## Chapter 2: The Components of Matter

1.	Kaolinite, a clay mineral with the formula A paper for magazines and as a raw material for kaolinite contains 8.009 g of oxygen. Calcul A) 1.792 mass % B) 24.80 mass % C) 30.81 mass % Ans: E Difficulty: M	or cera late th D)	amics. Analysis sh	ows that 14.35 g of
2.	Compound 1 has a composition of 46.7 mass element B. A and B also form a second binal compositions of the two compounds are compositions of the following compositions could be A) 23.4 mass % A 76.6 mass % B B) 30.4 mass % A 69.6 mass % B C) 33.3 mass % A 66.7 mass % B Ans: B Difficulty: M	ary consistent be that D)	npound (compoun t with the law of n	d 2). If the nultiple proportions, 46.7 mass % B
3.	What are the approximate carbon:hydrogen $(C_2H_2)$ ?  A) 1:4 and 1:1  B) 3:2 and 6:1  C) 3:1 and 12:1  Ans: C Difficulty: M		ratios in methane ( 3:2 and 12:1 3:1 and 6:1	(CH <sub>4</sub> ) and ethyne
4.	J. J. Thomson studied cathode ray particles mass/charge ratio. His results showed that A) the mass/charge ratio varied with as the the charge was always a whole-number of matter included particles much smalled atoms contained dense areas of positive atoms are largely empty space. Ans: C Difficulty: E	ne cath er mul er than	node material was tiple of some mini the atom.	changed.
5.	Who is credited with measuring the mass/ch A) Dalton B) Gay-Lussac C) Thomson Ans: C Difficulty: E	_		
6.	Who is credited with first measuring the character A) Dalton B) Gay-Lussac C) Thomson Ans: D Difficulty: E	_		utherford

7. Millikan's oil-drop experiment

	<ul> <li>A) established the charge on an electron.</li> <li>B) showed that all oil drops carried the same charge.</li> <li>C) provided support for the nuclear model of the atom.</li> <li>D) suggested that some oil drops carried fractional numbers of electrons.</li> <li>E) suggested the presence of a neutral particle in the atom.</li> <li>Ans: A Difficulty: E</li> </ul>
8.	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) -1.48 C) -2.22 D) -2.96 E) -5.55  Ans: B Difficulty: M
9.	Who is credited with discovering the atomic nucleus?  A) Dalton B) Gay-Lussac C) Thomson D) Millikan E) Rutherford Ans: E Difficulty: E
10.	Rutherford bombarded gold foil with alpha ( $\alpha$ ) 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 small size of the nucleus  B) the charge on the nucleus  C) the total mass of the atom  D) the existence of protons  E) the presence of electrons outside the nucleus  Ans: C Difficulty: M
11.	<ul> <li>Which one of the following statements about atoms and subatomic particles is correct?</li> <li>A) Rutherford discovered the atomic nucleus by bombarding gold foil with electrons.</li> <li>B) The proton and the neutron have identical masses.</li> <li>C) The neutron's mass is equal to that of a proton plus an electron.</li> <li>D) A neutral atom contains equal numbers of protons and electrons.</li> <li>E) An atomic nucleus contains equal numbers of protons and neutrons.</li> <li>Ans: D Difficulty: M</li> </ul>
12.	The chemical symbol for potassium is A) P. B) Po. C) Pt. D) Pm. E) K. Ans: E Difficulty: E
13.	Which of the following symbols does not represent an element?  A) O <sub>2</sub> B) Co C) HF D) Cs E) Xe  Ans: C Difficulty: E

