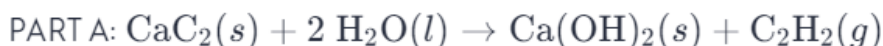


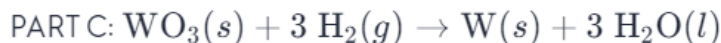
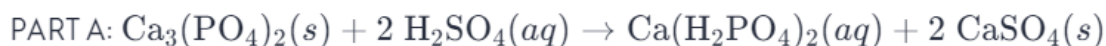
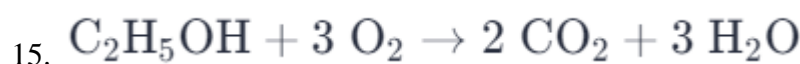
6. A reactant is a substance preset at the outset of a chemical reaction that is consumed during the reaction. They appear on the left side of a chemical equation.
A product is a substance formed in a chemical reaction that appears on the right side of a chemical equation.
7. solids: (s); liquids: (l); gases: (g); aqueous solutions: (aq)
8. The addition of heat is symbolized in a chemical equation by placing a Δ above the arrow. The addition of light energy is symbolized in a chemical equation by placing an $h\nu$ above the arrow.
9. The law of nature that underpins the concept of a balanced chemical equation is the law of conservation of matter, which states that matter is neither created nor destroyed.
10. A stoichiometric coefficient is a number placed in front of a species that balances a chemical equation.



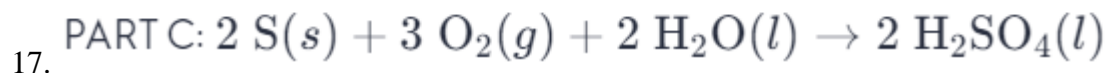
11. $\text{PART C: } 2 \text{ C}_6\text{H}_6(l) + 15 \text{ O}_2(g) \rightarrow 6 \text{ H}_2\text{O}(l) + 12 \text{ CO}_2(g)$



12. $\text{PART C: } 4 \text{ CH}_3\text{NH}_2(g) + 9 \text{ O}_2(g) \rightarrow 4 \text{ CO}_2(g) + 2\text{N}_2(g) + 10 \text{ H}_2\text{O}(g)$



16. $\text{PART D: } (\text{NH}_4)_2\text{Cr}_2\text{O}_7(s) \rightarrow \text{N}_2(g) + 4 \text{ H}_2\text{O}(g) + \text{Cr}_2\text{O}_3(s)$



20.

21. A solution is a homogeneous mixture of two or more substances in a single phase. A solute is the minor component of a solution. A solvent is the component present in the greatest amount in any solution.

22. A saturated solution is a solution that contains the maximum amount of a solute that will dissolve in a solvent at a specific temperature.

23. A concentrated solution is a solution in which many solute particles are present. A dilute solution is a solution in which few particles are present.

24. PART A: strong electrolyte; PART B: strong electrolyte; PART C: nonelectrolyte; PART D: strong electrolyte

PART A: K^+ and OH^- ions

PART B: K^+ and SO_4^{2-} ions

PART C: Li^+ and NO_3^- ions

25. PART D: NH_4^+ and SO_4^{2-} ions

PART A: soluble: Na^+ and CO_3^{2-} are produced

PART B: insoluble

PART C: insoluble

26. PART D: soluble: Ba^{2+} and Br^- are produced

27. 1.4 L

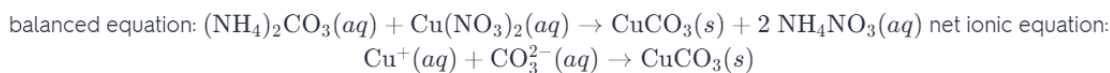
28. (A) 26.6 g NH_4NO_3 ; (B) 1.2×10^2 g product

29.

