

1. Which one of the following statements about atomic structure is false?
- [A] The protons and neutrons in the nucleus are very tightly packed.
 - [B] The number of protons and neutrons is always the same in the neutral atom.
 - [C] Almost all of the mass of the atom is concentrated in the nucleus.
 - [D] The electrons occupy a very large volume compared to the nucleus.
 - [E] All of these statements (a-d) are true.
2. Rutherford's experiment was important because it showed that:
- [A] a zinc sulfide screen scintillates when struck by a charged particle.
 - [B] gold foil can be made to be only a few atoms thick.
 - [C] the mass of the atom is uniformly distributed throughout the atom.
 - [D] radioactive elements give off alpha particles.
 - [E] an atom is mostly empty space.
3. Which of the following name(s) is(are) correct?
- 1. sulfide S^{2-}
 - 2. ammonium chloride NH_4Cl
 - 3. acetic acid $HC_2H_3O_2$
 - 4. barium oxide BaO
- [A] all [B] none [C] 1, 2 [D] 3, 4 [E] 1, 3, 4
4. Which of the following atomic symbols is incorrect?
- [A] ${}^{14}_8N$ [B] ${}^{37}_{17}Cl$ [C] ${}^{32}_{15}P$ [D] ${}^{14}_6C$ [E] ${}^{39}_{19}K$
5. The element rhenium (Re) exists as two stable isotopes and 18 unstable isotopes. Rhenium-185 has in its nucleus
- [A] 75 protons, 75 neutrons. [B] not enough information is given.
 - [C] 130 protons, 75 neutrons. [D] 75 protons, 130 neutrons.
 - [E] 75 protons, 110 neutrons.

6. Which statement is *not* correct?
- [A] A gamma ray is high-energy “light.”
- [B] The mass of an alpha particle is 7300 times that of the electron.
- [C] There are only three types of radioactivity known to scientists today.
- [D] Three types of radioactive emission are gamma rays, beta rays, and alpha particles.
- [E] An alpha particle has a 2+ charge.
7. ${}_{20}^{40}\text{Ca}^{2+}$ has
- [A] 20 protons, 20 neutrons, and 22 electrons.
- [B] 22 protons, 20 neutrons, and 20 electrons.
- [C] 22 protons, 18 neutrons, and 18 electrons.
- [D] 20 protons, 20 neutrons, and 18 electrons.
- [E] 20 protons, 22 neutrons, and 18 electrons.
8. Which of the following has 61 neutrons, 47 protons, and 46 electrons?
- [A] ${}_{61}^{80}\text{Pm}$ [B] ${}_{47}^{108}\text{Cd}^{+}$ [C] ${}_{47}^{108}\text{Pd}^{-}$ [D] ${}_{47}^{108}\text{Ag}^{+}$ [E] ${}_{47}^{108}\text{Ag}$
9. The numbers of protons, neutrons, and electrons in ${}_{19}^{39}\text{K}^{+}$ are:
- [A] 20 p, 19 n, 20 e [B] 19 p, 20 n, 20 e [C] 19 p, 20 n, 19 e
- [D] 20 p, 19 n, 19 e [E] 19 p, 20 n, 18 e
10. Which among the following represent a set of isotopes? Atomic nuclei containing:
- I. 20 protons and 20 neutrons.
- II. 21 protons and 19 neutrons.
- III. 22 neutrons and 18 protons.
- IV. 20 protons and 22 neutrons.
- V. 21 protons and 20 neutrons.
- [A] No isotopes are indicated. [B] I, II, III
- [C] I, V [D] I, IV and II, V [E] III, IV
11. The number of neutrons in an atom is the same for all neutral atoms of that element.
- [A] True [B] False