14.	<ul> <li>When an atom is represented by the symbol <sup>A</sup><sub>Z</sub>X, the value of A is the</li> <li>A) number of neutrons in the atom.</li> <li>B) number of protons in the atom.</li> <li>C) atomic mass of the element.</li> <li>D) total number of electrons and neutrons in the atom.</li> <li>E) total number of protons and neutrons in the atom.</li> <li>Ans: E Difficulty: E</li> </ul>		
15.	An isotope of which of the following elements is chosen as a standard in measuring atomic mass?  A) carbon B) oxygen C) hydrogen D) neon E) helium  Ans: A Difficulty: E		
16.	One amu is defined as A) the mass of a proton. D) $1/20$ the mass of an atom of $^{20}$ Ne . B) $1/12$ the mass of an atom of $^{12}$ C. E) $1/16$ the mass of an atom of $^{16}$ O. C) the mass of an atom of $^{14}$ H. Ans: B Difficulty: E		
17.	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, 46, 81 B) 35, 81, 46 C) 81, 46, 35 D) 46, 81, 35 E) 35, 81, 116 Ans: A Difficulty: E		
18.	Atoms X, Y, Z, and R have the following nuclear compositions:		
19.	Lithium forms compounds which are used in dry cells and storage batteries and in high-temperature lubricants. It has two naturally occurring isotopes, <sup>6</sup> Li (isotopic mass = 6.015121 amu) and <sup>7</sup> Li (isotopic mass = 7.016003 amu). Lithium has an atomic mass of 6.9409 amu. What is the percent abundance of lithium-6?  A) 92.50% B) 86.66% C) 46.16% D) 7.503% E) 6.080%  Ans: D Difficulty: H		

20. 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, <sup>28</sup>Si, <sup>29</sup>Si, and <sup>30</sup>Si. Calculate the atomic mass of silicon.

	<u>Isotope</u>	Isotopic Mass (amu)	$\mathbf{A}$	bundance %
	$^{28}$ Si	27.976927		92.23
	<sup>29</sup> Si	28.976495		4.67
	$^{30}$ Si	29.973770		3.10
A)	29.2252 amu		D)	28.0855 amu
B)	28.9757 amu		E)	27.9801 amu
C)	28.7260 amu			
Ans:	D Difficulty	y: M		

21. Bromine has two naturally-occurring isotopes. <sup>79</sup>Br has a mass of 78.9 amu and accounts for 50.3% of bromine atoms. If the atomic mass of bromine is 79.9 amu, what is the mass of an atom of the second bromine isotope?

A) 77.9 amu B) 80.0 amu C) 80.1 amu D) 80.9 amu E) 88.9 amu Ans: D Difficulty: M

22. In the modern periodic table, the order in which the elements are placed is based on

A) atomic mass.

D) atomic size.

B) mass number.

E) chemical reactivity.

C) atomic number.

