

Atomic Theory Practice Test

Name: *Key*
Date:
Block:

B 1. If two atoms of Ca have a different number of electrons, which property (or properties) would be significantly different?

- a) Mass
- b) Charge
- c) Both A & B
- d) Neither A nor B

A 2. If two atoms of Na have a different number of neutrons which property (or properties) would be significantly different?

- a) Mass
- b) Charge
- c) Both A & B
- d) Neither A nor B

C 3. Which of the following ions will NOT have the same electron configuration as Ne?

- a) Na^+ ✓
- b) Al^{3+} ✓
- c) Ar
- d) O^{2-} ✓

A 4. Which of the following easily loses one outermost electron?

- (a) Potassium
- b) Beryllium
- c) Iron
- d) Bromine

B 5. Which of the following would have the largest atomic radius?

- a) Seaborgium
- (b) Einsteinium
- c) Indium
- d) Thallium

A 6. Which trend in the halogen family occurs with increasing atomic number?

- (a) Ionization energies decrease
- ~~b) Atomic radii decrease~~ *group #17*
- c) Electronegativities increase
- ~~d) Tendency to gain electrons increases~~

D 7. Which of the following species would have 2 unpaired valence electrons?

- a) Boron ✗
- b) Fluorine ✗
- c) Beryllium ion ✗
- (d) Vanadium (III) ion ✓

C 8. What sub-shell is especially stable when it is half-filled?

- a) s-subshell
- b) p-subshell
- (c) d-subshell
- d) f-subshell

d 9. A molecule has the VSEPR shape of AX_4E_2 . What shape would it have?

- a) tetrahedral
- b) T-shaped
- c) trigonal planar
- d) square planar

A6

e 10. A molecule is T-shaped. What VSEPR notation would it have?

- a) AX_4E
- b) AX_5
- c) AX_3E_2
- d) AX_2E_3

11. The following mixtures of isotopes are found in nature. Calculate the average atomic mass of a sample given that $^{107}\text{Ag} = 51.8\%$ and $^{109}\text{Ag} = 48.2\%$. Round your answer to one decimal place. Include units.

$$(107 \times 0.518) + (109 \times 0.482)$$

$$= 107.964 \text{ amu}$$

$$= \boxed{108.0 \text{ amu}}$$

12. Complete the following table:

Element Name	Element Symbol	Atomic Number	Atomic Mass	# of protons	# of neutrons	# of electrons
Titanium	Ti^{4+}	22	47.88	22	26	18
Bromine	Br^-	35	79.90	35	45	36
Gold	Au	79	196.97	79	117.97	79

13. Fill in the following table by writing the full electron configuration for:

Element	Full Electron Configuration
Ge^{+2}	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10}$
Mo	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6 5s^1 4d^5$
Nitrogen	$1s^2 2s^2 2p^3$

14. Show the core notation orbital diagram and determine the number of valence electrons.

Element	Core Notation Orbital Diagram	# Valence Electrons
Ru ³⁺	$[Kr] \cancel{5s^2} 4d^5 \rightarrow [Kr] \underset{4d}{\begin{array}{c} 1 \\ 1 \\ 1 \\ 1 \\ 1 \end{array}}$	5
Sulphur	$[Ne] 3s^2 3p^4 \rightarrow [Ne] \underset{3s}{\begin{array}{c} 1 \\ \downarrow \end{array}} \underset{3p}{\begin{array}{c} 1 \\ \downarrow \\ 1 \\ \downarrow \\ 1 \end{array}}$	6
Ti ²⁺	$[Ar] \cancel{4s^2} 3d^2 \rightarrow [Ar] \underset{3d}{\begin{array}{c} 1 \\ 1 \\ - \\ - \\ - \end{array}}$	2

15. **Identify** the atoms that has the following electron configuration:

- a) $1s^2 2s^2 2p^2$ Carbon b) $1s^2 2s^2 2p^4$ Oxygen c) $1s^2 2s^2 2p^6 3s^2 3p^2$ Silicon
 d) $[Ne] 3s^2 3p^4$ Sulfur e) $[Ar] 4s^1$ Potassium f) $[Ar] \cancel{4s^2} 3d^8$ Nickel

16. Consider two neutral atoms: Al and Cl

- a) Which atom has a larger atomic radius?

Al

- b) Which atom has the larger ionization energy?

Cl

- c) Which atom has a greater electron affinity?