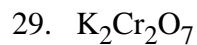
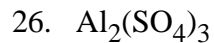
12. The number of electrons in an atom is the same for all neutral atoms of that element.
[A] True [B] False
13. Which of the following statements are *true* of uranium-238?
I. Its chemical properties will be exactly like those of uranium-235.
II. Its mass will be slightly different from that of an atom of uranium-235.
III. It will contain a different number of protons than an atom of uranium-235.
IV. It is more plentiful in nature than uranium-235.
[A] III, IV [B] I, II, IV [C] I, II, III [D] II, III, IV [E] all of these
14. An isotope, X, of a particular element has an atomic number of 7 and a mass number of 15. Therefore,
[A] X is an isotope of nitrogen. [B] X has 8 neutrons per atom.
[C] X has an atomic mass of 14.0067. [D] a and b [E] a, b, and c
15. How many oxygen atoms are there in one formula unit of $\text{Ca}_3(\text{PO}_4)_2$?
[A] 6 [B] 4 [C] 2 [D] 8 [E] none of these
16. Which of the following are incorrectly paired?
[A] Ba, alkaline earth metal [B] Ni, transition metal
[C] Ne, noble gas [D] O, halogen [E] K, alkali metal
17. A species with 12 protons and 10 electrons is
[A] Mg^{2+} [B] Ti^{2+} [C] Ne^{2-} [D] Ne^{2+} [E] Mg
18. The correct name for FeO is
[A] iron oxide [B] iron monoxide [C] iron (I) oxide
[D] iron (II) oxide [E] iron (III) oxide
19. The formula for calcium bisulfate is
[A] $\text{Ca}(\text{SO}_4)_2$ [B] $\text{Ca}(\text{HSO}_4)_2$ [C] Ca_2S [D] Ca_2HSO_4 [E] CaS_2

20. Which of the following is incorrectly named?
- [A] $\text{Pb}(\text{NO}_3)_2$, lead(II) nitrate [B] PO_4^{3-} , phosphate ion
 [C] NH_4ClO_4 , ammonium perchlorate [D] $\text{Mg}(\text{OH})_2$, magnesium hydroxide
 [E] NO^{3-} , nitrite ion
21. All of the following are in aqueous solution. Which is incorrectly named?
- [A] H_2SO_4 , sulfuric acid [B] HCN , cyanic acid [C] HCl , hydrochloric acid
 [D] H_2CO_3 , carbonic acid [E] H_3PO_4 , phosphoric acid
22. All of the following are in aqueous solution. Which is incorrectly named?
- [A] HBr , bromic acid [B] H_2SO_3 , sulfurous acid [C] HNO_2 , nitrous acid
 [D] $\text{HC}_2\text{H}_3\text{O}_2$, acetic acid [E] HClO_3 , chloric acid
23. Which of the following pairs is incorrect?
- [A] NH_4Br , ammonium bromide [B] K_2CO_3 , potassium carbonate
 [C] MnO_2 , manganese (IV) oxide [D] CuCl , copper(I) chloride
 [E] BaPO_4 , barium phosphate
24. Write the names of the following compounds:
- a) FeSO_4 _____
 b) $\text{NaC}_2\text{H}_3\text{O}_2$ _____
 c) KNO_2 _____
 d) $\text{Ca}(\text{OH})_2$ _____
 e) NiCO_3 _____

25. Complete the following table.

Symbol	# protons	# neutrons	# electrons	Net Charge
$^{206}_{82}\text{Pb}$				
	31	38		3^+
	52	75	54	
Mn		29		2^+

Name the following compounds:



Write the formula for:

35. sodium dichromate

36. cobalt (II) chloride

37. A piece of indium with a mass of 16.6 g is submerged in 46.3 cm^3 of water in a graduated cylinder. The water level increases to 48.6 cm^3 . The correct value for the density of indium from these data is:

[A] more than 0.1 g/cm^3 away from any of these values. [B] 7.217 g/cm^3

[C] 0.138 g/cm^3 [D] 7.2 g/cm^3 [E] 0.14 g/cm^3

38. Convert 5687.4 g to mg.
[A] 5.6874×10^3 mg [B] 56.784 mg [C] 568.74 mg
[D] 5.6874 mg [E] 5.6874×10^6 mg
39. Express the volume 245 cm³ in liters.
[A] 245 L [B] 24.5 L [C] 0.0245 L [D] 2.45 L [E] 0.245 L
40. 100 seconds contain this many nanoseconds.
[A] 1×10^8 [B] 1×10^{11} [C] 1×10^{10} [D] 1×10^{12} [E] 1×10^7
41. Convert 4301 mL to qts. (1 L = 1.06 qt)
[A] 4.559 qts [B] 4559 qts [C] 4058×10^{-3} qts [D] 4058 qts [E] 4.058 qts
42. Consider the element indium, atomic number 49, atomic mass 114.8 g. The nucleus of an atom of indium-112 contains
[A] 49 protons, 63 neutrons. [B] 49 protons, 63 neutrons, 49 electrons.
[C] 49 protons, 49 neutrons. [D] 49 protons, 49 alpha particles.
[E] 49 protons, 112 neutrons.
43. 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] 69.75 [B] 71.95 [C] 69.55 [D] 70.15 [E] 69.95
44. 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] 1.20×10^9 [B] 3.12×10^{22} [C] 2.60×10^{13}
[D] 8.33×10^{-10} [E] 5.19×10^{-2}
45. Naturally occurring copper exists in two isotopic forms: ⁶³Cu and ⁶⁵Cu. The atomic mass of copper is 63.55 amu. What is the approximate natural abundance of ⁶³Cu?
[A] 63% [B] 90% [C] 30% [D] 50% [E] 70%

46. 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] 72.7 amu [B] 54.0 amu [C] 28.1 amu [D] 29 amu [E] 36.2 amu

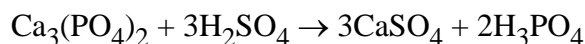
47. A sample of ammonia has a mass of 56.6 g. How many molecules are in this sample?

[A] 1.78×10^{24} molecules [B] 6.78×10^{23} molecules
[C] 2.00×10^{24} molecules [D] 3.32 molecules [E] 17.03×10^{24} molecules

48. 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] 2.96 [C] 84.5 [D] 0.338 [E] none of these

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



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

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

50. Suppose the reaction is carried out starting with 103 g of $Ca_3(PO_4)_2$ and 75.0 g of H_2SO_4 . Which substance is the limiting reactant?

[A] $Ca_3(PO_4)_2$ [B] H_2SO_4 [C] $CaSO_4$ [D] H_3PO_4 [E] none of these

51. How many atoms of hydrogen are present in 6.0 g of water?

[A] 4.0×10^{23} [B] 1.1×10^{24} [C] 7.2×10^{24} [D] 2.0×10^{23} [E] 0.66

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

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

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

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

54. A substance contains 35.0 g nitrogen, 5.05 g hydrogen, and 60.0 g of oxygen. How many grams of hydrogen are there in a 185-g sample of the substance?
[A] 9.34 g [B] 18.7 g [C] 10.6 g [D] 5.05 g [E] 36.6 g
55. How many grams of potassium are in 12.5 g of K_2CrO_7 ?
[A] 25.0 g [B] 4.04 g [C] 8.80 g [D] 2.02 g [E] 78.2 g
56. Nitric acid contains what percent hydrogen by mass?
[A] 10.0% [B] 20.0% [C] 3.45% [D] 1.60% [E] 4.50%
57. What is the coefficient for water when the following equation is balanced?
$$\text{As}(\text{OH})_3(\text{s}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{As}_2(\text{SO}_4)_3(\text{aq}) + \text{H}_2\text{O}(\text{l})$$