Ans: C Difficulty: E

23. Which of the following elements are the least reactive?

A) alkali metals

D) alkaline earth metals

B) noble gases

E) metalloids

C) halogens

Ans: B Difficulty: E

24. Which of the following is a non-metal?

A) lithium, Li, Z = 3

D) bismuth, Bi, Z = 83

B) bromine, Br, Z = 35

E) sodium, Na, Z = 11

C) mercury, Hg, Z = 80

Ans: B Difficulty: E

25. Which of the following is a metal?

A) nitrogen, N, Z = 7

- D) thallium, Tl, Z = 81
- B) phosphorus, P, Z = 15
- E) silicon, Si, Z = 14

C) arsenic, Z = 33

Ans: D Difficulty: M

26.	Which of the following is a metalloid?  A) carbon, $C, Z = 6$ B) sulfur, $S, Z = 16$ C) germanium, $Ge, Z = 32$ Ans: $C$ Difficulty: $M$ D) iridium, $Z = 77$ E) bromine, $Br, Z = 35$
27.	Which one of the following groups does not contain any metals?  A) C, S, As, H  D) Xe, Hg, Ge, O  B) Cu, P, Se, Kr  E) Cl, Al, Si, Ar  C) N, Ne, Nd, Np  Ans: A Difficulty: M
28.	A column of the periodic table is called a  A) group. B) period. C) isotopic mixture. D) pillar. E) shell.  Ans: A Difficulty: E
29.	A row of the periodic table is called a  A) group. B) period. C) isotopic mixture. D) family. E) subshell.  Ans: B Difficulty: E
30.	What is the chemical symbol for the group 6A (16) element that lies in period 4?  A) Cr B) Hf C) W D) Ti E) Se  Ans: E Difficulty: M
31.	Which of the following compounds is ionic?  A) PF <sub>3</sub> B) CS <sub>2</sub> C) HCl D) SO <sub>2</sub> E) MgCl <sub>2</sub> Ans: E Difficulty: M
32.	After an atom has lost an electron it becomes a/an and has a charge.  A) anion, positive D) cation, positive B) isotope, negative E) nucleus, positive C) anion, negative Ans: D Difficulty: E
33.	Which of the following ions occurs commonly?  A) N <sup>3+</sup> B) S <sup>6+</sup> C) O <sup>2-</sup> D) Ca <sup>+</sup> E) Cl <sup>+</sup> Ans: C Difficulty: E
34.	Which of the following ions occurs commonly?  A) P <sup>3+</sup> B) Br <sup>7+</sup> C) O <sup>6+</sup> D) Ca <sup>2+</sup> E) K <sup>-</sup> Ans: D Difficulty: E
35.	Which of the following compounds is covalent?  A) CaCl <sub>2</sub> B) MgO C) Al <sub>2</sub> O <sub>3</sub> D) Cs <sub>2</sub> S E) PCl <sub>3</sub> Ans: E Difficulty: M

30.	<ul> <li>A) All ionic compounds are neutral.</li> <li>B) Some elements exist as molecules.</li> <li>C) The bonding in compounds may be covalent or ionic.</li> <li>D) The molecular formula of a compound provides more information than the structural formula.</li> <li>E) Among the elements, there are more metals than non-metals.</li> <li>Ans: D Difficulty: M</li> </ul>
37.	Which, if any, of the following elements do not occur in the major classes of organic compounds?  A) H B) C C) N D) O E) All the above elements occur in the major classes of organic compounds.  Ans: E Difficulty: M
38.	Which of the following is the empirical formula for hexane, $C_6H_{14}$ ? A) $C_{12}H_{28}$ B) $C_6H_{14}$ C) $C_3H_7$ D) $CH_{2.3}$ E) $C_{0.43}H$ Ans: C Difficulty: E
39.	Sodium oxide combines violently with water. Which of the following gives the formula and the bonding for sodium oxide?  A) NaO, ionic compound  B) NaO, covalent compound  C) Na <sub>2</sub> O, ionic compound  C) Na <sub>2</sub> O, ionic compound  Ans: C Difficulty: E
40.	Barium fluoride is used in embalming and in glass manufacturing. Which of the following gives the formula and bonding for barium fluoride?  A) BaF <sub>2</sub> , ionic compound  B) BaF <sub>2</sub> , covalent compound  C) BaF, ionic compound  Ans: A Difficulty: E
41.	The colorless substance, MgF <sub>2</sub> , is used in the ceramics and glass industry. What is its name?  A) magnesium difluoride B) magnesium fluoride C) magnesium(II) fluoride D) monomagnesium difluoride E) none of the above, since they are all misspelled Ans: B Difficulty: M

42.	The compound, BaO, absorbs water and car and organic solvents. What is its name?  A) barium oxide  B) barium(II) oxide  C) barium monoxide	bon di D) E)	baric oxide barium peroxide
43.	Ans: A Difficulty: M  What is the name of Na <sub>2</sub> O? A) disodium monoxide B) sodium monoxide C) sodium dioxide Ans: E Difficulty: M	D) E)	sodium(I) oxide sodium oxide
44.	The substance, CaSe, is used in materials w A) calcium monoselenide B) calcium(II) selenide C) calcium selenide Ans: C Difficulty: M	hich a D) E)	re electron emitters. What is its name? calcium(I) selenide calcium(II) selenium
45.	The substance, CoCl <sub>2</sub> , is useful as a humiding blue to pink as it gains water from moist air A) cobalt dichloride B) cobalt(II) chloride C) cobalt chloride Ans: B Difficulty: M		
46.	In the ionic compound with the general form A) +1. B) +3. C) -1. D) -2. E) -3 Ans: D Difficulty: M		M <sub>2</sub> X <sub>3</sub> , the likely charge on X is
47.	Which one of the following combinations of A) $O_2^-$ oxide B) $Al^{3+}$ aluminum C) $NO_3^-$ nitrate Ans: A Difficulty: H	f name D) E)	es and formulas of ions is incorrect?  PO <sub>4</sub> <sup>3-</sup> phosphate  CrO <sub>4</sub> <sup>2-</sup> chromate
48.	Which one of the following is a polyatomic A) nitrate B) chromate C) permanganate D) hydronium E) potassium Ans: D Difficulty: M	cation	n?

