TRUE/FALSE. Write 'T' if the statement is true and 'F' if the statement is false.

1) Modern studies have shown that the Law of Multiple Proportions is not valid.
Answer: True False

2) Atoms of one element cannot be converted to another element by any known method.
Answer: True False

3) The mass of a neutron is equal to the mass of a proton plus the mass of an electron.
Answer: True False

4) All neutral atoms of tin have 50 protons and 50 electrons.
Answer: True False

5) Copper (Cu) is a transition metal.
Answer: True False

6) Lead (Pb) is a main-group element.
Answer: True False

7) In nature, some elements exist as molecules, while others do not.
Answer: True False

8) Ionic compounds may carry a net positive or negative charge.
Answer: True False

9) When an alkali metal combines with a non-metal, a covalent bond is normally formed.
Answer: True False

10) The molecular formula of a compound provides more information than its structural formula.
Answer: True False

11) Blood is an example of a homogeneous mixture.
Answer: True False

12) Sodium chloride fully dissolved in water is an example of a homogeneous mixture.
Answer: True False

13) Sand in water is an example of a heterogeneous mixture.
Answer: True False

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

14) In the ionic compound with the general formula M_2X_3, the likely charge on X is
A) -1. B) -2. C) +3. D) +1. E) -3.
Answer: B

15) Ammonium sulfate, $(NH_4)_2SO_4$, is a fertilizer widely used as a source of nitrogen. Calculate its molecular mass.

A) 132.13 u B) 128.11 u C) 114.10 u D) 118.13 u E) 63.07 u

Answer: A

16) Sodium chromate is used to protect iron from corrosion and rusting. Determine its molecular mass.

A) 161.98 u B) 238.98 u C) 261.97 u D) 138.98 u E) 74.99 u

Answer: A

17) In a Millikan oil-drop experiment, the charges on several different oil drops were as follows: -5.92; -4.44; -2.96; -8.88. The units are arbitrary. What is the likely value of the electronic charge in these arbitrary units?

A) -1.11 B) -5.55 C) -2.22 D) -2.96 E) -1.48

Answer: E

18) Iodine pentafluoride reacts slowly with glass and violently with water. Determine its molecular mass.

A) 653.52 u B) 221.90 u C) 259.89 u D) 202.90 u E) 145.90 u

Answer: B

19) Silicon, which makes up about 25% of Earth's crust by mass, is used widely in the modern electronics industry. It has three naturally occurring isotopes, ^{28}Si, ^{29}Si, and ^{30}Si. Calculate the atomic mass of silicon.

Isotope	Isotopic Mass (u)	Abundance %
^{28}Si	27.976927	92.23
^{29}Si	28.976495	4.67
^{30}Si	29.973770	3.10

A) 28.7260 u B) 28.9757 u C) 29.2252 u D) 28.0855 u E) 27.9801 u

Answer: D

20) Diiodine pentaoxide is used as an oxidizing agent that converts carbon monoxide to carbon dioxide. What is its chemical formula?

A) I_5O_2 B) $2IO_5$ C) IO_5 D) I_2O_5 E) $(IO_5)_2$

Answer: D

21) What are the approximate carbon:hydrogen mass ratios in methane (CH_4) and ethyne (C_2H_2)?

A) 1:4 and 1:1
B) 3:2 and 12:1
C) 3:1 and 6:1
D) 3:1 and 12:1
E) 3:2 and 6:1

Answer: D

22) Kaolinite, a clay mineral with the formula $Al_4Si_4O_{10}(OH)_8$, is used as a filler in slick-paper for magazines and as a raw material for ceramics. Analysis shows that 14.35 g of kaolinite contains 8.009 g of oxygen. Calculate the mass percent of oxygen in kaolinite.

A) 55.81 mass %
B) 24.80 mass %
C) 1.792 mass %
D) 34.12 mass %
E) 30.81 mass %

Answer: A

23) Determine the molecular mass of iron (III) bromide hexahydrate, a substance used as a catalyst in organic reactions.

