1. The value seven hundred fifty million with four significant figures is written as

    b. 7.500×10^8

2. Which of the following is **NOT** an element of the fourth period in the periodic table?

    c. Mg

3. To obtain 5.66×10^{21} atoms of nickel, you would weigh

    a. 0.552 g.

4. How many grams of magnesium contain the same number of atoms as 20.04 g of calcium?

    a. 12.16 g

5. Which of the following series represents only known stable metal ions?

    d. Fe^{2+}, Sr^{2+}, Mg^{2+}

6. Which formula represents the binary compound formed by sodium and tellurium?

    a. Na_2Te

7. What is the correct name of $KClO_4$?

    c. potassium perchlorate

8. Which of the following compounds is 36.4% oxygen by mass?

    a. N_2O

9. The molar mass of barium nitrate is

    c. 261.35 g/mol.

10. When 8.00 g of hydrogen reacts with 32.0 g of oxygen, the final mixture will contain

    b. H_2, H_2O.

11. A 27.0 g sample of an unknown carbon-hydrogen compound was burned in excess oxygen to form 88.0 g of CO_2 and 27.0 g H_2O. What is a possible molecular formula of the hydrocarbon?

c. C_4H_6

12. Ammonia gas can be prepared by the reaction of a basic oxide like calcium oxide with ammonium chloride, an acidic salt.
$$CaO(s) + 2NH_4Cl(s) \rightarrow 2NH_3(g) + H_2O(g) + CaCl_2(s)$$
If you isolate exactly 100. g of NH_3, but should have isolated 136 g in theory, what is the percentage yield of ammonia?

c. 73.5%

13. Which pairs of reagents (if any) could be used in an aqueous solution to prepare pure manganese(II) sulfide by a precipitation reaction?
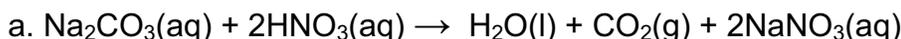
b. $MnCl_2$ and Na_2S

14. Consider the equation -- $2NaI(aq) + Cl_2(g) \rightarrow I_2(aq) + 2NaCl(aq)$. The species undergoing reduction is

c. chlorine.

15. The oxidation number of sulfur in $S_2O_3,^{2-}$

e. +2.

16. A solution of sodium carbonate is treated with a solution of nitric acid. Bubbles are observed in the colorless solution. The balanced equation is

a. $Na_2CO_3(aq) + 2HNO_3(aq) \rightarrow H_2O(l) + CO_2(g) + 2NaNO_3(aq)$

17. If 15.0 g water at 28.0 °C is added to 125.0 g water at 20.0 °C, what is the final temperature of the resulting mixture?

a. 20.9 °C

18. Consider the thermal energy transfer during a chemical process. When heat is transferred to the system, the process is said to be _____ and the sign of q is _____.

c. endothermic, positive

19. Which of the following particles has the largest radius?

e. N^{3-}

20. Given the heats of the following reactions:

$$2ClF(g) + O_2(g) \rightarrow Cl_2O(g) + F_2O(g) \quad \Delta H° = 167.4 \text{ kJ}$$
$$2ClF_3(g) + 2O_2(g) \rightarrow Cl_2O(g) + 3F_2O(g) \quad \Delta H° = 341.4 \text{ kJ}$$
$$2F_2(g) + O_2(g) \rightarrow 2F_2O(g) \quad \Delta H° = -43.4 \text{ kJ}$$

Calculate the heat of the reaction of chlorine monofluoride with F_2 according to the equation:

$$ClF(g) + F_2(g) \rightarrow ClF_3(g)$$

c. -108.7 kJ

21. Which of the following electronic transitions in a hydrogen atom would have the highest energy?

a. n = 4 to n = 1

22. When l = 3, what set of orbitals is designated?

c. f

23. What element has the electron configuration $1s^2 2s^2 2p^6 3s^2 3p^6$?

No answer correct. Everyone receives credit, those who answer "Argon" receive extra credit.

24. A measure of the ability of a gaseous atom to acquire an electron to become negatively charged is called its

c. electron affinity.

25. Which of the following elements has the highest electron affinity?

a. Cl

26. Which of the following diatomic molecules has the greatest bond strength?

c. N_2

27. A straight-chain alkene has six carbon atoms. Its molecular formula is

d. C_6H_{12}

28. The Lewis structure

represents

b. NO_2^+

4

29. In the combustion of methane, CH_4, what change in hybridization (if any) occurs to the carbon atom?

   d. sp^3 to sp

30. What hybrid orbital set is used by the terminal carbon atoms in the following molecule?
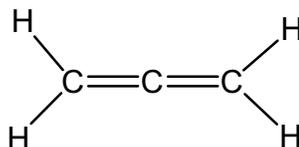
   b. sp^2

31. Which functional group does **not** contain an oxygen atom?

   c. alkene

32. Which of the following pairs are isomers?

   b. $CH_3CH_2OCH_3$ and $CH_3CH_2CH_2OH$

33. What volume will a mixture of 0.200 mole N_2 and 0.500 mole He occupy at 0.944 atm and 15.0 °C?

   e. 17.5 liters

34. What is the density of CH_4 at 200 °C and 0.115 atm?

   a. 0.0475 g/L

35. What is the chemical formula of a gas if it has a pressure of 1.40 atm and a density of 1.82 g/L at 27 °C?

   d. O_2

36. When NaBr dissolves in water, what types of intermolecular forces must be broken?

   d. ion-ion forces and H-bonds

37. A metal fluoride crystallizes such that the fluoride ions occupy cubic lattice positions at the corners and on the faces while the 4 metal atoms occupy positions within the body of the unit cells. The formula of the metal fluoride is

   a. MF

The following questions pertain to lead (atomic mass of 207.2 g/mol) which crystallizes in a face-centered cubic arrangements. Lead has an atomic radius of 1.75×10^{-8} cm.

38. What is the density of lead in g/cm^3?

    d. 11.4 g/cm^3

39. How many pi (π) bonds are in the following molecule?

$$H_3C-C\equiv C-C\equiv N$$

  b. 4

40. Which group of compounds includes an aldehyde, an acid, and an alcohol (in any order)?

    e. H_2CO, CH_3CO_2H, CH_3CH_2OH