49.	Whic	h one of th	e following combinations of	name	s and form	ulas of ions is incorrect?
		$O^{2-}$	oxide			hydrogen carbonate
		$Cd^{2+}$		E)	$NO_2^-$	
	C)			,	_	
		E Diffic				
50.	Whic	h one of th	e following combinations of	name	s and form	ulas of ions is incorrect?
		$Ba^{2+}$	barium			perchlorate
	,	$S^{2-}$		E)		bicarbonate
	,	CN <sup>-</sup>		_/		
		B Diffic	•			
51.	Whic	h one of th	e following combinations of	name	s and form	ulas of ions is incorrect?
	A)	$NH_4^+$	ammonium	D)	$S_2O_3^{2-}$	thiosulfate
	B)	$S^{2-}$	sulfide	E)	$\text{ClO}_3^-$	perchlorate
	C)	$CN^{-}$	cyanide	,		•
		E Diffic	•			
			Ž			
52.	A red	glaze on p	orcelain can be produced by	using	g MnSO <sub>4</sub> . V	What is its name?
	A)	manganes		D)	manganes	
	B)	manganes	e(II) sulfate	E)	manganes	e(I) sulfate
	<b>C</b> )	manganes	e(IV) sulfate		C	
		B Diffic				
			-			
53.		-	$(NH_4)_2S$ , can be used in ana is its name?	lysis f	or trace am	nounts of metals present in
	A)	ammoniur		D)	ammonia(	I) sulfite
	,		um sulfide	E)	,	n(I) sulfide
	,	ammoniur		L)	ammomu	II(1) suffice
		A Diffic				
	Alls.	A DIIII	cuity. Wi			
54	The c	uhetance k	XClO <sub>3</sub> , is a strong oxidizer u	sed in	evnlosives	s fireworks and matches
54.		is its name		isca III	. CAPIOSI VCS	s, meworks, and materies.
	A)	potassium		D)	notassium	(I) chlorate
	B)	potassium		E)	potassium	` '
	C)	-	(I) chlorite	L)	potassiam	Cinorate
	Ans:	•	culty: M			
	Alls.	L Dillic	curty. W			
55	The	ompound	NaH <sub>2</sub> PO <sub>4</sub> , is present in man	v haki	ng nowder	s What is its name?
55.	A)	sodium bi		D)	<b>U</b> 1	drophosphate
	B)		drogen phosphate	E)	•	hydride phosphate
	C)	•	hydrogen phosphate	L)	sourum un	nyunuc phosphate
	,	C Diffic				
	AllS.	C DIIIIC	cuity. IVI			