[A] 12 [B] 2 [C] 6 [D] 4 [E] 1
58. You take an aspirin tablet (a compound consisting solely of carbon, hydrogen, and oxygen) with a mass of 1.00 g, burn it in air, and collect 2.20 g of carbon dioxide and 0.400 g water. The molar mass of aspirin is between 170 and 190 g/mol. The molecular form of aspirin is
[A] $\text{C}_6\text{H}_8\text{O}_5$ [B] $\text{C}_8\text{H}_{10}\text{O}_5$ [C] $\text{C}_9\text{H}_8\text{O}_4$ [D] $\text{C}_{10}\text{H}_6\text{O}_4$ [E] none of these
59. The limiting reactant in a reaction
[A] has the lowest coefficient in a balanced equation.
[B] has the lowest ratio of coefficient in the balanced equation/moles available.
[C] has the lowest ratio of moles available/coefficient in the balanced equation.
[D] is the reactant for which you have the fewest number of moles.
[E] none of these
60. Given the equation $3\text{A} + \text{B} \rightarrow \text{C} + \text{D}$, you react 1 mole of A with 3 moles of B. True or false: A is the limiting reactant because you have fewer moles of A than B.
[A] True [B] False
61. Suppose the reaction $\text{Ca}_3(\text{PO}_4)_2 + 3\text{H}_2\text{SO}_4 \rightarrow 3\text{CaSO}_4 + 2\text{H}_3\text{PO}_4$ is carried out starting with 103 g of $\text{Ca}_3(\text{PO}_4)_2$ and 75.0 g of H_2SO_4 . How much phosphoric acid will be produced?
[A] 50.0 g [B] 97.6 g [C] 74.9 g [D] 32.5 g [E] 112 g

62. An oxide of iron has the formula Fe_3O_4 . What mass percent of iron does it contain?
[A] 30.% [B] 72% [C] 0.72% [D] 28% [E] 70.%
63. Which of the following compounds has the same percent composition by mass as styrene, C_8H_8 ?
[A] cyclobutadiene, C_4H_4 [B] α -ethyl naphthalene, $\text{C}_{12}\text{H}_{12}$
[C] acetylene, C_2H_2 [D] benzene, C_6H_6 [E] all of these
64. Adipic acid contains 49.32% C, 43.84% O, and 6.85% H by mass. What is the empirical formula?
[A] C_2HO_3 [B] $\text{C}_3\text{H}_5\text{O}_2$ [C] C_3HO_3 [D] $\text{C}_2\text{H}_5\text{O}_4$ [E] $\text{C}_3\text{H}_3\text{O}_4$
65. What is the coefficient for oxygen when the following equation is balanced?
$$\text{NH}_3(\text{g}) + \text{O}_2(\text{g}) \rightarrow \text{NO}_2(\text{g}) + \text{H}_2\text{O}(\text{g})$$

[A] 12 [B] 7 [C] 3 [D] 14 [E] 6
66. When 125.0 g of ethylene (C_2H_4) burns in oxygen to give carbon dioxide and water, how many grams of CO_2 are formed?
[A] 250.0 g [B] 327.0 g [C] 392.2 g [D] 425.6 g [E] 57.50 g
67. How many of the following statements are true concerning chemical equations?
I. Coefficients can be fractions.
II. Subscripts can be fractions.
III. Coefficients represent the relative masses of the reactants and / or products.
IV. Changing the subscripts to balance an equation can only be done once.
V. Atoms are conserved when balancing chemical equations.
[A] 3 [B] 5 [C] 1 [D] 2 [E] 4
68. What is the sum of the coefficients of the following equation when it is balanced using smallest whole number integers?
$$\text{NaNH}_2 + \text{NaNO}_3 \rightarrow \text{NaN}_3 + \text{NaOH} + \text{NH}_3$$

[A] 8 [B] 7 [C] 6 [D] 9 [E] 5

69. Potassium forms an oxide containing 1 oxygen atom for every 2 atoms of potassium. What is the coefficient of oxygen in the balanced equation for the reaction of potassium with oxygen to form this oxide?

