KEY

Chemical Families in Detail

Name - _____

1.) Write the electron configurations for each of the following Noble Gases using core notation.

He	$1s^2$
Ne	$[He]2s^22p^6$
Ar	$[Ne]3s^23p^6$
Kr	$[Ar]4s^23d^{10}4p^6$
Xe	$[Kr]5s^24d^{10}5p^6$
Rn	$[Xe]6s^24f^{14}5d^{10}6p^6$

2.) Why are the Noble Gases so unreactive? (Hint – How many valence electrons do they have?)

Answer – All have full valence shells and so won't react as they need to lose or gain zero electrons.

3.) What should happen to the ionization energy of the Noble Gases going down the periodic table from He to Rn?

Answer – IE decreases as the atomic radii is increasing, allowing less energy to be needed to remove the outer most (valence) electrons.

4.) Some of the Noble Gases can be made to react with fluorine gas. Which Noble Gas, He or Rn, would you expect to be more likely to react? Why?

Answer – Radon will be easier to force to react as the atomic radii is bigger allowing the nucleus to have less control on the valence electrons.

5.) Suggest a reason why the Noble Gases were among the last naturally-occurring elements to be discovered?

Answer – Since the noble gases don't react so there are no compounds from which they can be extracted.

- Quite rare on earth.

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6.) Write the electron configurations for each of the following Alkali Metals using core notation.

Li	[He]$2s^1$
Na	[Ne]$3s^1$
K	[Ar]$4s^1$
Rb	[Kr]$5s^1$
Cs	[Xe]$6s^1$
Fr	[Rn]$7s^1$

7.) Why are the Alkali Metals so reactive? (Hint – How many valence electrons do they have?)

Answer – All have one valence electron which is easy to remove.

8.) What happens to the ease with which the Alkali Metals lose an electron, going down the periodic table from Li to Cs? Why?

Answer – The ease increases. The electron is easier and easier to remove because the atomic radii is increasing as you go down the family, making the pull from the nucleus weaker and weaker on the outermost electrons.

9.) What trend in ionization energy should exist going down the periodic table from Li to Fr?

Answer – General trend is decreasing ionization energy for the same reason stated above.

10.) The electrical conductivity of a metal is governed by the ability of its valence electrons to move freely from one atom to the next. Would you expect the Alkali Metals to be good or poor conductors? Why?

Answer – Good conductors as they have one valence electron that is easily removed.

11.) Write the electron configurations for each of the following Alkali Earth Metals using core notation.

Be	[He]$2s^2$
Mg	[Ne]$3s^2$
Ca	[Ar]$4s^2$
Sr	[Kr]$5s^2$
Ba	[Xe]$6s^2$
Ra	[Rn]$7s^2$

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12.) Would you expect the Alkaline Earth Metals to be more or less reactive than their Alkali Metal counterparts? (Hint – What has to be done to form the ions of the metals in each family).

Answer – Alkaline Earth metals are less reactive as removing 2 valence electrons are harder than 1 valence electron.

13.) What trend in ionization energy should exist going down the periodic table from Be to Ra?

Answer – ionization energy (IE) will decrease. Atomic radii are increasing so the valence electron(s) are easier to remove.

14.) Write the electron configurations for each of the following Halogens using core notation.

F	$[He]2s^2 2p^5$
Cl	$[Ne]3s^2 3p^5$
Br	$[Ar]4s^2 3d^{10} 4p^5$
I	$[Kr]5s^2 4d^{10} 5p^5$
At	$[Xe]6s^2 4f^{14} 5d^{10} 6p^5$

15.) Based on the phases of the Halogens at room temperature, what can you conclude about the trend in melting/boiling temperatures going down the Halogens?

Answer – Boiling and melting points increase as one goes down the halogen family.

16.) Why are the Halogens so reactive? (Hint – How many valence electrons do they have?)

Answer – All have nearly full valence shells and a high electronegativity allowing them to take an electron to fill their shells.

17.) What trend in ionization energy should exist going down the Halogen family on the periodic table? Why?

Answer – ionization energy (IE) will decrease. Atomic radii are increasing so the valence electron(s) are easier to remove.