1. Bromine exists naturally as a mixture of bromine-79 and bromine-81 isotopes. An atom of bromine-79 contains

   [A] 35 protons, 44 neutrons, 35 electrons.

   [B] 79 protons, 79 electrons, and 35 neutrons.

   [C] 35 protons, 79 neutrons, and 35 electrons.

   [D] 34 protons and 35 electrons, only. [E] 44 protons, 44 electrons, and 35 neutrons.

2. Gallium consists of two isotopes of masses 68.95 amu and 70.95 amu with abundances of 60.16% and 39.84%, respectively. What is the average atomic mass of gallium?

   [A] 71.95 [B] 69.75 [C] 70.15 [D] 69.95 [E] 69.55

3. What is the mass of one atom of copper in grams?

   [A] 63.5 g [B] 52.0 g [C] 1.06×10^{-22} g [D] 65. 4 g [E] 58.9 g

4. Iron is biologically important in the transport of oxygen by red blood cells from the lungs to the various organs of the body. In the blood of an adult human, there are approximately 2.60×10^{13} red blood cells with a total of 2.90 g of iron. On the average, how many iron atoms are present in each red blood cell? (molar mass (Fe) = 55.85 g)

   [A] 2.60×10^{13} [B] 1.20×10^{9} [C] 5.19×10^{-2}

   [D] 8.33×10^{-10} [E] 3.12×10^{22}

5. Naturally occurring element X exists in three isotopic forms: X-28 (27.977 amu, 92.21% abundance), X-29 (28.976 amu, 4.70% abundance), and X-30 (29.974 amu, 3.09% abundance). Calculate the atomic weight of X.

   [A] 28.1 amu [B] 72.7 amu [C] 36.2 amu [D] 54.0 amu [E] 29 amu

6. A sample of ammonia has a mass of 56.6 g. How many molecules are in this sample?

   [A] 17.03×10^{24} molecules [B] 6.78×10^{23} molecules

   [C] 2.00×10^{24} molecules [D] 3.32 molecules [E] 1.78×10^{24} molecules

7. How many moles of hydrogen sulfide are contained in a 35.0-g sample of this gas?

   [A] 2.16 mol [B] 7.43 mol [C] 6.97 mol [D] 10.4 mol [E] 1.03 mol

8. What is the molar mass of ethanol (C_2H_5OH)?

   [A] 62.07 [B] 38.90 [C] 34.17 [D] 46.07 [E] 45.07

9. For which compound does 0.256 mole weigh 12.8 g?

[A] C_2H_4O [B] CH_3Cl [C] CO_2 [D] C_2H_6 [E] none of these

10. Roundup, an herbicide manufactured by Monsanto, has the formula $C_3H_8NO_5P$. How many moles of molecules are there in a 500.-g sample of Roundup?

[A] 1.75 [B] 84.5 [C] 0.338 [D] 2.96 [E] none of these

Phosphoric acid can be prepared by reaction of sulfuric acid with "phosphate rock" according to the equation:

$$Ca_3(PO_4)_2 + 3H_2SO_4 \rightarrow 3CaSO_4 + 2H_3PO_4$$

11. What is the molar mass of $Ca_3(PO_4)_2$?

[A] 87.05 g/mol [B] 166.02 g/mol [C] 310.18 g/mol
[D] 135.05 g/mol [E] 118.02 g/mol