A) 317.61 u B) 313.57 u C) 355.54 u D) 295.56 u E) 403.65 u

Answer: E

24) Compound 1 has a composition of 46.7 mass % of element A and 53.3 mass % of element B. A and B also form a second binary compound (compound 2). If the compositions of the two compounds are consistent with the law of multiple proportions, which of the following compositions could be that of compound 2?

A) 23.4 mass % A 76.6 mass % B
B) 33.3 mass % A 66.7 mass % B
C) 73.3 mass % A 26.7 mass % B
D) 53.3 mass % A 46.7 mass % B
E) 30.4 mass % A 69.6 mass % B

Answer: E

25) Lithium forms compounds which are used in dry cells and storage batteries and in high-temperature lubricants. It has two naturally occurring isotopes, ^6Li (isotopic mass = 6.015121 u) and ^7Li (isotopic mass = 7.016003 u). Lithium has an atomic mass of 6.9409 u. What is the percent abundance of lithium-6?

A) 92.50% B) 7.503% C) 86.66% D) 46.16% E) 6.080%

Answer: B

26) Tetrasulfur dinitride decomposes explosively when heated. What is its formula?

A) S_2N B) $4SN_2$ C) S_4N_2 D) S_4N E) S_2N_4

Answer: C

27) Bromine has two naturally-occurring isotopes. ^{79}Br has a mass of 78.9 u and accounts for 50.3% of bromine atoms. If the atomic mass of bromine is 79.9 u, what is the mass of an atom of the second bromine isotope?

A) 88.9 u B) 77.9 u C) 80.9 u D) 80.0 u E) 80.1 u

Answer: C

28) Bromine is the only nonmetal that is a liquid at room temperature. Consider the isotope bromine-81, $^{81}_{35}Br$. Select the combination which lists the correct atomic number, neutron number, and mass number, respectively.

A) 35, 81, 46 B) 35, 81, 116 C) 46, 81, 35 D) 35, 46, 81 E) 81, 46, 35

Answer: D

29) Silver chloride is used in photographic emulsions. What is its formula?

A) $AgCl_3$ B) Ag_2Cl_3 C) AgCl D) $AgCl_2$ E) Ag_2Cl

Answer: C

30) Which of the following compounds is covalent?

A) Cs_2S B) MgO C) Al_2O_3 D) PCl_3 E) $CaCl_2$

Answer: D

31) The compound, $(NH_4)_2S$, can be used in analysis for trace amounts of metals present in a sample. What is its name?

A) ammonium sulfite
B) diammonium sulfide
C) ammonium(I) sulfide
D) ammonia(I) sulfite
E) ammonium sulfide

Answer: E

32) After an atom has lost an electron it becomes a/an _____ and has a _____ charge.

A) isotope, negative
B) nucleus, positive
C) anion, negative
D) anion, positive
E) cation, positive

Answer: E

33) Which of the following is a metal?
A) phosphorus, P, $Z = 15$
B) silicon, Si, $Z = 14$
C) arsenic, $Z = 33$
D) thallium, Tl, $Z = 81$
E) nitrogen, N, $Z = 7$
Answer: D

34) When an atom is represented by the symbol ${}^{A}_{Z}\mathrm{X}$, the value of A is the
A) atomic mass of the element.
B) total number of protons and neutrons in the atom.
C) number of neutrons in the atom.
D) total number of electrons and neutrons in the atom.
E) number of protons in the atom.
Answer: B

35) In the modern periodic table, the order in which the elements are placed is based on
A) atomic size
B) mass number
C) chemical reactivity
D) atomic mass
E) atomic number
Answer: E

36) Barium sulfate is used in manufacturing photographic paper. What is its formula?
A) $BaSO_3$ B) Ba_2SO_4 C) $BaSO_4$ D) $Ba_2(SO_4)_3$ E) $Ba(SO_4)_2$
Answer: C

37) Barium fluoride is used in embalming and in glass manufacturing. Which of the following gives the formula and bonding for barium fluoride?
A) BaF, covalent compound
B) BaF_2, covalent compound
C) Ba_2F, ionic compound
D) BaF_2, ionic compound
E) BaF, ionic compound
Answer: D

38) The compound, BaO, absorbs water and carbon dioxide readily and is used to dry gases and organic solvents. What is its name?

