------------------|-------------|--------------------------|
| a. Mg and S | ionic $\Delta EN = 1.27$ | c. K and Br | ionic $\Delta EN = 2.14$ |
| b. H and O | polar covalent $\Delta EN = 1.24$ | d. C and H | ionic $\Delta EN = 1.27$ |

16. Arrange the following bonds in order from most polar to least polar: S-O, Cl-Cl, Cl-O

S-O most polar $\Delta EN = 0.86$

Cl-O next $\Delta EN = 0.28$

Cl-Cl least $\Delta EN = 0$