1. In the balanced equation for the reaction between dinitrogen pentoxide and water, forming nitric acid, the coefficient for nitric acid is:
(a) 4
(b) 1
(c) 2
(d) 3

2. What is the mass of one mole of silicon atoms?
(a) 6.022×10^{23} g
(b) 74.92 g
(c) 14.04 g
(d) 28.08 g

3. The formula mass of Iron(III) carbonate is given by:
(a) 291.72 g/mol
(b) 115.81 g/mol
(c) 139.85 g/mol
(d) 287.55 mol/g

4. The correct name for SF_6 is:
(a) Fluoride of sulfur
(b) Monosulfur hexafluoride
(c) Sulfur hexafluoride
(d) [illegible]

5. The formula for hydrogen sulfate ion is:
(a) H_2SO_4
(b) SO_4^{2-}
(c) HSO_4^{2-}
(d) HSO_4^-

6. Magnesium phosphate has the formula:
(a) $Mg_3(PO_4)_2$
(b) $Mg_2(PO_4)_3$
(c) $MgaPO_4$
(d) $Mg_3(PO_4)_3$

How many microliters are there in 363 L?
(a) 0.363 µL
(b) 36.3 µL
(c) 3.63×10^3 µL
(d) 3.63×10^8 µL

8. At a speed of 66.5 km per hour, how many seconds will it take to cover a distance of 1.00×10^3 m?
(a) 5.41 × 10 s
(b) 18.5 s
(c) 54,135 s
(d) 0.015 s

9. If the density of a substance is 1.680 g/mL, what is the mass of 9.200×10^{-3} L of this substance?
(a) 9.200 mL
(b) 1.546 × 10 g
(c) 1.55 × 10 g
(d) 1.68 g

10. A mass of 1.7 ng is also equal to:
(a) 1.70×10^{-9} g
(b) 1.7×10^{9} g
(c) 1.7×10^{-9} g
(d) 1.70×10^{12} mg

11. An anion X^{3-} contains 10 electrons. The number of protons in the neutral atom (from which the anion is formed) is given by:
(a) 10
(b) 3
(c) 7
(d) 13

12. A neutral atom contains 82 protons and has a mass number of 207. The number of neutrons in the atom is:
(a) 125
(b) 82
(c) 207
(d) 289

13. An atom with 80 protons, 80 electrons and 121 neutrons represents an atom of:
(a) Pb
(b) Sb
(c) Nb
(d) Hg

14. You are driving on a highway with a posted speed limit of 100 km/hr. Your speedometer indicates a speed of 95 miles/hr. If 1 km = 0.62 mile, are you driving:
(a) Below the speed limit
(b) Above the speed limit
(c) At the posted limit
(d) None of the above

15. The correct answer (expressed in scientific notation) for the calculation, 229.56 g + 123.345 g + 13.2 g is:
(a) 366.105 g
(b) 3.661×10^2 g
(c) 366.1 g
(d) 3.7×10^2 g

16. The largest volume is represented by:
(a) 1.0 L
(b) 1000 mL
(c) 1.0×10^5 µL
(d) 1.0×10^4 cm^3

17. After performing a calculation, Martha's calculator displayed the result as 4.25961. If the answer can have only three significant figures and must be expressed using scientific notation, it should be reported as:
(a) 4.26×10^0
(b) 0.426×10
(c) 4.26
(d) 42.6/10

18. In the Periodic Table, the halogens are in the same
(a) Period
(b) Group
(c) Section
(d) Row

19. An element containing 54 electrons is a:
(a) Metal
(b) Non-metal
(c) Metalloid
(d) None of the above

20. One mole of hydrogen atoms contains:
(a) 1 atom of hydrogen
(b) 6.022×10^{23} atoms of hydrogen
(c) 6.022×10^{-23} atoms of H
(d) 1 g of hydrogen

21. The mass of an empty container is 15.096g. A solid is then placed in the container. The combined mass of the solid and the container is 15.119 g. How many significant figures are there in the calculated mass of the solid?
(a) 5
(b) 4
(c) 3
(d) 2