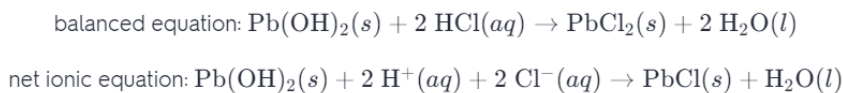
30. A spectator ion is an ion that is present in a solution but that does not participate in a chemical reaction.

31. A total ionic equation shows all ions and molecules present in solution, whereas a net ionic equation has the spectator ions removed.

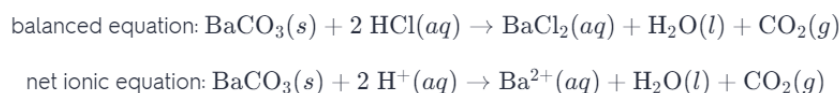
PART A:



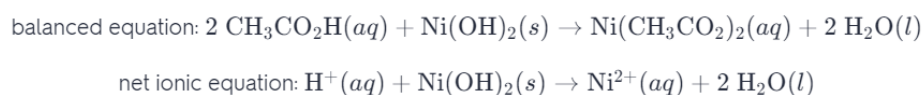
PART B:



PART C:

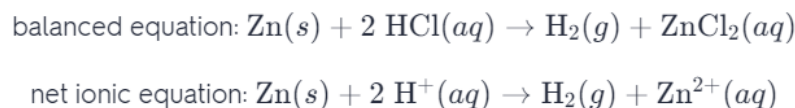


PART D:

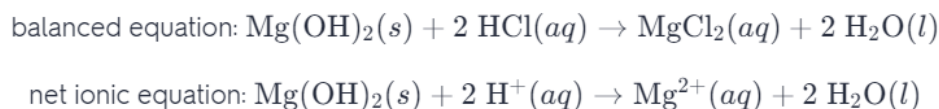


32.

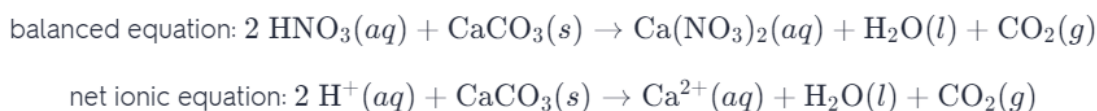
PART A:



PART B:



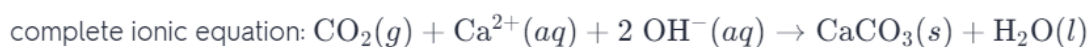
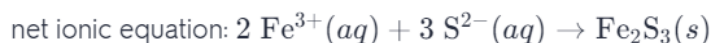
PART C:



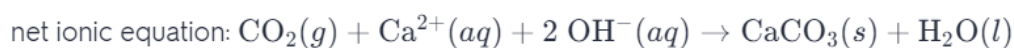
PART D:



33.



34.



35. A mole is an Avogadro constant (6.022×10^{23}) number of particles. This quantity is defined as the number of carbon atoms in exactly 12 grams of carbon-12. Thus,

one mole of a substance has a mass in grams numerically equal to the mass of one particle of that substance in atomic mass units.