A) barium monoxide
B) barium(II) oxide
C) barium peroxide
D) baric oxide
E) barium oxide

Answer: E

39) What is the name of BBr_3?

A) boron tribromide
B) bromine triboride
C) boric bromide
D) tribromoboride
E) boron bromide

Answer: A

40) The formula of decane is

A) $C_{12}H_{26}$ B) $C_{11}H_{24}$ C) C_9H_{20} D) $C_{10}H_{20}$ E) $C_{10}H_{22}$

Answer: E

41) The formula of heptane is

A) C_7H_{14} B) C_7H_{16} C) C_8H_{16} D) C_6H_{12} E) C_6H_{14}

Answer: B

42) Calcium hydroxide is used in mortar, plaster, and cement. What is its formula?

A) $CaOH_2$ B) CaOH C) Ca_2OH D) $Ca(OH)_2$ E) $CaHO_2$

Answer: D

43) The substance, CaSe, is used in materials which are electron emitters. What is its name?

A) calcium(II) selenium
B) calcium monoselenide
C) calcium selenide
D) calcium(II) selenide
E) calcium(I) selenide

Answer: C

44) What is the name of the acid formed when $HClO_4$ liquid is dissolved in water?

A) chlorous acid
B) hydrochlorate acid
C) chloric acid
D) perchloric acid
E) hydrochloric acid

Answer: D

45) Chlorine dioxide is a strong oxidizer that is used for bleaching flour and textiles and for purification of water. What is its formula?

A) Cl_2O_4 B) Cl_2O_2 C) ClO_2 D) Cl_2O E) $(ClO)_2$

Answer: C

46) Which one of the following combinations of names and formulas of ions is incorrect?

A) ClO_3^- chlorate
B) NO_2^- nitrate
C) O^{2-} oxide
D) Cd^{2+} cadmium
E) HCO_3^- hydrogen carbonate

Answer: B

47) Which one of the following combinations of names and formulas of ions is incorrect?

A) ClO_4^- perchlorate
B) Ba^{2+} barium
C) S^{2-} sulfate
D) CN^- cyanide
E) HCO_3^- bicarbonate

Answer: C

48) Which one of the following combinations of names and formulas of ions is incorrect?

A) $Cr_2O_7^{2-}$ dichromate
B) CN^- cyanide
C) S^{2-} sulfide
D) ClO_3^- perchlorate
E) NH_4^+ ammonium

Answer: D

49) The substance, $CoCl_2$, is useful as a humidity indicator because it changes from pale blue to pink as it gains water from moist air. What is its name?

A) cobaltic chloride
B) copper(II) chloride
C) cobalt chloride
D) cobalt(II) chloride
E) cobalt dichloride

Answer: D

50) What is the name of the acid formed when HCN gas is dissolved in water?
A) hydrogen cyanide
B) hydrocyanic acid
C) hydrocyanous acid
D) cyanic acid
E) cyanous acid
Answer: B

51) Which separation technique uses the difference in particle size between substances in order to separate mixtures?
A) distillation
B) chromatography
C) crystallization
D) extraction
E) filtration
Answer: E

52) Which separation technique uses the difference in volatility between substances to separate mixtures?
A) crystallization
B) chromatography
C) distillation
D) extraction
E) filtration
Answer: C

53) Which separation technique uses the difference in solubility between substances to separate mixtures?
A) extraction
B) distillation
C) filtration
D) chromatography
E) none of the choices use solubility to separate mixtures
Answer: A

54) Which separation technique uses a mobile phase and a stationary phase to separate mixtures?
A) filtration
B) crystallization
C) chromatography
D) distillation
E) extraction
Answer: C

55) Iron (III) chloride hexahydrate is used as a coagulant for sewage and industrial wastes. What is its formula?

A) $FeCl_3(H_2O)_6$
B) $Fe_3Cl{\bullet}6H_2O$
C) $Fe(Cl{\bullet}6H_2O)_3$
D) $FeCl_3{\bullet}6H_2O$
E) $Fe_3Cl(H_2O)_6$

Answer: D

56) Ferric oxide is used as a pigment in metal polishing. Which of the following is its formula?

A) Fe_2O_5 B) FeO C) FeO_3 D) Fe_2O_3 E) Fe_2O

Answer: D

57) Which of the following is a metalloid?

