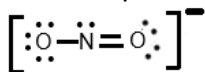


### Version B

## Midterm Examination #2

1. A lab report had just had a number “10.0” with no units written for this quantity. It was supposed to be the **mass** of sulfur used in the experiment. What units should the number have had?  
a) g            b) mol            c) g/mol            d) (number of) molecules            e) mol/g
2. Which of the following represents a change in enthalpy in a substance that is being is being boiled?  
a)  $\Delta H_{\text{vap}}$             b)  $\Delta H_{\text{sub}}$             c)  $\Delta H_{\text{fus}}$             d)  $\Delta H_{\text{melt}}$
3. Which of these types of matter will have a definite volume and a definite shape?  
a) gas            b) liquid            c) solid            d) London Dispersion Force            e) choices (a) and (b))



4. What are the total number of valence electrons for the molecule?  
a) 6      b) 10      c) 12      d) 18      e) 24

5. Each atom in the molecule should have an octet of electrons. How many electrons is that?  
a) 2      b) 4      c) 8      d) 10      e) 12

- There are a total of 3 bonding pairs of electrons in the molecule
- The molecule has a net charge of -1
- The central atom nitrogen has no nonbonding (lone) pairs of electrons
- One of the oxygen atoms has three nonbonding (lone) pairs of electrons

a) 400 J                      b) 225 J                      c) 75.0 J                      d) 0.635 J

- a) it is a positively charged metal cation
- b) it is an element that can ionize to more than one charge state (for example, it can be +1, +2, +3, and even -1, -2, etc)
- c) the element's name in a compound requires the use of a roman numeral (the Stock system)
- d) all the above

a) ionic                      b) metallic                      c) (nonpolar) covalent                      d) polar covalent

10. In drawing a Lewis structure for the carbonate ( $\text{NO}_3$ )<sup>-</sup> ion, you have placed the octet around the three oxygen (O) atoms, but you see the central carbon (N) atom has only six electrons (3 bonding pairs) to the oxygen atoms. You have no electrons remaining to add in your inventory. What step do you need to do?
- Nothing: your Lewis structure is ready and complete
  - Add a hydrogen atom to the molecule
  - A lone pair from one of the oxygen (O) atoms will have to be used to create a double bond with the central nitrogen (N)
  - Use Avogadro's Number at an earlier step
  - The noble gas argon (Ar) must provide a single electron to complete this structure
11. What is the molar mass of  $\text{MgSO}_4 \cdot 7 \text{H}_2\text{O}$ ?
- 120.38 g/mol
  - 126.112 g/mol
  - 246.5 g/mol
  - 18.016 g/mol
12. What is the mass percentage of water in the hydrate  $\text{MgSO}_4 \cdot 7 \text{H}_2\text{O}$ ?
- 0%
  - 49.84%
  - 51.16%
  - 100%
13. What class of (crystalline) solid does extensively hydrogen-bonded  $\text{H}_2\text{O}$  as ice as well as carbon dioxide ( $\text{CO}_2$ ) as dry ice, and also diatomic element molecule iodine ( $\text{I}_2$ ) form?
- ionic
  - covalent network
  - metallic
  - molecular
14. Ammonia ( $:\text{NH}_3$ ) is a molecule with three terminal H atoms and a nonbonding (lone) pair of electrons on the central N atom. What is its molecular geometry?
- bent
  - trigonal planar
  - trigonal pyramidal
  - tetrahedral
15. Water is at  $1^\circ\text{C}$ . What is its temperature on the Kelvin scale?
- 0 K
  - 100 K
  - 274 K
  - 298 K
16. When atoms like cesium and fluorine have the largest differences in electronegativity, what kind of bond will they form?
- ionic
  - metallic
  - covalent
  - polar covalent
  - covalent-ionic
17. How many moles of a compound is there if the number of molecules or atoms or particles of that compound is two (2) times Avogadro's Number?
- 1 mol
  - 2 mol
  - 10 mol
  - 20 mol
  - 100 mol
18. Of the following intermolecular forces dipole-dipole (D-D), hydrogen bonding (H-B), London Dispersion Forces (LDF), which choice shows the order of strength of interaction? (LDF > H-B means LDF is stronger than H-B)
- LDF > H-B > D-D
  - H-B > D-D > LDF
  - H-B > LDF > D-D
  - D-D > H-B > LDF
19. What procedure is done in a laboratory if the goal is to get the **empirical formula** of an unknown compound?
- checking viscosity
  - elemental analysis
  - boiling point determination
  - heating curve analysis
  - cooling curve analysis
20. What is the correct name for  $\text{Fe}_2\text{O}_3$ , noting that Fe is a Type II metal cation?
- tin(IV) sulfide
  - iron(I) oxide
  - iron(III) oxide
  - iron oxide
21. Which molecular formula correctly shows the compound **dinitrogen tetrachloride**?
- NCl
  - $\text{N}_2\text{Cl}_2$
  - $\text{N}_4\text{Cl}_2$
  - $\text{N}_2\text{Cl}_4$

22. What kind of **intermolecular force** is an electrostatic interaction in which the molecules have a structure giving them a permanent partial positive charge ( $\delta^+$ ) on one end or side and a partial negative charge ( $\delta^-$ ) on another end or side?
- a) hydrogen bonding                      b) London dispersion forces                      c) covalent-ionic  
d) dipole-dipole interaction                      e) enthalpy of covalency
23. There are  $6.022 \times 10^{23}$  atoms of element calcium (Ca). How many grams of calcium are there?
- a)  $6.022 \times 10^{23}$  g                      b) 6.65 g                      c) 40.08 g                      d) 241.3 g
24. Which of these elements is a Group 2 element?
- a) Na                      b) Ca                      c) Mg                      d) both (b) and (c)                      e) all elements (a), (b), (c) are Group 2
25. What characteristics are true about the  $\text{H}_2\text{O}$  molecule?
- a) Its central oxygen atom has three nonbonding (lone) pairs of electrons  
b) The difference in electronegativity between O and H atoms enables hydrogen bonding  
c) Its molecular geometry is described as trigonal planar  
d) It has no molecular polarity (no dipole moment)

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26. Beryllium has a molar mass of 9.012 g/mol
- a) true                      b) false
27. There are more molecules in 0.50 mol of  $\text{CO}_2$  than in 0.50 mol of  $\text{SO}_2$
- a) true                      b) false
28. A **formula unit** is a dimension of **mass** and its units are in grams (g)
- a) true                      b) false
29. 1 mol of sodium and 1 mole of potassium are equal numbers of Na and K atoms
- a) true                      b) false
30. Kinetic energy is an energy determined by motion or velocity of a mass
- a) true                      b) false
31. Nonbonding (lone) pairs of electrons affecting molecular geometry is explained by Valence Shell Electron Pair Repulsion (VSEPR) theory
- a) true                      b) false
32. The burning of gasoline is an endothermic process
- a) true                      b) false
33. 2.0 moles of  $\text{H}_2$  molecules is  $6.022 \times 10^{23}$  molecules of  $\text{H}_2$
- a) true                      b) false
34. London Dispersion Forces describe a temporary, instantaneous induced dipole as intermolecular force
- a) true                      b) false
35. Cesium chloride is an ionic compound with the formula  $\text{Cs}_2\text{Cl}$
- a) true                      b) false