56.	is its form A) ZnA B) ZnO C) Zn(	nula? Ac <sub>2</sub>	in ma D) E)	nufacturing glazes for porcelain. What Zn <sub>2</sub> CH <sub>3</sub> COO ZnCH <sub>3</sub> COCH <sub>3</sub>
57.	A) $Ag_2C$	oride is used in photographic emulas B) Ag <sub>2</sub> Cl C) AgCl <sub>3</sub> D) A Difficulty: E		
58.	A) BaSO	ulfate is used in manufacturing pho 4 B) Ba(SO <sub>4</sub> ) <sub>2</sub> C) Ba <sub>2</sub> SO <sub>4</sub> D Difficulty: M		
59.	formula? A) NaO	eroxide is an oxidizer used to blead B) NaO <sub>2</sub> C) Na <sub>2</sub> O <sub>2</sub> D) Na <sub>2</sub> O Difficulty: M		mal and vegetable fibers. What is its  NaH <sub>2</sub> O <sub>2</sub>
60.	A) MgS	ne formula for magnesium sulfide?  B) MgS <sub>2</sub> C) Mg <sub>2</sub> S D) Mg <sub>2</sub> S  Difficulty: E		MgSO <sub>4</sub>
61.	formula? A) FeO	de is used as a pigment in metal por B) Fe <sub>2</sub> O C) FeO <sub>3</sub> D) Fe <sub>2</sub> O <sub>5</sub> Difficulty: E		
62.	A) PbO	ne formula for lead (II) oxide? B) PbO <sub>2</sub> C) Pb <sub>2</sub> O D) PbO <sub>4</sub> Difficulty: E	E) F	$Pb_2O_3$
63.	materials. A) KMn0	n permanganate is a strong oxidize What is its formula? O <sub>3</sub> B) KMnO <sub>4</sub> C) K <sub>2</sub> MnO <sub>4</sub> l Difficulty: M		reacts explosively with easily oxidized $MnO_4)_2$ E) $K_2Mn_2O_7$
64.	A) CaOH	nydroxide is used in mortar, plaster I B) CaOH <sub>2</sub> C) Ca <sub>2</sub> OH D) ODIFFICULTY: E		
65.	A) LiNO	ne formula for lithium nitrite?  2 B) Li <sub>2</sub> NO <sub>2</sub> C) LiNO <sub>3</sub> D) li Difficulty: E	Li <sub>2</sub> NO	E) LiNO <sub>4</sub>

66.	Iron (III) chloride hexahydrate is used as a c What is its formula? A) Fe(Cl·6H <sub>2</sub> O) <sub>3</sub> B) Fe <sub>3</sub> Cl·6H <sub>2</sub> O C) FeCl <sub>3</sub> (H <sub>2</sub> O) <sub>6</sub> Ans: E Difficulty: M	coagul D) E)	ant for sewage and industrial wastes. Fe <sub>3</sub> Cl(H <sub>2</sub> O) <sub>6</sub> FeCl <sub>3</sub> ·6H <sub>2</sub> O
67.	Which one of the following formulas of ion correct?  A) NH <sub>4</sub> Cl B) Ba(OH) <sub>2</sub> C) Na <sub>2</sub> SO <sub>4</sub> D Ans: D Difficulty: M		•
68.	Which one of the following formulas of ion correct?  A) CaCl <sub>2</sub> B) NaSO <sub>4</sub> C) MgCO <sub>3</sub> D) I Ans: B Difficulty: M		•
69.	What is the name of the acid formed when I A) sulfuric acid B) sulfurous acid C) hydrosulfuric acid Ans: C Difficulty: H	H <sub>2</sub> S ga D) E)	hydrosulfurous acid
70.	What is the name of the acid formed when I A) bromic acid B) bromous acid C) hydrobromic acid Ans: C Difficulty: M	HBr ga D) E)	
71.	What is the name of the acid formed when B A) hydrochloric acid B) perchloric acid C) chloric acid Ans: B Difficulty: M	HClO <sub>4</sub> D) E)	•
72.	What is the name of the acid formed when B A) cyanic acid B) hydrocyanic acid C) cyanous acid Ans: B Difficulty: M	HCN g D) E)	gas is dissolved in water? hydrocyanous acid hydrogen cyanide