A) sulfur, S, $Z = 16$
B) bromine, Br, $Z = 35$
C) iridium, $Z = 77$
D) germanium, Ge, $Z = 32$
E) carbon, C, $Z = 6$

Answer: D

58) Which of the following elements are the least reactive?

A) alkaline earth metals
B) noble gases
C) alkali metals
D) halogens
E) metalloids

Answer: B

59) Which of the following compounds is ionic?

A) HCl B) $MgCl_2$ C) SO_2 D) PF_3 E) CS_2

Answer: B

60) Which of the following symbols does not represent an element?

A) Co B) HF C) O_2 D) Xe E) Cs

Answer: B

61) What is the name of the acid formed when HBr gas is dissolved in water?

A) hydrobromic acid
B) bromous acid
C) bromic acid
D) hydrobromous acid
E) hydrobromidic acid

Answer: A

62) An isotope of which of the following elements is chosen as a standard in measuring atomic mass?
A) helium B) Neon C) hydrogen D) oxygen E) carbon
Answer: E

63) The name for HF(g) is
A) hydrogen fluoride
B) hydrogen fluorine
C) fluoric acid
D) hydrofluoric acid
E) hydrogen(I) fluoride
Answer: A

64) What is the name of the acid formed when H_2S gas is dissolved in water?
A) sulfurous acid
B) hydrosulfuric acid
C) sulfuric acid
D) hydrosulfurous acid
E) sulfidic acid
Answer: B

65) What is the name of IF_7?
A) iodine fluoride
B) heptafluoroiodide
C) iodine heptafluoride
D) iodic fluoride
E) heptafluorine iodide
Answer: C

66) A column of the periodic table is called a
A) pillar.
B) period.
C) isotopic mixture.
D) group.
E) shell.
Answer: D

67) A row of the periodic table is called a
A) subshell.
B) family.
C) period.
D) group.
E) isotopic mixture.
Answer: C

68) Potassium permanganate is a strong oxidizer that reacts explosively with easily oxidized materials. What is its formula?

A) K_2MnO_4 B) $KMnO_3$ C) $K_2Mn_2O_7$ D) $K(MnO_4)_2$ E) $KMnO_4$

Answer: E

69) What is the formula for lithium nitrite?

A) Li_2NO_2 B) $LiNO_2$ C) Li_2NO_3 D) $LiNO_4$ E) $LiNO_3$

Answer: B

70) The colorless substance, MgF_2, is used in the ceramics and glass industry. What is its name?

A) magnesium difluoride
B) magnesium fluoride
C) monomagnesium difluoride
D) magnesium(II) fluoride
E) none of the other choices, since they are all misspelled

Answer: B

71) J. J. Thomson studied cathode ray particles (electrons) and was able to measure the mass/charge ratio. His results showed that

A) the charge was always a whole-number multiple of some minimum charge.
B) the mass/charge ratio varied with as the cathode material was changed.
C) atoms contained dense areas of positive charge.
D) atoms are largely empty space.
E) matter included particles much smaller than the atom.

Answer: E

72) Which of the following is a non-metal?

A) mercury, Hg, $Z = 80$
B) bromine, Br, $Z = 35$
C) lithium, Li, $Z = 3$
D) bismuth, Bi, $Z = 83$
E) sodium, Na, $Z = 11$

Answer: B

73) What is the formula for magnesium sulfide?

A) Mg_2S_3 B) $MgSO_4$ C) MgS_2 D) MgS E) Mg_2S

Answer: D

74) Which one of the following formulas of ionic compounds is the least likely to be correct?