12. How many oxygen atoms are there in 1.55 ng of $Ca_3(PO_4)_2$?

[A] 3.01×10^{18} [B] 2.41×10^{13} [C] 1.21×10^{16}
[D] 3.01×10^{12} [E] 1.20×10^{13}

13. How many grams are in a 6.94-mol sample of sodium hydroxide?

[A] 131 g [B] 278 g [C] 169 g [D] 40.0 g [E] 34.2 g

14. What is the molar mass of cryolite (Na_3AlF_6)?

[A] 209.9 [B] 210.0 [C] 68.97 [D] 185.3 [E] 104.2

15. Which compound contains the highest percent by mass of hydrogen?

[A] HF [B] H_2O [C] H_2SO_4 [D] H_2S [E] HCl

16. How many grams of potassium are in 12.5 g of K_2CrO_7?

[A] 2.02 g [B] 8.80 g [C] 4.04 g [D] 78.2 g [E] 25.0 g

17. Nitric acid contains what percent hydrogen by mass?

[A] 1.60% [B] 3.45% [C] 10.0% [D] 20.0% [E] 4.50%

18. An oxide of iron has the formula Fe_3O_4. What mass percent of iron does it contain?

[A] 30.% [B] 28% [C] 70.% [D] 0.72% [E] 72%

19. Which of the following compounds has the same percent composition by mass as styrene, C_8H_8?

[A] α-ethyl naphthalene, $C_{12}H_{12}$ [B] acetylene, C_2H_2

[C] benzene, C_6H_6 [D] cyclobutadiene, C_4H_4 [E] all of these

20. The molar mass of an insecticide, dibromoethane, is 187.9. Its molecular formula is $C_2H_4Br_2$. What percent by mass of bromine does dibromoethane contain?

[A] 89.3% [B] 37.8% [C] 50.0% [D] 42.5% [E] 85.0%

21. Ammonium carbonate contains what percent nitrogen by mass?

[A] 29.2% [B] 14.6% [C] 34.8% [D] 17.9% [E] none of these

22. A hydrocarbon (a compound consisting solely of carbon and hydrogen) is found to be 85.6% carbon by mass. What is the empirical formula for this compound?

[A] CH_6 [B] CH_2 [C] CH [D] C_6H [E] C_3H

23. The empirical formula of styrene is CH; its molar mass is 104.1. What is the molecular formula of styrene?

[A] C_2H_4 [B] C_6H_6 [C] C_8H_8 [D] $C_{10}H_{12}$ [E] none of these

24. Adipic acid contains 49.32% C, 43.84% O, and 6.85% H by mass. What is the empirical formula?

[A] $C_2H_5O_4$ [B] C_3HO_3 [C] $C_3H_3O_4$ [D] C_2HO_3 [E] $C_3H_5O_2$

25. Vitamin C contains the elements C, H, and O. It is known to contain 40.9% C and 4.58% H by mass. The molar mass of vitamin C has been found to be about 180. The molecular formula for vitamin C is:

[A] $C_4H_6O_4$ [B] $C_2H_3O_2$ [C] $C_3H_4O_3$ [D] $C_6H_8O_6$

26. The hormone epinephrine is released in the human body during stress and increases the body's metabolic rate. Epinephrine, like many biochemical compounds, is composed of carbon, hydrogen, oxygen, and nitrogen. The percentage composition of the hormone is 56.8% C, 6.56% H, 28.4% O, and 8.28% N. Determine the empirical formula.

[1] _____

[2] _____

[3] _____

[4] _____

[5] _____

[6] _____

[7] _____

[8] _____

[9] _____

[10] _____

[11] _____

[12] _____

[13] _____

[14] _____

[15] _____

[16] _____

[17] _____

[18] _____

[19] _____

[20] _____

[21] _____

[22] _____

[23] _____

[24] _____

[25] _____

[26] _____

Reference: 3.1

[1] [A]

Reference: 3.1

[2] [B]

Reference: 3.2

[3] [C]

Reference: 3.2

[4] [B]

Reference: 3.1

[5] [A]

Reference: 3.3

[6] [C]

Reference: 3.3

[7] [E]

Reference: 3.3

[8] [D]

Reference: 3.3

[9] [B]

Reference: 3.3

[10] [D]

Reference: 3.3

[11] [C]

Reference: 3.3

[12] [B]

Reference: 3.3

[13] [B]

Reference: 3.3

[14] [B]

Reference: 3.4

[15] [B]

Reference: 3.4

[16] [C]

Reference: 3.4

[17] [A]

Reference: 3.4

[18] [E]

Reference: 3.4

[19] [E]

Reference: 3.4

[20] [E]

Reference: 3.4

[21] [A]

Reference: 3.5

[22] [B]

Reference: 3.5

[23] [C]

Reference: 3.5

[24] [E]

Reference: 3.5

[25] [D]

Reference: 3.5

[26] $C_8H_{11}O_3N$