- [A] 1 [B] 0 [C] 2 [D] 3 [E] 4

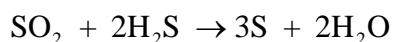
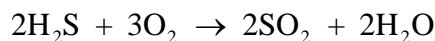
70. What would be the g Al/mole S ratio for the product of a reaction between aluminum and sulfur?

- [A] 40.47 g Al/mol S [B] 17.99 g Al/mol S [C] 53.98 g Al/mol S
[D] 26.98 g Al/mol S [E] 80.94 g Al/mol S

71. A reaction occurs between sodium carbonate and hydrochloric acid producing sodium chloride, carbon dioxide, and water. The correct set of coefficients, respectively, for the balanced reaction is:

- [A] 8 6 5 10 5 [B] 3 6 6 3 4 [C] 1 2 2 1 1
[D] 5 10 10 5 5 [E] none of these

72. The Claus reactions, shown below, are used to generate elemental sulfur from hydrogen sulfide.



How much sulfur (in grams) is produced from 48.0 grams of O_2 ?

- [A] 96.2 g [B] 32.1 g [C] 16.0 g [D] 48.1 g [E] none of these

73. A 6.32-g sample of potassium chlorate was decomposed according to the following equation: $2\text{KClO}_3 \rightarrow 2\text{KCl} + 3\text{O}_2$

How many moles of oxygen are formed?

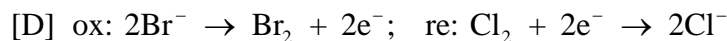
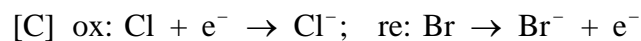
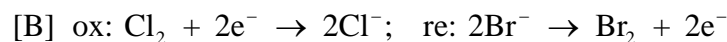
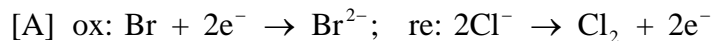
- [A] 1.65 g [B] 0.0774 moles [C] 0.0344 moles
[D] 0.051 moles [E] none of these

74. How many grams of $\text{Ca}(\text{NO}_3)_2$ can be produced by reacting excess HNO_3 with 7.40 g of $\text{Ca}(\text{OH})_2$?

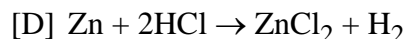
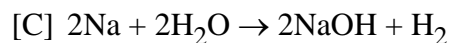
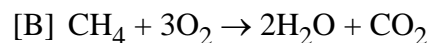
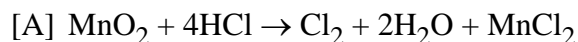
- [A] 32.8 g [B] 8.22 g [C] 7.40 g [D] 10.2 g [E] 16.4 g