A) $CaCl_2$ B) $MgCO_3$ C) $Cu(NO_3)_2$ D) KF E) $NaSO_4$

Answer: E

75) Which, if any, of the following elements do not occur in the major classes of organic compounds?
A) C
B) H
C) O
D) N
E) All the above elements occur in the major classes of organic compounds

Answer: E

76) Which one of the following groups does not contain any metals?
A) Cl, Al, Si, Ar
B) N, Ne, Nd, Np
C) Cu, P, Se, Kr
D) Xe, Hg, Ge, O
E) C, S, As, H

Answer: E

77) Sodium oxide combines violently with water. Which of the following gives the formula and the bonding for sodium oxide?
A) NaO, ionic compound
B) Na_2O_2, ionic compound
C) Na_2O, covalent compound
D) NaO, covalent compound
E) Na_2O, ionic compound

Answer: E

78) Sodium peroxide is an oxidizer used to bleach animal and vegetable fibers. What is its formula?
A) NaH_2O_2 B) Na_2O C) Na_2O_2 D) NaO E) NaO_2

Answer: C

79) Which one of the following formulas of ionic compounds is the least likely to be correct?
A) $Ba(OH)_2$ B) NH_4Cl C) $Cu(CN)_2$ D) Ca_2NO_3 E) Na_2SO_4

Answer: D

80) Which one of the following combinations of names and formulas is incorrect?
A) H_3PO_4 phosphoric acid
B) KOH potassium hydroxide
C) H_2CO_3 carbonic acid
D) HNO_3 nitric acid
E) $NaHCO_3$ sodium carbonate

Answer: E

81) Which one of the following combinations of names and formulas of ions is incorrect?

A) PO_4^{3-} phosphate

B) NO_3^- nitrate

C) CrO_4^{2-} chromate

D) O_2^- oxide

E) Al^{3+} aluminum

Answer: D

82) Which of the following ions occurs commonly?

A) S^{6+} B) N^{3+} C) O^{2-} D) Cl^+ E) Ca^+

Answer: C

83) Which of the following ions occurs commonly?

A) Ca^{2+} B) K^- C) P^{3+} D) O^{6+} E) Br^{7+}

Answer: A

84) What is the formula for lead (II) oxide?

A) Pb_2O_3 B) PbO C) PbO_2 D) Pb_2O E) PbO_4

Answer: B

85) Which one of the following is a polyatomic cation?

A) hydronium

B) nitrate

C) potassium

D) permanganate

E) chromate

Answer: A

86) The compound, P_4S_{10}, is used in the manufacture of safety matches. What is its name?

A) phosphorus pentasulfide

B) phosphorus decasulfide

C) tetraphosphorus decasulfide

D) phosphorus sulfide

E) phosphoric sulfide

Answer: C

87) What is the name of PCl_3?

A) phosphorus trichlorate

B) phosphorus chloride

C) trichlorophosphide

D) phosphoric chloride

E) phosphorus trichloride

Answer: E

88) The substance, $KClO_3$, is a strong oxidizer used in explosives, fireworks, and matches. What is its name?

A) potassium chlorite
B) potassium chloride
C) potassium(I) chlorite
D) potassium chlorate
E) potassium(I) chlorate

Answer: D

89) Millikan's oil-drop experiment

A) established the charge on an electron.
B) suggested that some oil drops carried fractional numbers of electrons.
C) showed that all oil drops carried the same charge.
D) provided support for the nuclear model of the atom.
E) suggested the presence of a neutral particle in the atom.

Answer: A

90) The chemical symbol for potassium is

A) Pt B) Po C) K D) P E) Pm

Answer: C

91) The compound, NaH_2PO_4, is present in many baking powders. What is its name?

A) sodium dihydrogen phosphate
B) sodium hydrophosphate
C) sodium hydrogen phosphate
D) sodium dihydride phosphate
E) sodium biphosphate

Answer: A

92) What is the name of Na_2O?

A) sodium monoxide
B) disodium monoxide
C) sodium dioxide
D) sodium oxide
E) sodium(I) oxide

Answer: D

93) What is the name of P_4Se_3?

A) tetraphosphorus triselenide
B) tetraphosphorus selenide
C) phosphorus selenide
D) phosphoric selenide
E) phosphorus triselenide

Answer: A

94) Select the incorrect statement about elements and compounds.
A) The molecular formula of a compound provides more information than the structural formula.
B) Among the elements, there are more metals than non-metals.
C) All ionic compounds are neutral.
D) Some elements exist as molecules.
E) The bonding in compounds may be covalent or ionic.