.023

22. Workers have a right to:
(a) Work in a safe and healthy environment
(b) Know the processes and substances they are working with
(c) Know the potential hazards from the substances and the processes
(d) All of the above

23. The mere presence of a toxic agent constitutes a hazard. It is hazardous in all circumstances.
(a) True
(b) False

24. A mountain climber at an altitude of 10,000 meters may be subjected to pressure conditions described as:
(a) Atmospheric
(b) Hyperbaric
(c) Hypobaric
(d) Hyperatmospheric

25. Hazard posed by exposure to radiation is classified as:
(a) Chemical
(b) Biological
(c) Ergonomic
(d) Physical

26. Hazard posed by exposure to a virus is classified as:
(a) Chemical
(b) Biological
(c) Ergonomic
(d) Physical

27. Ergonomic stresses arise as a result of optimal adjustment between the worker and the work or workplace.
(a) True
(b) False

28. Which of the following statement is false for chronic toxicity?
(a) Results from brief exposure to high concentrations of the contaminant
(b) Responses generally have latency periods
(c) Responses are difficult to observe and relate
(d) Results from low and repeated exposure over a long period of time

29. WHMIS was implemented with the goal to:
(a) Increase the incidence of illnesses and injuries caused by the hazardous materials in the workplace
(b) Catch those who pollute the environment
(c) Collect more taxes
(d) None of the above

30. Chemicals causing changes in DNA are classified as:
(a) Asphyxiants
(b) Carcinogens
(c) Teratogens
(d) Mutagens

31. Extremely fine particles of lead oxide formed during welding (a high temperature process) are an example of:
(a) Vapor
(b) Fume
(c) Smoke
(d) Mist

32. Commonly used units of concentration for gases and vapors in air are:
(a) ppm
(b) ppb
(c) %
(d) All of the above

33. Toxicity of air contaminants is determined by:
(a) Humans population studies
(b) Animals studies
(c) Bacterial studies
(d) All if the above

34. A concentration of 31.0 ppb for a gas in air is equal to:
(a) 3.1×10^{-3}%
(b) 3.10×10^{-6}%
(c) 3.1×10^{5}%
(d) 3.10×10^{-3}%

35. The concentration of SO_2 in air near a paper mill is 25. ppb, what will it be in ppm?
(a) 2.50×10^{3} ppm
(b) 2.5×10^{-2} ppm
(c) 2.5×10^{3} ppm
(d) 2.5×10^{-9} ppm

36. Based upon TLV-TWA values (given in parentheses), which of the following gas poses the most risk:
(a) Carbon monoxide (50 ppm)
(b) Ozone (100 ppb)
(c) Carbon dioxide (5.0×10^{3} ppm)
(d) Nitrogen dioxide (3.0×10^{3} ppb)

37. Hydrogen bonds in water are:
(a) Weaker than covalent bonds
(b) Stronger than covalent bonds
(c) Of the same bond strength
(d) None of the above

38. The formation of sulfuric acid in the atmosphere is due to the reactions of:
(a) NO_x
(b) SO_x
(c) CO
(d) SO_4^{2-}

39. A worker is repeatedly exposed to a concentration of 9.5×10^{3} ppb of a substance. If the TLV-TWA for the substance is 12.5 ppm, it is a safe work environment for the worker.
(a) True
(b) False

40. The presence of hydrogen bonding in water accounts for its:
(a) Taste
(b) Exceptionally high heat of vaporization
(c) Odor
(d) None of the above

41. The burning of fossil fuels to generate energy is mainly responsible for the production of NO_x.
(a) True
(b) False

42. Which of the following factor(s) influence the intensity of toxic action?
(a) Age
(b) Environmental factors
(c) Host factors
(d) All of the above

43. On the basis of physiological action, gaseous carbon monoxide is classified as an:
(a) Irritant
(b) Asphyxiant
(c) Anaesthetic
(d) None of the above

44. Hepatotoxins are substances that affect the liver.
(a) False
(b) True

45. WHMIS was developed through the collective efforts of Labor, Industry, and Federal/Provincial/Territorial Governments.
(a) True
(b) False

