B

King Abdulaziz University

Faculty of Science - Chemistry Department

Thursday 19 /05 /1435 H

Chem-110, First Exam

Time: 90 minutes

Name:	Number:	Section:

•Useful information:

Speed of light,	$C = 3.0 \times 10^8$ m/s
Planck's const.,	$h = 6.626 \times 10^{-34}$ J.s
Avogadro's No.,	$N_{av} = 6.022 \times 10^{23}$ mol^{-1}
Rydberg const. for H atom	$R_H = 2.18 \times 10^{-18}$ J
Mass of the electron,	$m_e = 9.11 \times 10^{-31}$ kg
Gas constant,	$R = 0.082$ L atm K^{-1} mol^{-1}

PERIODIC TABLE

Key — Relative atomic mass to nearest whole number

12 → C → Symbol

Carbon

6 → Atomic number

1 H Hydrogen 1																		4 He Helium 2
7 Li Lithium 3	9 Be Beryllium 4											11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Flourine 9	20 Ne Neon 10	
23 Na Sodium 11	24 Mg Magnesium 12											27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulfur 16	35.5 Cl Chlorine 17	40 Ar Argon 18	
39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	63.5 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	72.5 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36	
85.5 Rb Rubidium 37	86 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	(96) Tc Technetium 43	101 Ru Ruthenium 44	103 Rh Rhodium 45	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54	
133 Cs Cesium 55	137 Ba Barium 56	139 La Lanthanum 57	178.5 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	186 Re Rhenium 75	190 Os Osmium 76	192 Ir Iridium 77	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	(210) Po Polonium 84	(210) At Astatine 85	(222) Rn Radon 86	
(223) Fr Francium 87	(226) Ra Radium 88	(227) Ac Actinium 89	(261) Rf Rutherfordium 104	(262) Db Dubnium 105	(266) Sg Seaborgium 106	(264) Bh Bohrium 107	(265) Hs Hassium 108	(268) Mt Meitnerium 109										

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	145 Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162.5 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71
232 Th Thorium 90	231 Pa Protactinium 91	238 U Uranium 92	237 Np Neptunium 93	244 Pu Plutonium 94	(243) Am Americium 95	(247) Cm Curium 96	(247) Bk Berkelium 97	(251) Cf Californium 98	(252) Es Einsteinium 99	(257) Fm Fermium 100	(258) Md Mendelevium 101	(259) No Nobelium 102	(262) Lr Lawrencium 103

B

Choose the correct answer

B-1 Which of the following is *not* a mixture?
a) Salt solution   b) Nitrogen   c) Fruit salad   d) Milk

B-2 What is the SI unit for mass?
a) Milligram   b) Pound   c) Gram   d) Kilogram

B-3 How many centimeters are there in 1.5 decimeters?
a) 150 cm   b) 1.5 cm   c) 0.15 cm   d) 15 cm

B-4 What is the symbol of the element that has 26 neutrons and a mass number of 48?
a) Fe   b) Ti   c) Cd   d) W

B-5 How many electrons are in $^{27}_{13}Al^{3+}$?
a) 13   b) 14   c) 10   d) 40

B-6 Which of the following elements is a metal?
a) P   b) Zn   c) He   d) O

B-7 Which two of the following pair of atoms are isotopes?
a) $^{38}_{19}K$ and $^{39}_{19}K$ b) $^{40}_{20}Ca$ and $^{40}_{21}Sc$ c) $^{73}_{32}Ge$ and $^{32}_{16}S$ d) $^{39}_{20}Ca$ and $^{39}_{19}K$

B-8 Which three elements have similar chemical properties?
a) B, O, C   b) Na, K, Cs   c) Ca, K, Ti   d) Ni, Ag, Hg

B-9 Which of the following could be an empirical formula?
a) C_2H_8 b) C_2H_2 c) C_3H_8 d) C_2H_6

B-10 An example of monatomic ion is
a) S   b) SO_2^{-2} c) SO_3^{-2} d) S^{-2}

B-11 How many moles are in 6 g of carbon?
a) 0.5 mole   b) 4 mole   c) 0.25 mole   d) 2 mole

