

35 poss
in 2011

Name key
Period _____

EGG CARTON ACTIVITY: Electron Configurations & Orbital Diagrams

Materials: egg cartons, beans, periodic table

Procedure:

- Obtain two egg cartons and bag of beans.
- Label each trough with the appropriate energy sublevel. Create a chart (with arrows) to help you determine the correct order of the energy sublevels. Check your order w/ teacher before marking in the egg cartons.

+Vw
1s, 2s, 2p, 3s, 3p, 4s, 3d, 4p, 5s, 4d, 5p, 6s,
4f, 5d, 6p, 7s, 5f, 6d, 7p, 6f, 7d, 7f

1s
2s 2p
~~3s 3p 3d~~
~~4s 4p 4d 4f~~
~~5s 5p 5d 5f~~
~~6s 6p 6d 6f~~
~~7s 7p 7d 7f~~

- Fill each sublevel according to the three rules for determining electron configurations. (Let white beans = cc spin and brown = c spin.) These rules are:

+1/2
Rule 1: Pauli Exclusion: Each orbital can have a max of 2e⁻ & must be opposite spin.
Rule 2: Aufbau Principle: Lowest energy ^{sub} levels filled first
Rule 3: Hund's Rule: e⁻ fill up equal energy orbitals first so max # of unpaired e⁻ results.

From
wieder aufbau =
rebuilding

- Indicate the orbital diagrams and electron configurations for the following elements: * Also indicate the abbreviated configuration (where appropriate).

+2
a. Helium: 1s²
He 2
orbital diagram 1↓
1s

+3
b. Neon: 1s² 2s² 2p⁶ → 10 → abbrev. [He]² 2s² 2p⁶ → 10
Ne 10
orbital diagram 1↓ 1↓ 1↓ 1↓ 1↓ _____
1s 2s 2p 2p 2p 3s 3p 3p 3p

c. Argon: $1s^2 2s^2 2p^6 3s^2 3p^6$ Abbrev: $[\text{Ne}]^{10} 3s^2 3p^6$
 Ar 18

orbital diagram $\frac{1\downarrow}{1s} \frac{1\downarrow}{2s} \frac{1\downarrow}{2p} \frac{1\downarrow}{2p} \frac{1\downarrow}{2p} \frac{1\downarrow}{3s} \frac{1\downarrow}{3p} \frac{1\downarrow}{3p} \frac{1\downarrow}{3p}$

d. Krypton: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6$ Abbrev: $[\text{Ar}]^{18} 4s^2 3d^{10} 4p^6$
 Kr 36

orbital diagram $\frac{1\downarrow}{1s} \frac{1\downarrow}{2s} \frac{1\downarrow}{2p} \frac{1\downarrow}{2p} \frac{1\downarrow}{2p} \frac{1\downarrow}{3s} \frac{1\downarrow}{3p} \frac{1\downarrow}{3p} \frac{1\downarrow}{3p}$

$\frac{1\downarrow}{4s} \frac{1\downarrow}{3d} \frac{1\downarrow}{3d} \frac{1\downarrow}{3d} \frac{1\downarrow}{3d} \frac{1\downarrow}{3d} \frac{1\downarrow}{3d} \frac{1\downarrow}{4p} \frac{1\downarrow}{4p} \frac{1\downarrow}{4p}$

e. Boron: $1s^2 2s^2 2p^1 \rightarrow 5$ Abbrev: $[\text{He}]^2 2s^2 2p^1$
 B 5

orbital diagram $\frac{1\downarrow}{1s} \frac{1\downarrow}{2s} \frac{1}{2p} \frac{}{2p} \frac{}{2p} \frac{}{3s} \frac{}{3p} \frac{}{3p} \frac{}{3p}$

* f. Sulfur: $1s^2 2s^2 2p^6 3s^2 3p^4 \rightarrow 16$ Abbrev: $[\text{Ne}]^{10} 3s^2 3p^4$
 S 16