82. A 54.8 g sample of SrCl_2 is dissolved in 112.5 mL of solution. Calculate the molarity of this solution.
[A] 8.89 M [B] 0.346 M [C] 3.07 M [D] 3.96 M [E] none of these
83. What mass of solute is contained in 256 mL of a 0.895 M ammonium chloride solution?
[A] 47.9 g [B] 53.5 g [C] 12.3 g [D] 13.7 g [E] none of these
84. What volume of 18.0 M sulfuric acid must be used to prepare 15.5 L of 0.195 M H_2SO_4 ?
[A] 92.3 mL [B] 226 mL [C] 0.336 L [D] 168 mL [E] none of these
85. How many grams of NaOH are contained in 5.0×10^2 mL of a 0.80 M sodium hydroxide solution?
[A] 80. g [B] 20. g [C] 16 g [D] 64 g [E] none of these
86. The net ionic equation for the reaction of aluminum sulfate and sodium hydroxide contains which of the following species?
[A] $3\text{Al}^{3+}(\text{aq})$ [B] $2\text{Al}(\text{OH})_3(\text{s})$ [C] $3\text{OH}^{-}(\text{aq})$ [D] $\text{OH}^{-}(\text{aq})$ [E] $2\text{Al}^{3+}(\text{aq})$
87. The net ionic equation for the reaction of calcium bromide and sodium phosphate contains which of the following species?
[A] $2\text{Ca}_3(\text{PO}_4)_2(\text{s})$ [B] $\text{Ca}^{2+}(\text{aq})$ [C] $3\text{Ca}^{2+}(\text{aq})$
[D] $\text{PO}_4^{3-}(\text{aq})$ [E] $6\text{NaBr}(\text{aq})$
88. In the reaction $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$, N_2 is
[A] the reducing agent. [B] reduced. [C] the electron donor.
[D] oxidized. [E] two of these
89. In the reaction $\text{P}_4(\text{s}) + 10\text{Cl}_2(\text{g}) \rightarrow 4\text{PCl}_5(\text{s})$, the reducing agent is
[A] chlorine. [B] phosphorus. [C] PCl_5 . [D] Cl^{-} . [E] none of these
90. In the reaction $\text{C}(\text{s}) + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g})$ carbon is _____.
[A] the reducing agent [B] the oxidizing agent [C] reduced
[D] the electron acceptor [E] more than one of these

91. For the reaction of sodium bromide with chlorine gas to form sodium chloride and bromine, the appropriate half-reactions are (ox = oxidation and re = reduction):

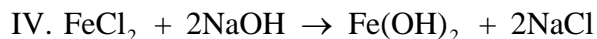
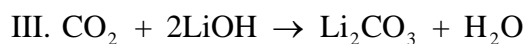
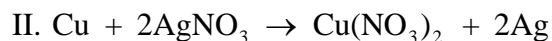


92. Which of the following reactions does *not* involve oxidation-reduction?



[E] All are oxidation-reduction reactions.

93. Which of the following are oxidation-reduction reactions?



[A] I, II, III, and IV [B] IV [C] I and II [D] I, II, and III [E] III

94. Which of the following statements is(are) *true*? Oxidation and reduction

[A] cannot occur independently of each other.

[B] accompany all chemical changes.

[C] describe the loss and gain of electron(s), respectively.

[D] result in a change in the oxidation states of the species involved.

[E] a, c, and d are true

95. In the reaction $\text{Zn} + \text{H}_2\text{SO}_4 \rightarrow \text{ZnSO}_4 + \text{H}_2$, which, if any, element is oxidized?

[A] oxygen

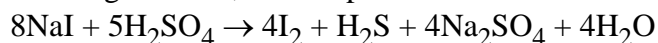
[B] sulfur

[C] hydrogen

[D] zinc

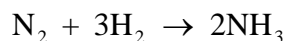
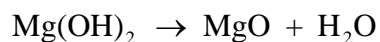
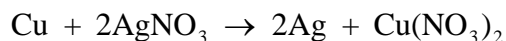
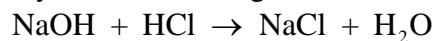
[E] none of these

96. In the following reaction, which species is oxidized?



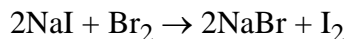
- [A] sulfur [B] sodium [C] hydrogen [D] iodine [E] oxygen

97. How many of the following are oxidation-reduction reactions?



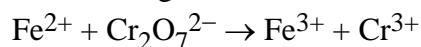
- [A] 4 [B] 0 [C] 3 [D] 2 [E] 1

98. In the reaction shown below, what species is oxidized?



- [A] I_2 [B] I^- [C] Br_2 [D] Br^- [E] Na^+

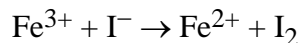
99. Given the following reaction in acidic media:



answer the following question: The coefficient for water in the balanced reaction is

- [A] 1. [B] 3. [C] 5. [D] 7. [E] none of these

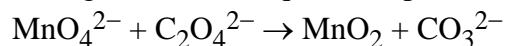
100. Balance the following oxidation-reduction reaction using the half-reaction method:



In the balanced equation, the coefficient of Fe^{2+} is

- [A] 3. [B] 4. [C] 1. [D] 2. [E] none of these

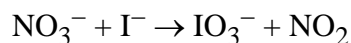
101. The following unbalanced equation represents a reaction that occurs in basic solution:



How many moles of MnO_4^{2-} are required to produce 1 mole of CO_3^{2-} ?