B-12 How many atoms are there in 5.4 g of helium?
a) 6.023×10^{23} atoms   b) 4.46×10^{23} atoms   c) 12.41×10^{23} atoms   d) 8.13×10^{23} atoms

B-13 Calculate the average atomic mass of nickel which consists of three stable isotopes: nickel-58 (68.08%), nickel-60 (27.26%) and nickel-62 (4.66%) which have atomic masses of 57.94 amu, 60.93 amu and 61.93 amu respectively.

a) 58.94 amu   b) 60.47 amu   c) 62.07 amu   d) 57.68 amu

B-14 What is the percent composition of phosphorus in $Mg_3(PO_4)_2$?

a) 20 %   b) 13.4%   c) 23.7%   d) 32.1%

B-15 A compound is composed of 40.68% carbon, 5.08% hydrogen and 54.24% oxygen by mass. Determine the empirical formula of this compound?

a) CHO   b) $C_2H_3O_2$ c) $C_3H_4O_3$ d) C_3HO_3
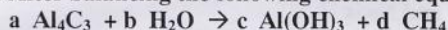
B-16 The molar mass of the compound above found to be 118 g/mole. What is its molecular formula?

a) $C_4H_6O_4$ b) $C_3H_7O_3$ c) $C_3H_5O_5$ d) $C_3H_{18}O_4$

B-17 The process in which the concentration of solution is changed by adding more solvent is called:

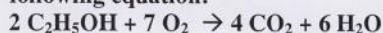a) dilution   b) mole   c) Chemical symbols   d) Chemical reaction

B-18 After balancing the following chemical equation:
a Al_4C_3 + b H_2O → c $Al(OH)_3$ + d CH_4
The sum of a, b, c and d (a+b+c+d) is:
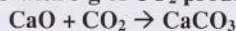
a) 19   b) 20   c) 11   d) 10

B-19 How many grams of water is produced by burning 46 g of C_2H_5OH according to the following equation:
2 C_2H_5OH + 7 O_2 → 4 CO_2 + 6 H_2O

a) 3 9 g   b) 20 g   c) 18 g   d) 54 g

B-20 The reaction of 10 g CaO with 5 g of CO_2 produced $CaCO_3$ according to the following equation: $CaO + CO_2$ → $CaCO_3$
The limiting reagent is:

a) CaO   b) CO_2 c) CaO and CO_2 d) $CaCO_3$

B-21 What is the excess reagent in the previous question (question 20)?

a) CaO   b) CO_2 c) CaO and CO_2 d) $CaCO_3$

B-22 What is the percent yield of $CaCO_3$ in question (20) if 10 g of $CaCO_3$ are actually obtained?

a) 100 %   b) 50 %   c) 88 %   d) 114%

B-23 What mass of NaCl is needed to prepare 1 L of 0.4 M sodium ion solution?
    a) 9.2 g   b) 20.5 g   c) 67.5 g   d) 23.4 g

B-24 What volume of 0.5M NaOH solution would you need to prepare 200 mL of 0.1 M NaOH solution?
    a) 0.4mL   b) 400 mL   c) 40 mL   d) 4 mL

B-25 1 L of a 0.5 M NaCl solution is mixed with 1 L of 0.1 M NaCl. What is the concentration of NaCl in the final solution?
    a) 0.4 M   b) 0.3 M   c) 0.1 M   d) 0.6 M

B-26 Calculate the density of gold metal with a mass of 50.5g and a volume of 2.62 cm^3?
    a) 132.3 g/mL   b) 193 g/mL   c) 19.3 g/mL   d) 0.019 g/mL

B-27 What is the chemical name of the formula SO_3?
    a) Sulfur dioxide   b) Sulfur trioxide   c) Sulfur oxide   d) Sulfate

B-28 What is the correct formula of sodium nitrite?
    a) $NaNO_3$ b) $NaNO_2$ c) NaN ,   d) $NaNO_4$

B-29 The correct formula of a compound consists of O and Na is
    a) Na_2O b) NaO_2 c) NaO   d) NaO_3

B-30 Which of the following is most likely to be poor conductors of heat and electricity?
    a) Li   b) Ca   c) Ni   d) S