46. The abbreviation WHMIS stands for:
(a) Workers House and Money Investment Society
(b) Workplace Hazardous Materials Information System
(c) Workplace Hazardous Machinery Indicator System
(d) Workers Hazardous Materials Inventory System

47. Toxic hazards posed by a substance depend upon:
(a) Exposure dose
(b) Individual susceptibility
(c) Synergistic and other effects
(d) All of the above
Answer: (d)

48. SO_x represents:
(a) SO_3 only
(b) Mixture of SO_2 and SO_3
(c) Droplets of H_2SO_4
(d) Particles of sulfate salts
Answer: (b)

49. What are the coefficients for the reactants and the products when the equation for the reaction:
$BaC\ell_2\,(aq) + Na_2SO_4\,(aq) \rightarrow BaSO_4\,(s) + NaC\ell\,(aq)$
is balanced?
(a) 1, 1, 1, 1
(b) 1, 1, 1, 2
(c) 2, 2, 2, 4
(d) 2, 2, 2, 2
Answer: (b)

50. Patrick saw three cats in his backyard. The number has:
(a) one significant figure
(b) three significant figures
(c) Infinite number of significant figures
(d) Two significant figures
Answer: (c)

51. What is the coefficient for water when the equation for the reaction:
$C_2H_5OH + O_2 \rightarrow CO_2 + H_2O$
Is balanced?
(a) 2
(b) 3
(c) 1
(d) 6
Answer: (b)

52. How many moles of ammonium ions are formed when one mole of ammonium sulfate (an ionic compound) is dissolved in water?
(a) 1
(b) 3
(c) 2
(d) 4
Answer: (c)

53. How many moles are there in 10.0 µg of nitrogen dioxide (molar mass = 45.98 g/mol)?
(a) 2.17×10^{-4}
(b) 2.17×10^{-2}
(c) 2.17×10^{-7}
(d) 4.59×10^{2}

54. The O–H bonds in water are:
(a) Covalent
(b) Ionic
(c) Nonbonding
(d) None of the above

55. The statistical estimate of dose that would cause death in 50% of the subjects is defined as LD_{50}.
(a) True
(b) False

56. Which of the following statement is true for acute toxicity?
(a) Much more difficult to study
(b) Results from brief exposure to high contaminant levels
(c) May have latency periods
(d) Results from low and repeated exposure over a long period of time

57. Hazard posed by HNO_3 is classified as:
(a) Ergonomic
(b) Biological
(c) Physical
(d) Chemical

58. How many moles of sulfur are there in 64.12 g of sulfur?
(a) 1.000 mole
(b) 2.000 moles
(c) 5.000×10^{-1} mole
(d) 3.000 moles

59. Carbon-carbon double bond in organic compounds is formed by the sharing of:
(a) One pair of electrons
(b) Two pairs of electrons
(c) Loss and gain of electrons
(d) Three pairs of electrons

60. Organic polymers containing long chain structures are common because carbon can form covalent bonds with other carbon atoms.
(a) True
(b) False

61. The functional group in an alcohol is:
(a) –SH
(b) $-NH_2$
(c) –OH
(d) None of the above

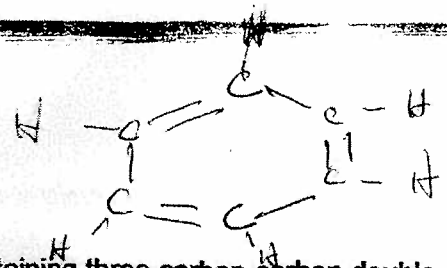
62. The compound with the formula $CH_3(CH_2)_3NH_2$ is an:
(a) Amine $R-NH_2$
(b) Ether $R-O-R$
(c) Ester
(d) Alcohol $R-OH$