- [A] 3 [B] 1 [C] 2 [D] 4 [E] none of these

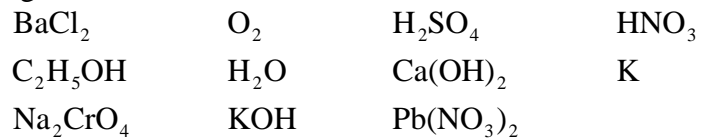
102. The following reaction occurs in aqueous acid solution:



The oxidation state of iodine in IO_3^- is:

- [A] -3 [B] +5 [C] 0 [D] -5 [E] +3

Write balanced equations for each of the processes in the questions below, choosing from the following substances as reactants:



107. Precipitation of BaSO_4 from solution

108. Formation of hydrogen gas

109. Neutralization of sulfuric acid

110. Combustion reaction

[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] _____

[27] _____

[28] _____

[29] _____

[30] _____

[31] _____

[32] _____

[33] _____

[34] _____

[35] _____

[36] _____

[37] _____

[38] _____

[39] _____

[40] _____

[41] _____

[42] _____

[43] _____

[44] _____

[45] _____

[46] _____

[47] _____

[48] _____

[49] _____

[50] _____

[51] _____

[52] _____

[53] _____

[54] _____

[55] _____

[56] _____

[57] _____

[58] _____

[59] _____

[60] _____

[61] _____

[62] _____

[63] _____

[64] _____

[65] _____

[66] _____

[67] _____

[68] _____

[69] _____

[70] _____

[71] _____

[72] _____

[73] _____

[74] _____

[75] _____

[76] _____

[77] _____

[78] _____

[79] _____

[80] _____

[81] _____

[82] _____

[83] _____

[84] _____

[85] _____

[86] _____

[87] _____

[88] _____

[89] _____

[90] _____

[91] _____

[92] _____

[93] _____

[94] _____

[95] _____

[96] _____

[97] _____

[98] _____

[99] _____

[100] _____

[101] _____

[102] _____

[103] _____

[104] _____

[105] _____

[106] _____

[107] _____

[108] _____

[109] _____

[110] _____

Reference: 2.4,5

[1] [B]

Reference: 2.4

[2] [E]

Reference: 2.8

[3] [A]

Reference: 2.5

[4] [A]

Reference: 2.5

[5] [E]

Reference: 2.4

[6] [C]

Reference: 2.5

[7] [D]

Reference: 2.5

[8] [D]

Reference: 2.5

[9] [E]

Reference: 2.5

[10] [D]

Reference: 2.5

[11] [B]

Reference: 2.5,2.6

[12] [A]

Reference: 2.5

[13] [B]

Reference: 2.5

[14] [D]

Reference: 2.8

[15] [D]

Reference: 2.7

[16] [D]

Reference: 2.5

[17] [A]

Reference: 2.8

[18] [D]

Reference: 2.8

[19] [B]

Reference: 2.8

[20] [E]

Reference: 2.8

[21] [B]

Reference: 2.8

[22] [A]

Reference: 2.8

[23] [E]

Reference: 2.8

- a) iron(II) sulfate
- b) sodium acetate
- c) potassium nitrite
- d) calcium hydroxide

[24] e) nickel(II) carbonate

Reference: 2.5

Symbol	# protons	# neutrons	# electrons	Net Charge
$^{206}_{82}\text{Pb}$	82	124	82	0
Ga	31	38	28	3+
Te	52	75	54	2-
Mn	25	29	23	2+