73.	The name for HF( <i>g</i> ) is  A) hydrofluoric acid. B) hydrogen(I) fluoride. C) hydrogen fluoride. Ans: C Difficulty: M	D) E)	hydrogen fluorine. fluoric acid.
74.	Which one of the following combinations A) H <sub>3</sub> PO <sub>4</sub> phosphoric acid B) HNO <sub>3</sub> nitric acid C) NaHCO <sub>3</sub> sodium carbonate Ans: C Difficulty: M	of nam D) E)	
75.	What is the name of PCl <sub>3</sub> ?  A) phosphorus chloride  B) phosphoric chloride  C) phosphorus trichlorate  Ans: E Difficulty: E	D) E)	trichlorophosphide phosphorus trichloride
76.	The compound, P <sub>4</sub> S <sub>10</sub> , is used in the manu A) phosphorus sulfide B) phosphoric sulfide C) phosphorus decasulfide Ans: D Difficulty: M	facture D) E)	tetraphosphorus decasulfide
77.	What is the name of BBr <sub>3</sub> ?  A) boron bromide  B) boric bromide  C) boron tribromide  Ans: C Difficulty: M	D) E)	tribromoboride bromine triboride
78.	What is the name of IF <sub>7</sub> ?  A) iodine fluoride  B) iodic fluoride  C) iodine heptafluoride  Ans: C Difficulty: M	D) E)	heptafluoroiodide heptafluorine iodide
79.	What is the name of P <sub>4</sub> Se <sub>3</sub> ?  A) phosphorus selenide  B) phosphorus triselenide  C) tetraphosphorus selenide  Ans: E Difficulty: M	D) E)	phosphoric selenide tetraphosphorus triselenide

80.	Diiodine pentaoxide is used as an oxidizing agent that converts carbon monoxide to carbon dioxide. What is its chemical formula?  A) I <sub>2</sub> O <sub>5</sub> B) IO <sub>5</sub> C) 2IO <sub>5</sub> D) I <sub>5</sub> O <sub>2</sub> E) (IO <sub>5</sub> ) <sub>2</sub> Ans: A Difficulty: E			
81.	Tetrasulfur dinitride decomposes explosively when heated. What is its formula? A) $S_2N_4$ B) $S_4N_2$ C) $4SN_2$ D) $S_4N$ E) $S_2N$ Ans: B Difficulty: E			
82.	c. Chlorine dioxide is a strong oxidizer that is used for bleaching flour and textiles and for purification of water. What is its formula?  A) (ClO) <sub>2</sub> B) Cl <sub>2</sub> O C) Cl <sub>2</sub> O <sub>2</sub> D) Cl <sub>2</sub> O <sub>4</sub> E) ClO <sub>2</sub> Ans: E Difficulty: E			
83.	The formula of heptane is A) $C_6H_{12}$ . B) $C_6H_{14}$ . C) $C_7H_{14}$ . D) C Ans: D Difficulty: M	C7H16.	E) C <sub>8</sub> H <sub>16</sub> .	
84.	Ammonium sulfate, (NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> , is a fertilize Calculate its molecular mass.  A) 63.07 amu  B) 114.10 amu  C) 118.13 amu  Ans: E Difficulty: E	D)	ely used as a source of nitrogen.  128.11 amu 132.13 amu	
85.	Sodium chromate is used to protect iron fromolecular mass.  A) 261.97 amu  B) 238.98 amu  C) 161.97 amu  Ans: C Difficulty: M	D)	rosion and rusting. Determine its  138.98 amu 74.99 amu	
86.	Iodine pentafluoride reacts slowly with glass molecular mass.  A) 653.52 amu B) 259.89 amu C) 221.90 amu Ans: C Difficulty: E	D) E)	202.90 amu	
87.	Determine the molecular mass of iron (III) catalyst in organic reactions.  A) 403.65 amu  B) 355.54 amu  C) 317.61 amu  Ans: A Difficulty: M	bromic D) E)	le hexahydrate, a substance used as a 313.57 amu 295.56 amu	

- 88. Name the three important "laws" that were accounted for by Dalton's atomic theory. Ans: laws of conservation of mass; definite composition; multiple proportions Difficulty: M
- 89. Dalton's atomic theory has required some modifications in the light of subsequent discoveries. For any three 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.

- Ans: 1. Matter consists of atoms which are indivisible, cannot be created or destroyed. But, atoms are divisible, as the existence of subatomic particles shows.
  - 2. Atoms of one element cannot be converted into atoms of another element. They can be converted 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.