63. The compound with the formula $CH_3CH_2OCH_2CH_3$ is an:
(a) Ether
(b) Ester
(c) Alcohol
(d) None of the above

64. How many carbon atoms are there in a compound with the formula $CH_3(CH_2)_4CH_3$?
(a) 8
(b) 14
(c) 6
(d) 10

65. How many hydrogen atoms are there in a compound with the formula $CH_3(CH_2)_5COOC_2H_5$?
(a) 9
(b) 18
(c) 2
(d) 29

66. How many oxygen atoms are there in a compound with the formula $HOCH_2(CH_2)_2COOC_3H_7$?
(a) 7
(b) 14
(c) 10
(d) 3



67. Benzene has a ring structure containing three carbon-carbon double bonds.
(a) True
(b) False

68. Interaction of high energy with atmospheric oxygen leads to the formation of ozone.
(a) True
(b) False

69. Using non-fossil energy sources is a suggested way to control global warming.
(a) True
(b) False

70. The abbreviation VOCs stands for:
(a) Volume of Contaminants
(b) Victory over Contaminants
(c) Volatile Organic Complexes
(d) Volatile Organic Compounds

71. iron is a:
(a) Transition metal
(b) Metalloid
(c) Halogen
(d) Non-metal

72. The corrosion product of iron has the formula:
(a) Fe
(b) Fe_2O_3
(c) O_2
(d) $CaCO_3$

73. Acid precipitation plays no role in the damage to forests.
(a) True
(b) False

74. Weakly acidic nature of rain is due to the formation of:
(a) O_2 (g)
(b) N_2 (g)
(c) H_2CO_3 (aq)
(d) O_3 (g)

75. The pH of a wastewater sample is measured to be 11.9. The sample is:
(a) Acidic
(b) Neutral
(c) Basic
(d) None of the above

76. The pH value for an aqueous solution of nitric acid should be:
(a) Higher than 7.0
(b) Lower than 7.0
(c) Equal to 7.0
(d) Equal to 11.5

77. A water sample shows a pH of 7.0. The sample is:
(a) Acidic
(b) Neutral
(c) Colorless
(d) Basic

78. The solubility of lead at a pH of 7.0 is lower than at a pH of 3.2.
(a) True
(b) False

metals are more soluble in acidic conditions

79. Which compound reacts with an acid to generate carbon dioxide gas?
(a) H_2O (l)
(b) $CaCO_3$ (s)
(c) NaBr (aq)
(d) SO_2 (g)

80. Solar energy is an example of a:
(a) Fossil energy source
(b) Non-fossil energy source
(c) No energy source
(d) Nuclear energy source

81. One of the gases responsible for global warming is:
(a) CO
(b) N_2O
(c) N_2
(d) O_2

greenhouse gases
CO_2, CH_4, N_2O

82. One of the suggested ways to control global warming is to:
(a) Increase CO_2 emissions
(b) Use more fossil fuels
(c) Destroy CO_2 sinks
(d) Conserve energy

83. Oxygen/Ozone screen in the stratosphere blocks much of the solar UV radiation.
(a) True
(b) False

84. The agreement to reduce and ultimately ban the manufacture and use of chlorofluorocarbons goes by the name of:
(a) Kyoto Protocol greenhouse
(b) Glen Eagle Agreement
(c) Montreal Protocol → ozone.
(d) Geneva Convention

85. The depletion of stratospheric ozone is caused by:
(a) Natural sources only
(b) Human-made sources only
(c) Both natural and human-made sources
(d) None of the above

86. The major causes of ozone destruction include:
(a) Water vapor
(b) Nitric oxide
(c) CFCs
(d) All of the above

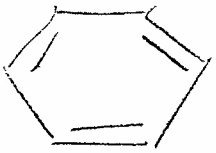
87. Adverse effects of acid rain on the aquatic life are due to:
(a) Increase in pH
(b) Decrease in pH
(c) Decrease in aqueous concentrations of Al
(d) Decrease in aqueous concentrations of Pb

88. If under a set of optimum conditions, 2.00 moles of gaseous ozone are produced from 3.00 moles of oxygen gas, how many moles of oxygen gas will be required (under similar conditions) to produce 15.0 moles of gaseous ozone?
(a) 15.0 moles
(b) 45.0 moles
(c) 30.0 moles
(d) 22.5 moles