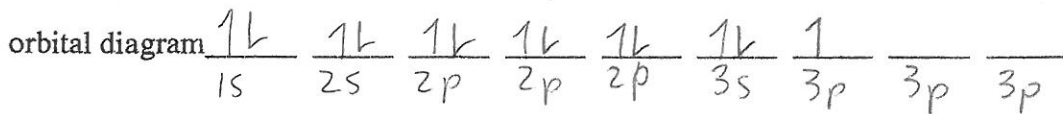
orbital diagram $\frac{1\downarrow}{1s} \frac{1\downarrow}{2s} \frac{1\downarrow}{2p} \frac{1\downarrow}{2p} \frac{1\downarrow}{2p} \frac{1\downarrow}{3s} \frac{1\downarrow}{3p} \frac{1}{3p} \frac{1}{3p}$

g. Scandium: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^1 \rightarrow 21$ Abbrev: $[\text{Ar}]^{18} 4s^2 3d^1$
 Sc 21

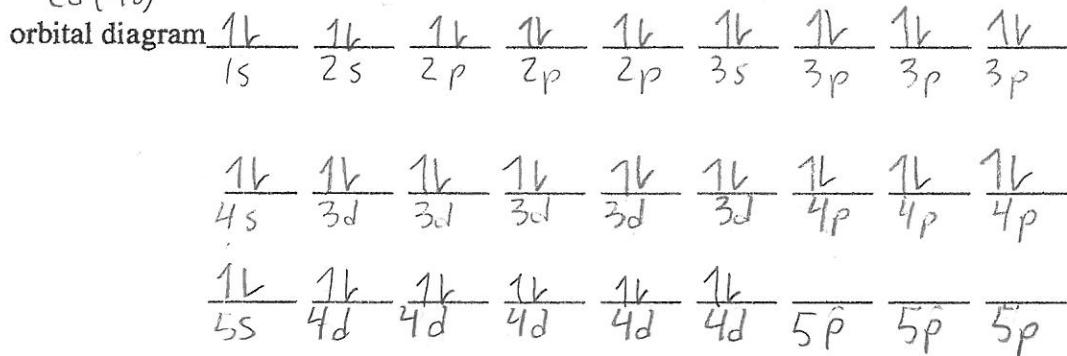
orbital diagram $\frac{1\downarrow}{1s} \frac{1\downarrow}{2s} \frac{1\downarrow}{2p} \frac{1\downarrow}{2p} \frac{1\downarrow}{2p} \frac{1\downarrow}{3s} \frac{1\downarrow}{3p} \frac{1\downarrow}{3p} \frac{1\downarrow}{3p}$

$\frac{1\downarrow}{4s} \frac{1}{3d} \frac{}{3d} \frac{}{3d} \frac{}{3d} \frac{}{3d} \frac{}{4p} \frac{}{4p} \frac{}{4p}$

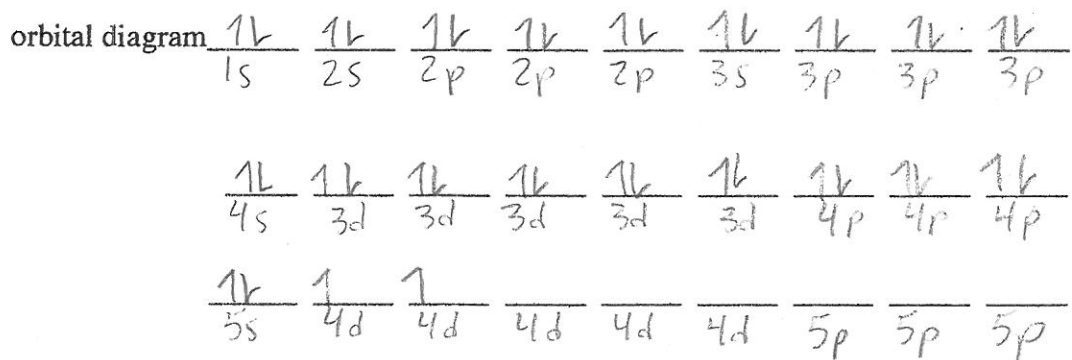
h. Aluminum: $1s^2 2s^2 2p^6 3s^2 3p^1 \rightarrow ^{13}$ Abbrev: $[\text{Ne}]^{10} 3s^2 3p^1$
 Al (13)



i. Cadmium: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^{10} \rightarrow ^{48}$ $\rightarrow [\text{Kr}]^{36} 5s^2 4d^{10}$
 Cd (48)



j. Zirconium: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^2 4d^2 \rightarrow ^{40}$ Abbrev: $[\text{Kr}]^{36} 5s^2 4d^2$
 Zr (40)



k. Germanium: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^2 \rightarrow ^{32}$ Abbrev: $[\text{Ar}]^{18} 4s^2 3d^{10} 4p^2$
 Ge (32)