[25]

Reference: 2.8

[26] aluminum sulfate

Reference: 2.8

[27] ammonium nitrate

Reference: 2.8

[28] sodium hydride

Reference: 2.8

[29] potassium dichromate

Reference: 2.8

[30] carbon tetrachloride

Reference: 2.8

[31] silver chloride

Reference: 2.8

[32] calcium sulfate

Reference: 2.8

[33] nitric acid

Reference: 2.8

[34] dinitrogen trioxide

Reference: 2.8

[35] Na₂Cr₂O₇

Reference: 2.8

[36] CoCl₂

Reference: 1.5,8

[37] [D]

Reference: 1.3

[38] [E]

Reference: 1.3

[39] [E]

Reference: 1.3

[40] [B]

Reference: 1.6

[41] [A]

Reference: 3.1

[42] [A]

Reference: 3.1

[43] [A]

Reference: 3.2

[44] [A]

Reference: 3.1

[45] [E]

Reference: 3.1

[46] [C]

Reference: 3.3

[47] [C]

Reference: 3.3

[48] [B]

Reference: 3.3

[49] [D]

Reference: 3.9

[50] [B]

Reference: 3.3

[51] [A]

Reference: 3.3

[52] [D]

Reference: 3.4

[53] [B]

Reference: 3.4

[54] [A]

Reference: 3.4

[55] [B]

Reference: 3.4

[56] [D]

Reference: 3.7

[57] [C]

Reference: 3.5

[58] [C]

Reference: 3.9

[59] [C]

Reference: 3.9

[60] [B]

Reference: 3.9

[61] [A]

Reference: 3.4

[62] [B]

Reference: 3.4

[63] [E]

Reference: 3.5

[64] [B]

Reference: 3.7

[65] [B]

Reference: 3.8

[66] [C]

Reference: 3.7

[67] [D]

Reference: 3.7

[68] [D]

Reference: 3.7

[69] [A]

Reference: 3.7,8

[70] [B]

Reference: 3.7

[71] [C]

Reference: 3.8

[72] [A]

Reference: 3.8

[73] [B]

Reference: 3.8

[74] [E]

Reference: 3.8

[75] [B]

Reference: 3.8

[76] [D]

Reference: 4.1

[77] [C]

Reference: 4.3

[78] [A]

Reference: 4.3

[79] [B]

Reference: 4.3

[80] [D]

Reference: 4.3

[81] [D]

Reference: 4.3

[82] [C]

Reference: 4.3

[83] [C]

Reference: 4.3

[84] [D]

Reference: 4.3

[85] [C]

Reference: 4.6,8

[86] [C]

Reference: 4.6,8

[87] [C]

Reference: 4.9

[88] [B]

Reference: 4.9

[89] [B]

Reference: 4.9

[90] [A]

Reference: 4.10

[91] [D]

Reference: 4.9

[92] [E]

Reference: 4.9

[93] [C]

Reference: 4.9

[94] [E]

Reference: 4.9

[95] [D]

Reference: 4.9

[96] [D]

Reference: 4.9

[97] [D]

Reference: 4.9

[98] [B]

Reference: 4.10

[99] [D]

Reference: 4.10

[100] [D]

Reference: 4.10

[101] [E]

Reference: 4.9

[102] [B]

Reference: 4.10

[103] [B]

Reference: 4.10

[104] [C]

Reference: 3.9,4.10

[105] [A]

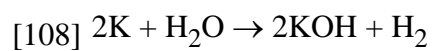
Reference: 4.10

[106] [E]

Reference: 4.5,9

[107] $H_2SO_4 + BaCl_2 \rightarrow BaSO_4 + 2HCl$

Reference: 4.5,9



Reference: 4.5,9



Reference: 4.5,9