$2O_3 \rightarrow 3O_2$ $\quad \frac{2}{15} = \frac{3}{x}$

89. The reaction of limestone with H_2SO_4 (aq) generates gaseous:
(a) Carbon dioxide
(b) Sulfur dioxide
(c) Carbon monoxide
(d) Sulfur trioxide

90. Benzene contains:



(a) Single bonds only
(b) Double bonds only
(c) Triple bonds only
(d) Single and double bonds

91. The increased intensity of ground-level UV due to ozone depletion may lead to higher probability (in case of humans) of:
(a) Deafness
(b) Depression
(c) Cataracts
(d) AIDS

92. Hazard posed by exposure to an oxidizing agent is classified as:
(a) Chemical
(b) Biological
(c) Ergonomic
(d) Physical

93. The combined interaction of O_3/O_2 in the stratosphere with solar radiation protects us from the harmful effects of:
(a) IR radiation
(b) UV radiation
(c) Visible radiation
(d) Microwave radiation

94. The symbol for the rare gas in the same period as sodium is:
(a) Mg
(b) S
(c) Ar
(d) Cℓ

95. The oxide ion contains:
(a) 8 protons and 8 electrons
(b) 8 protons and 10 electrons
(c) 8 protons and 5 electrons
(d) 8 protons and 6 electrons

96. In the implementation of WHMIS, suppliers must provide hazard information through:
(a) Telephone calls
(b) e-Mails
(c) MSDSs only
(d) Labels and MSDSs

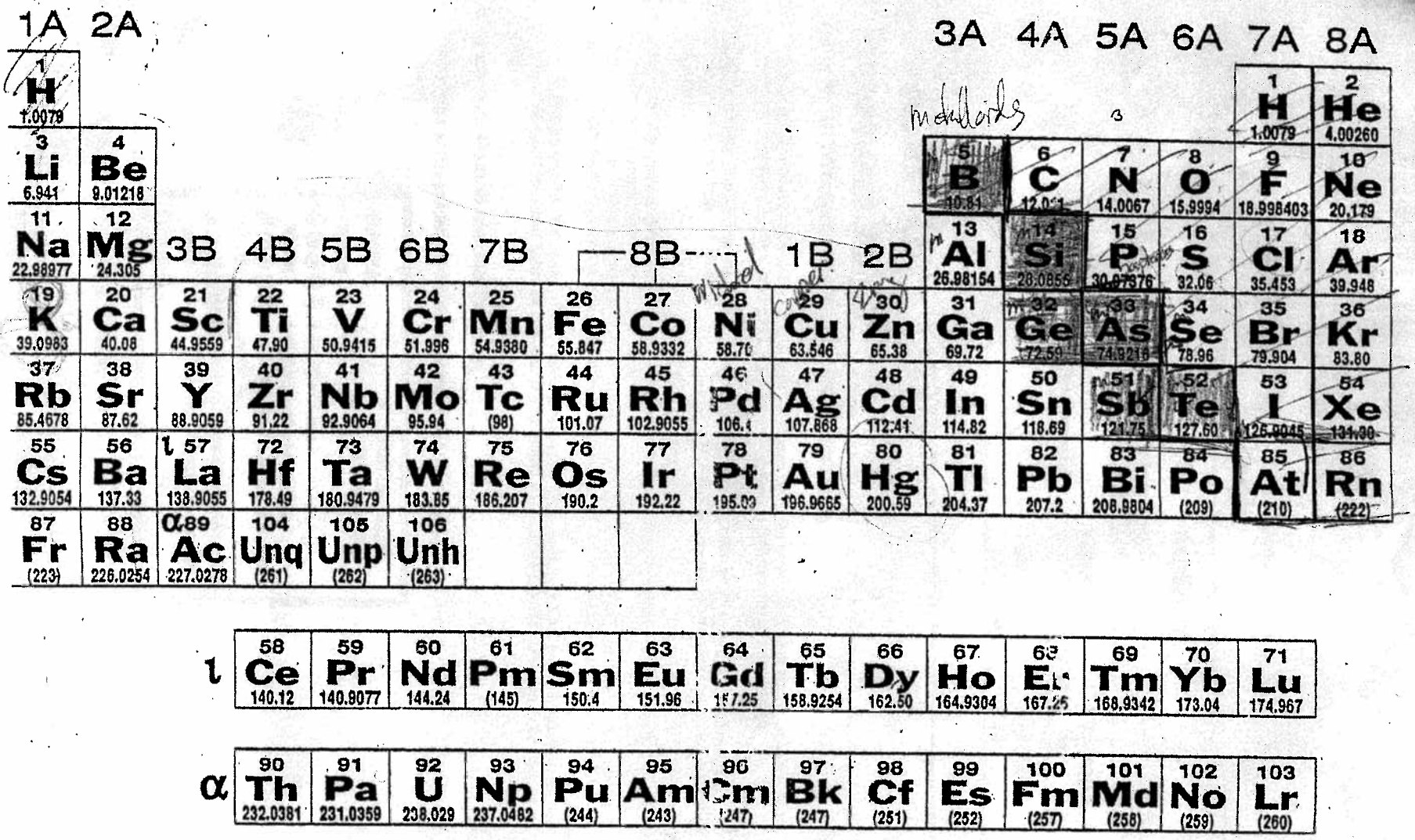
97. Serious damage to lungs may occur on exposure to:
(a) O_2 (g)
(b) NO_2 (g)
(c) N_2 (g)
(d) CO_2 (g)