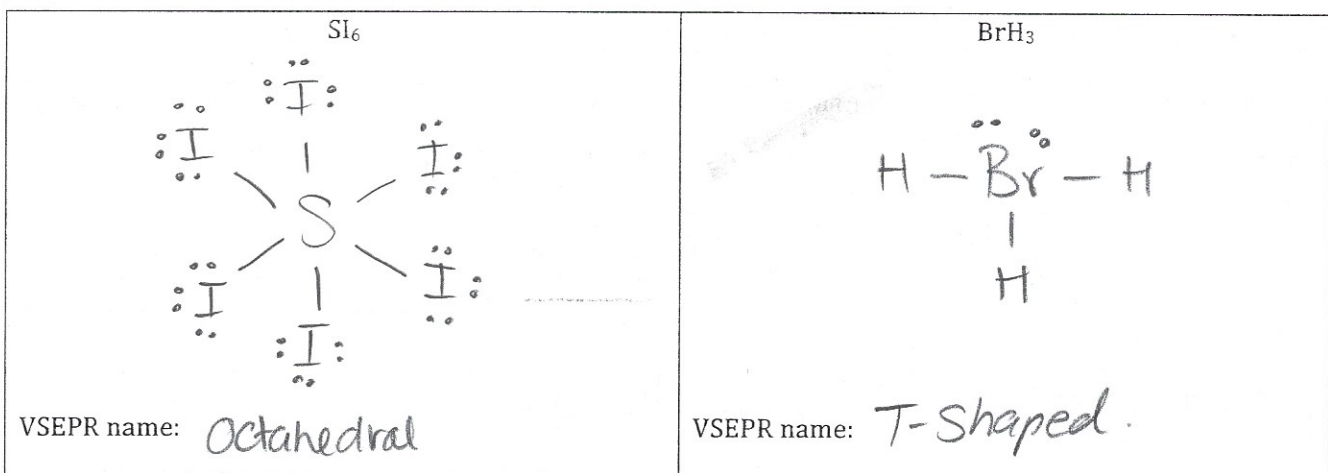
Cl

- d) How many valence electrons does each atom have?

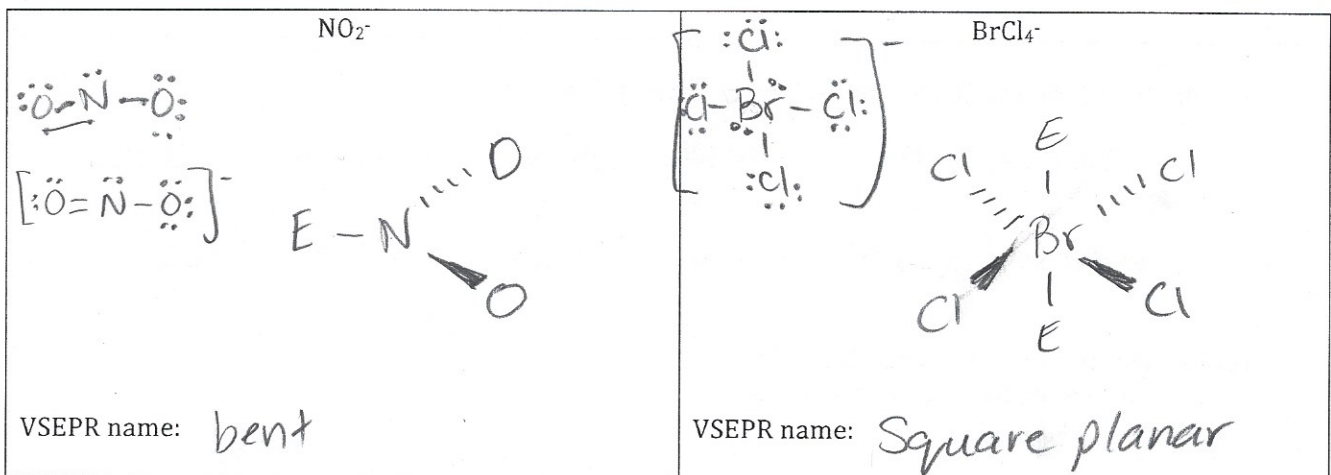
Al = 3 Cl = 7

17. Draw the **Lewis structures** (electron dot diagrams) for the following. *Include the VSEPR names as well.*

Boron trifluoride	Oxygen gas
$\begin{array}{c} \text{:}\ddot{\text{F}}\text{:} - \text{B} - \text{:}\ddot{\text{F}}\text{:} \\ \\ \text{:}\ddot{\text{F}}\text{:} \end{array}$	$\text{:}\ddot{\text{O}} = \ddot{\text{O}}\text{:}$
VSEPR name: <u>trigonal planar</u>	VSEPR name: <u>linear</u>



18. Draw the **VSEPR shapes** for the following. Include the VSEPR names as well.



19. Determine the type of bond that forms between the following atoms:

- a) O and O $3.5 - 3.5 = 0$ *non-polar covalent*
- b) Na and F $4.0 - 0.9 = 3.1$ *ionic*
- c) Ca and Br $2.8 - 1.0 = 1.8$ *ionic*
- d) P and O $3.5 - 2.1 = 1.4$ *Polar covalent*