Answer: A

95) One atomic mass unit (u) is defined as
A) 1/20 the mass of an atom of ^{20}Ne.
B) the mass of a proton.
C) the mass of an atom of ^{1}H.
D) 1/12 the mass of an atom of ^{12}C.
E) 1/16 the mass of an atom of ^{16}O.

Answer: D

96) Which one of the following statements about atoms and subatomic particles is correct?
A) The proton and the neutron have identical masses.
B) An atomic nucleus contains equal numbers of protons and neutrons.
C) A neutral atom contains equal numbers of protons and electrons.
D) Rutherford discovered the atomic nucleus by bombarding gold foil with electrons.
E) The neutron's mass is equal to that of a proton plus an electron.

Answer: C

97) Rutherford bombarded gold foil with alpha (α) particles and found that a small percentage of the particles were deflected. Which of the following was <u>not</u> accounted for by the model he proposed for the structure of atoms?
A) the charge on the nucleus
B) the presence of electrons outside the nucleus
C) the total mass of the atom
D) the small size of the nucleus
E) the existence of protons

Answer: C

98) Who is credited with measuring the mass/charge ratio of the electron?
A) Gay-Lussac B) Thomson C) Millikan D) Rutherford E) Dalton

Answer: B

99) Who is credited with first measuring the charge of the electron?
A) Thomson B) Dalton C) Millikan D) Gay-Lussac E) Rutherford

Answer: C

100) Who is credited with discovering the atomic nucleus?

A) Thomson B) Millikan C) Gay-Lussac D) Rutherford E) Dalton

Answer: D

101) What is the chemical symbol for the group 16 element that lies in period 4?

A) Hf B) W C) Se D) Cr E) Ti

Answer: C

102) Atoms X, Y, Z, and R have the following nuclear compositions:

$^{410}_{186}X$ $^{410}_{183}Y$ $^{412}_{186}Z$ $^{412}_{185}R$

Which two are isotopes?

A) Y & R B) X & Y C) X & R D) X & Z E) Z & R

Answer: D

103) Zinc acetate is used in preserving wood and in manufacturing glazes for porcelain. What is its formula?

A) Zn_2CH_3COO

B) $ZnAc_2$

C) $ZnCH_3COCH_3$

D) $Zn(CH_3COO)_2$

E) $ZnCH_3COO$

Answer: D

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

104) Name the three important "laws" that were accounted for by Dalton's atomic theory.

Answer: laws of conservation of mass; definite composition; multiple proportions

105) Dalton's atomic theory has required some modifications in the light of subsequent discoveries. For ar appropriate postulates of Dalton's atomic theory

a. state the postulate in its original form.
b. in one sentence, describe why the postulate has needed modification.

Answer: 1. Matter consists of atoms which are indivisible, cannot be created or destroyed. But, atoms ar divisible, as the existence of subatomic particles shows.
2. Atoms of one element cannot be converted into atoms of another element. They can be conv in various nuclear reactions, including radioactive decay.
3. Atoms of an element are identical in mass and other properties. Isotopes of an element differ in their masses and other properties.

106) For the elements represented below, fill in the blank spaces and write out all the symbols in the left hand column in full, in the form $^{A}_{Z}\mathrm{X}$ (i.e., include the appropriate values of *Z* and *A* as well as the correct symbol X).

Symbol	# protons	# neutrons	# electrons
…	17	18	…
Au	…	118	…
…	…	20	20

Answer:

Symbol	# protons	# neutrons	# electrons
$^{35}_{17}\mathrm{Cl}$	17	18	17
$^{197}_{79}\mathrm{Au}$	79	118	79
$^{40}_{20}\mathrm{Ca}$	20	20	20

107) The following charges on individual oil droplets were obtained during an experiment similar to Milli Use them to determine a charge for the electron in coulombs (C), showing all your working.

Charges (C): -3.184×10^{-19}; -4.776×10^{-19}; -7.960×10^{-19}

Answer: -1.59×10^{-19} C

108) State the two important experimental results (and the names of the responsible scientists) which enabled the mass of the electron to be determined.

Answer: Thomson measured *m*/*e*, the mass-to-charge ratio. Millikan measured *e*, the charge. Thus, the mass *m* could be calculated.