98. Risk characterization integrates the exposure and effects components to estimate the risk.
(a) True
(b) False

99. The organization responsible for developing TLVs is abbreviated as:
(a) AGCIH
(b) ACGIH
(c) AHGIC
(d) ACGHI

100. Which of the following is a greenhouse gas?
(a) Nitrogen
(b) Oxygen
(c) Methane
(d) None of the above

Periodic Table of the Elements



1A	2A	3B	4B	5B	6B	7B	8B	1B	2B	3A	4A	5A	6A	7A	8A
1 H 1.0079														1 H 1.0079	2 He 4.00260
3 Li 6.941	4 Be 9.01218									5 B 10.81	6 C 12.011	7 N 14.0067	8 O 15.9994	9 F 18.998403	10 Ne 20.179
11 Na 22.98977	12 Mg 24.305									13 Al 26.98154	14 Si 28.0855	15 P 30.97376	16 S 32.06	17 Cl 35.453	18 Ar 39.948
19 K 39.0983	20 Ca 40.08	21 Sc 44.9559	22 Ti 47.90	23 V 50.9415	24 Cr 51.996	25 Mn 54.9380	26 Fe 55.847	27 Co 58.9332	28 Ni 58.70	29 Cu 63.546	30 Zn 65.38	31 Ga 69.72	32 Ge 72.59	33 As 74.9216	34 Se 78.96	35 Br 79.904	36 Kr 83.80
37 Rb 85.4678	38 Sr 87.62	39 Y 88.9059	40 Zr 91.22	41 Nb 92.9064	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.9055	46 Pd 106.4	47 Ag 107.868	48 Cd 112.41	49 In 114.82	50 Sn 118.69	51 Sb 121.75	52 Te 127.60	53 I 126.9045	54 Xe 131.30
55 Cs 132.9054	56 Ba 137.33	ℓ 57 La 138.9055	72 Hf 178.49	73 Ta 180.9479	74 W 183.85	75 Re 186.207	76 Os 190.2	77 Ir 192.22	78 Pt 195.09	79 Au 196.9665	80 Hg 200.59	81 Tl 204.37	82 Pb 207.2	83 Bi 208.9804	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra 226.0254	α 89 Ac 227.0278	104 Unq (261)	105 Unp (262)	106 Unh (263)												

ℓ	58 Ce 140.12	59 Pr 140.9077	60 Nd 144.24	61 Pm (145)	62 Sm 150.4	63 Eu 151.96	64 Gd 157.25	65 Tb 158.9254	66 Dy 162.50	67 Ho 164.9304	68 Er 167.26	69 Tm 168.9342	70 Yb 173.04	71 Lu 174.967
α	90 Th 232.0381	91 Pa 231.0359	92 U 238.029	93 Np 237.0482	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (260)