MOLE CALCULATIONS (Difficult Level)

1. In which of the following compounds, the mass percentage of hydrogen is the greatest?
A. HF B. HCl C. H_2S D. NH_3 E. H_2O

2. A compound that consists of carbon and hydrogen elements contains 75 % carbon by mass. What is the molecular formula of this compound if its molecular weight is 16 g /mole?
A. C_2H_5 B. C_3H_7 C. CH_4 D. C_2H E. CH_2

3. Which of the following pairs of gases have the same volume at STP?
A. 1 mol of hydrogen and 11.2 L of carbon dioxide
B. 16 g of oxygen and 32 g of sulfur dioxide
C. 28 g of nitrogen and 76 g of fluorine
D. 2 moles of chlorine and 17 g of ammonia
E. 67.2 L of hydrogen and 2 moles of oxygen

4. What is the mass percentage of sulfur in aluminum sulfide?
A. 12 B. 27 C. 36 D. 64 E. 75

5. In 4.6 g of an organic compound containing C, H and O, there are 2.4 g of C and 0.6 g of H. What is the empirical formula of this compound?
A. CHO B. CH_2O C. C_2H_4O
D. $C_2H_4O_2$ E. C_2H_6O

6. What is the mass percentage magnesium in magnesium sulfate?
A. 20 B. 25 C. 30 D. 40 E. 50

7. One molecule of a substance, X, has a mass of $7.89x10^{-23}$ g. What is the molecular weight of X?
A. 47.5 B. 12 C. 44 D. 13 E. 38.8

8. What is the molecular weight of the compound, X_2Y, if mass of $3.01x10^{23}$ atoms of X is 0.5 g and $1.806x10^{24}$ atoms of Y is 48 g?
A. 12 B. 16 C. 24 D. 31 E. 18

9. 0.2 mol XO and 0.3 mole XO_2 has a total mass of 18.8 g. What is the atomic weight of X?
A. 24 B. 36 C. 12 D. 48 E. 32

10. 22.4 L of a gas has a mass of 28 g at STP. What is the mass of one molecule of the gas?
A. $2.33x10^{-23}$
B. $4.65x10^{-23}$
C. $4.21x10^{24}$
D. $1.16x10^{-23}$
E. $1.69x10^{25}$

11. If we take Avogadro's number as "N", what is the total number of atoms in 23 g of C_2H_5OH in terms of N?
A. 9 N B. 4.5 N C. 12 N D. 8 N E. 18 N

12. How many moles of hydrogen atoms are there in 3.6 g of C_5H_{12}?
A. 0.05 B. 0.3 C. 0.6 D. 0.75 E. 1

13. How many moles of H atoms are there in H_2S gas that occupies a volume of 4.48 L at STP?
A. 0.1 B. 0.4 C. 0.8 D. 1 E. 1.2

14. How many atoms of oxygen are there in 22.4 L of ozone (O_3) gas at STP?
A. $2.33x10^{23}$
B. $6.01x10^{23}$
C. $0.1806x10^{22}$
D. $1.204x10^{24}$
E. $1.806x10^{24}$

15. 3.6 g of H_2X contains 0.4 moles of hydrogen atom. What is the atomic weight of X?
A. 15 B. 16 C. 8 D. 18 E. 7

16. 0.02 moles of $Na_2CO_3.XH_2O$ solid is heated to a constant mass. What is the value of "X" in the formula if the mass loss during heating is 3.6 g?
A. 5 B. 2 C. 10 D. 4 E. 8

17. What is the total number of atoms in 8.8 g carbon dioxide gas?
A. $6.01x10^{23}$
B. $1.204x10^{24}$
C. $6.01x10^{24}$
D. $3.612x10^{23}$
E. $1.806x10^{23}$

18. 3 g of compound X_2O contains 1.6 g of oxygen. What is the molecular weight of X_2O?
A. 30 B. 55 C. 64 D. 78 E. 94

19. How many moles of carbonic acid contain a total number of $3.612x10^{24}$ atoms?
A. 0.4 B. 0.6 C. 1 D. 1.2 E. 6

20. 27 g of the oxide X_2O_5 contains 20 g of oxygen. What is the atomic weight of X?

A. 28 g/mol
B. 19 g/mol
C. 14 g/mol
D. 12 g/mol
E. 7 g/mol

21. Which one of the followings is correct about the number of nitrogen atoms in 1 gram N_2O_3? (N: 14, O: 16, Na: Avogadro's number)
A. 38/Na B. Na/38 C. Na/76 D. 76/Na E. No/28

22. What is the mass of 1 molecule of C_2H_4? (C_2H_4: 28, Na: Avogadro's number)
A. Na/28 B. Na C. 2Na D. 28/Na E. Na/14

23. Which one of the followings is a correct relation between the numbers of molecules of gases given below?
I. 1 g H_2(g)
II. 5.6 L CO_2(g) at STP
III. 3.01 10^{22} atoms of O_2(g)
A. II>III>I B. I=III>II C. I>II>III
D. I=II>III E. III>I=II

24. A 23 g sample of a compound that consists of nitrogen and oxygen contains 7 g of nitrogen. What is its empirical formula?
A. N_2O_5 B. N_2O C. NO_2 D. N_2O_3 E. NO_3

25. Molecular weight of XCl_2 is 95 g/mole. What is the atomic weight of X?
A. 71 g/mole
B. 95 g/mole
C. 52 g/mole
D. 35.5 g/mole
E. 24 g/mole

26. What is the mass percentage of calcium in $CaBr_2$?
A. 60 B. 40 C. 25 D. 20 E. 10

27. 2.24 L of XO gas has a mass of 3 g at STP. What is the atomic weight of X?
A. 14 B. 31 C. 1 D. 12 E. 32

28. Calculate molar mass of X if 5.68 g X_2SO_4 contains 0.16 mole oxygen.

29. What is the empirical formula of the compound containing 2.80 g Fe, 1.35 g Al and 2.40 g O?

30. Caffeine is the organic substance that contains 49.5% C, 28.9%N, 16.5% O and 5.1% H. Find the empirical formula of the caffeine.

31. The mixture of NO, NO_2 and N_2O_4 gases are 0.7 mole which contains equal number of oxygen atoms. Find the mass of mixture. (N: 14 O: 16)

32. The analysis of a compound that contains carbon and hydrogen elements gives 2.4 g of carbon and 0.4 g of hydrogen atoms after the experiment. What is the empirical formula of the compound?

33. A 0.3 mole mixture of lithium and sodium weighs 5.3 g.
A. Find the mole number of sodium.
B. Calculate the mass percentages of lithium.

34. An 11.2 L mixture of nitrogen monoxide and nitrogen dioxide weighs 18.2 g.
A. What is the mole number of nitrogen monoxide?
B. Find the mass percentage of nitrogen dioxide.

35. A 4.6 g sample of XO_2 occupies 2.24 L at STP. Find X.

36. A 23 g sample of a compound containing nitrogen and oxygen has 7 g of nitrogen. Find its empirical formula.

37. What is the mass percentage of each element in sodium sulfate?

38. A compound contains 40 % carbon, 6.6 % hydrogen, and 53.3 % oxygen by mass. What is the empirical formula of this compound? And, if molecular weight of compound is 90 g/mole, find its molecular formula.

39. What is the mass percentage of each element in the following compounds?
A. Magnesium nitride
B. Calcium bromide
C. Sulfur trioxide