109) For each of the following elements, indicate whether it is a metal, a non-metal, or a metalloid:

a. S
b. Ge
c. Ga
d. H
e. I
f. Si

Answer: a. nonmetal
b. metalloid
c. metal
d. nonmetal
e. nonmetal
f. metalloid

110) Give the common name of the group in the periodic table to which each of the following elements be

a. Rb
b. Br
c. Ba
d. Ar

Answer: a. alkali metals
b. halogens
c. alkaline earth metals
d. noble gases

111) a. Give the names of the following ions:

(i) NH_4^+
(ii) SO_3^{2-}
b. Write down the formulas of the following ions:
(i) aluminum
(ii) carbonate

Answer:

a. (i) ammonium
(ii) sulfite
b. (i) Al^{3+}
(ii) CO_3^{2-}

112) a. Give the names of the following ions:

(i) O_2^{2-}
(ii) SO_4^{2-}
b. Write down the formulas of the following ions:
(i) ammonium
(ii) nitrate

Answer:

a. (i) peroxide
   (ii) sulfate
b. (i) NH_4^+
   (ii) NO_3^-

113) For each of the following names, write down the corresponding formula, including charge where appropriate (atomic numbers and mass numbers are not required):

a. zinc ion
b. nitrite ion
c. carbonic acid
d. cyanide ion

Answer: a. Zn^{2+}
b. NO_2^-
c. H_2CO_3
d. CN^-

114) Calculate the molecular masses of the following:

a. Cl_2
b. H_2O_2
c. $(NH_4)_2SO_4$
d. $Ba(NO_3)_2$

Answer: a. 70.90 u
b. 34.02 u
c. 132.15 u
d. 261.32 u

1) FALSE
2) FALSE
3) FALSE
4) TRUE
5) TRUE
6) TRUE
7) TRUE
8) FALSE
9) FALSE
10) FALSE
11) FALSE
12) TRUE
13) TRUE
14) B
15) A
16) A
17) E
18) B
19) D
20) D
21) D
22) A
23) E
24) E
25) B
26) C
27) C
28) D
29) C
30) D
31) E
32) E
33) D
34) B
35) E
36) C
37) D
38) E
39) A
40) E
41) B
42) D
43) C
44) D
45) C
46) B
47) C
48) D
49) D
50) B

51) E
52) C
53) A
54) C
55) D
56) D
57) D
58) B
59) B
60) B
61) A
62) E
63) A
64) B
65) C
66) D
67) C
68) E
69) B
70) B
71) E
72) B
73) D
74) E
75) E
76) E
77) E
78) C
79) D
80) E
81) D
82) C
83) A
84) B
85) A
86) C
87) E
88) D
89) A
90) C
91) A
92) D
93) A
94) A
95) D
96) C
97) C
98) B
99) C
100) D

101) C
102) D
103) D
104) laws of conservation of mass; definite composition; multiple proportions
105) 1. Matter consists of atoms which are indivisible, cannot be created or destroyed. But, atoms are divisible, a existence of subatomic particles shows.
2. Atoms of one element cannot be converted into atoms of another element. They can be converted in vari nuclear reactions, including radioactive decay.
3. Atoms of an element are identical in mass and other properties. Isotopes of an element differ in their masses and other properties.
106)

Symbol	# protons	# neutrons	# electrons
$^{35}_{17}Cl$	17	18	17
$^{197}_{79}Au$	79	118	79
$^{40}_{20}Ca$	20	20	20

107) -1.59×10^{-19} C
108) Thomson measured *m*/*e*, the mass-to-charge ratio. Millikan measured *e*, the charge. Thus, the mass *m* could be calculated.
109) a. nonmetal
b. metalloid
c. metal
d. nonmetal
e. nonmetal
f. metalloid
110) a. alkali metals
b. halogens
c. alkaline earth metals
d. noble gases

111)
a. (i) ammonium
(ii) sulfite
b. (i) Al^{3+}
(ii) CO_3^{2-}

112)
a. (i) peroxide
(ii) sulfate
b. (i) NH_4^+
(ii) NO_3-

113) a. Zn^{2+}
b. NO_2^-
c. H_2CO_3
d. CN^-

114) a. 70.90 u
b. 34.02 u
c. 132.15 u
d. 261.32 u