Difficulty: M

90. Fill in the blank spaces and write out all the symbols in the left hand column in full, in the form  $_{Z}^{A}X$  (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

Ans:	<u>Symbol</u>	# protons	# neutrons	# electrons
	<sup>35</sup> Cl	17	18	17
	<sup>197</sup> <sub>79</sub> Au	79	118	79
	$_{20}^{20}$ Ca	20	20	20

Difficulty: M

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

Charges (C):  $-3.184 \times 10^{-19}$ ;  $-4.776 \times 10^{-19}$ ;  $-7.960 \times 10^{-19}$ 

Ans:  $-1.59 \times 10^{-19}$  C

Difficulty: M

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

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

Difficulty: M

93.	For each of the following elements, indicate whether it is a metal, a non-metal, or a metalloid:
	a. S
	b. Ge
	c. g
	d. H
	e. I f. Si
	Ans: a. nonmetal
	b. metalloid
	c. metal
	d. nonmetal
	e. nonmetal
	f. metalloid
	Difficulty: E
94.	Give the common name of the group in the periodic table to which each of the following
	elements belongs:
	a. Rb
	b. Br
	c. Ba
	d. Ar
	Ans: a. alkali metals
	b. halogens
	c. alkaline earth metals
	d. noble gases
	Difficulty: E
05	a. Give the names of the following ions:
75.	(i) NH <sub>4</sub> <sup>+</sup>
	(ii) $SO_3^{2-}$
	b. Write down the formulas of the following ions:
	(i) aluminum
	(ii) carbonate
	Ans: a. (i) ammonium
	(ii) sulfite
	b. (i) Al <sup>3+</sup>
	(ii) CO <sub>3</sub> <sup>2-</sup>
	Difficulty: M

```
96. a. Give the names of the following ions:
      (i) O_2^{2-}
      (ii) SO<sub>4</sub><sup>2-</sup>
      b. Write down the formulas of the following ions:
      (i) ammonium
      (ii) nitrate
      Ans: a. (i) peroxide
              (ii) sulfate
             b. (i) NH<sub>4</sub><sup>+</sup>
              (ii) NO<sub>3</sub><sup>-</sup>
      Difficulty: M
 97. 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
      Ans: a. Zn<sup>2+</sup>
             b.\ NO_2^-
             c. H<sub>2</sub>CO<sub>3</sub>
             d. CN-
      Difficulty: M
 98. Calculate the molecular masses of the following:
      a. Cl<sub>2</sub>
      b. H<sub>2</sub>O<sub>2</sub>
      c. (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>
      d. Ba(NO_3)_2
      Ans: a. 70.90 amu
             b. 34.02 amu
             c. 132.2 amu
             d. 261.3 amu
      Difficulty: E
 99. In nature, some elements exist as molecules, while others do not.
      Ans: True
                      Difficulty: E
100. Modern studies have shown that the Law of Multiple Proportions is not valid.
      Ans: False
                      Difficulty: M
101. Atoms of one element cannot be converted to another element by any known method.
                      Difficulty: E
      Ans: False
```

## Chapter 2: The Components of Matter

102. The mass of a neutron is equal to the mass of a proton plus the mass of an electron.

Ans: False Difficulty: E

103. All neutral atoms of tin have 50 protons and 50 electrons.

Ans: True Difficulty: E

104. Copper (Cu) is a transition metal.

Ans: True Difficulty: E

105. Lead (Pb) is a main-group element.

Ans: True Difficulty: E

106. Ionic compounds may carry a net positive or negative charge.

Ans: False Difficulty: E

107. When an alkali metal combines with a non-metal, a covalent bond is normally formed.

Ans: False Difficulty: E

108. The molecular formula of a compound provides more information than its structural formula.

101111u1a.

Ans: False Difficulty: E

109. The formula  $C_9H_{20}$  is an empirical formula.

Ans: True Difficulty: E