36. (A) 1.93×10^{24} atom Ar; (B) 7.8×10^{11} marbles; (C) 2×10^{30} molecule H_2O ; (D) 4.59×10^6 basketballs
37. $7.8 \times 10^{19} \text{ cm}^3$ and $7.8 \times 10^{16} \text{ L}$
- 38.
39. (A) 159.688 g/mol; (B) 117.160 g/mol; (C) 176.1238 g/mol
40. (A) 342.2956 g/mol; (B) 44.0128 g/mol; (C) 286.4504 g/mol
41. (A) $M(\text{PbS}) = 239.3 \text{ g/mol}$; %Pb = 86.60%; %S = 13.40%;
(B) $M(\text{C}_2\text{H}_6) = 30.0688 \text{ g/mol}$; %C = 79.8881%; %H = 20.1119%;
(C) $M(\text{CH}_3\text{COOH}) = 60.0518 \text{ g/mol}$; %C = 40.0011%; %H = 6.7315%; %O = 53.2852%;
(D) $M(\text{NH}_4\text{NO}_3) = 80.0432 \text{ g/mol}$; %N = 34.9979%; %H = 5.0368%; %O = 59.9654%;
42. 65.0099 g/mol
43. (A) 262.8578 g/mol; (B) 78.0446 g/mol; (C) 92.0110 g/mol
44. (A) 192.50 g/mol; (B) 264.0369 g/mol; (C) 233.193 g/mol
- 45.
46. $2.2 \times 10^2 \text{ g O}_3$
47. (A) 67 g Al; (B) 0.0698 g Fe; (C) 0.60 g Ca; (D) $1.32 \times 10^4 \text{ g Ne}$
48. (A) 844 g $\text{C}_2\text{H}_3\text{Cl}$; (B) $4.12 \times 10^3 \text{ g C}_{18}\text{H}_{27}\text{NO}_3$; (C) $3.84 \times 10^3 \text{ g C}_{18}\text{H}_{36}\text{O}_2$
49. (A) 1.577 mol $\text{C}_7\text{H}_5\text{N}_3\text{O}_6$; (B) 1.35 mol CH_3NO_2 ; (C) 7.56 mol $\text{C}_3\text{H}_6\text{N}_6\text{O}_6$
50. 0.36 mol NO_2
51. 6.8×10^{13} molecule CO_2
52. 8.22×10^{23} atom H
53. 4.29×10^{24} atom O
54. 2.39 g $\text{H}_2\text{C}_2\text{O}_4$
55. (A) 4.7×10^{22} molecule O_2 ; (B) 2.8×10^{24} molecule O_2 ; (C) 6.8×10^{25} molecule O_2
56. B_5H_7
57. Empirical: $\text{C}_8\text{H}_8\text{O}_3$; molecular: $\text{C}_8\text{H}_8\text{O}_3$
58. (A) $\text{NaC}_5\text{H}_8\text{NO}_4$; (B) ZrSiO_4 ; (C) $\text{C}_5\text{H}_7\text{N}$
59. (A) %mol Cu = 40% (one significant digit); %mol Al = 60% (one significant digit);
(B) %wt NiO = 38% (two significant digits); %wt MgO = 62% (two significant digits);
(C) %mol MgO = 50% (one significant digit); %mol FeO = 50% (one significant digit)
60. %mol Al_2O_3 = 5.5%; %mol Cu = 94.5%
61. (A) 5.8 M HCl; (B) 4.2 M NaOH; (C) 3.41 M KCl; (D) 0.71 M NaNO_3

PART A: 0.0269 M Co^{3+} and 0.0807 M Cl^{-}

PART B: 0.0219 M Ni^{3+} and $0.0329 \text{ M SO}_4^{2-}$

PART C: 0.0313 M Na^{+} and $0.0313 \text{ M MnO}_4^{-}$

PART D: 0.0206 M Fe^{2+} and 0.0412 M Br^{-}

62.

63. (A) $0.16 \text{ mol H}_2\text{SO}_4$; (B) $8.3 \times 10^{-3} \text{ mol KNO}_3$; (C) 0.11 mol NH_3 ; (D) 0.027 mol NaF

64. (A) 1.42 g HBr ; (B) $1.71 \times 10^4 \text{ g Na}_2\text{CO}_3$; (C) $8.7 \text{ g CH}_3\text{COOH}$; (D) $0.011 \text{ g H}_2\text{SO}_3$

65. (A) 0.74 M ; (B) 0.0646 M ; (C) $4.9 \times 10^{-3} \text{ M}$; (D) 0.294 M

66. (A) 1.5 L ; (B) 0.128 L ; (C) 2.2 mL ; (D) 0.066 mL

67. 0.208 L

68. 0.0593 M Mg^{2+} and $1.89 \times 10^4 \text{ gal}$