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King Abdulaziz University

Faculty of Science - Chemistry Department

Monday 29 /11 /1433 H

Chem-110, First Exam

Time: 90 minutes

Name:	Number:	Section:

•Useful information:

Speed of light,	$C = 3.0\times10^{8}$ m/s
Planck's const.,	$h = 6.626\times10^{-34}$ J.s
Avogadro's No.,	$N_{av} = 6.022\times10^{23}$ mol^{-1}
Rydberg const. for H atom	$R_H = 2.18\times10^{-18}$ 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: 12 (Relative atomic mass to nearest whole number) 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 Aluminum 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

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Choose the correct answer

A-1 Prefixes giga and deci represent, respectively:

a) 10^{-9} and 10^{-1}. **b)** 10^{6} and 10^{-3}. **c)** 10^{3} and 10^{-3} **d)** 10^{9} and 10^{-1}.

A-2 If 586 g of bromine occupies 188 mL, what is the density of bromine in g/mL?

a) 3.12g/ml **b)** 0.321 g/ml **c)** 3.63g/ml **d)** 3.08g/ml

10^{9} 10^{6}

A-3 3.5 nanometer contains how many micrometers?

a) $3.5 \times 10^{+3}$ **b)** 3.5×10^{-3} **c)** $3.5 \times 10^{+8}$ **d)** 3.5×10^{-8}

A-4 The element in group 2A and period 3 is:

a) Ga **b)** Be **c)** Al **d)** Mg

A-5 Predict the formula of a compound formed from Sr and Cl?

a) Sr_2Cl **b)** Sr_2Cl_2 **c)** $SrCl_2$ **d)** SrCl

A-6 Which compound has the same empirical formula as $C_6H_{12}O_6$?

a) $C_{12}H_{20}O_4$ **b)** $C_2H_8O_4$ **c)** $C_6H_3O_6$ **d)** $C_{12}H_{24}O_{12}$

A-7 An atom is

a) Smallest unit of matter that maintains its chemical identity.

b) The smallest unit of a compound.

c) Always made of carbon

d) Smaller than electron

A-8 The right answer is:

a) Compounds are: N_2, NH_3 , H_2O and CH_4

b) Elements are: N_2, H_2O, H_2 and F_2

c) Molecules are: N_2, H_2, F_2 and Cl_2 and Fe_2SO_4

d) Compounds are: NH_3, O_2, H_2O and CH_4

A-9 Rubidium (Rb) and cesium (Cs) are members of which of the following categories?

a) Halogens b) Alkali metals c) Alkaline earth metals d) Noble gases

A-10 What is the number of protons, electrons and neutrons in the atom of $^{32}_{16}S^{-2}$?

a) 32 protons, 34 electrons, 16 neutrons

b) 16 protons, 16 electrons, 16 neutrons

c) 16 protons, 18 electrons, 16 neutrons

d) 18 protons, 16 electrons, 32 neutrons

A-11 The correct systematic name for Cr_2O_3 is

a) Chromium (III) oxide.
b) Dichromium trioxide.
c) Chromium trioxide
d) Chromium oxide.

A-12 The correct formula for calcium sulfate is

a) $CaHSO_4$
b) $CaSO_4$
c) CaS
d) $Ca(HSO_4)_2$

A-13 Gallium consists of 60.108% ^{69}Ga with a mass of 68.9256 amu, and 39.892% ^{71}Ga with a mass of 70.9247 amu, the average atomic mass of gallium is:

a) 70.93 amu
b) 71.62 amu
c) 68.93 amu
d) 69.723 amu

A-14 Which pair of Atoms would be most likely to form an ionic compound?

a) C and N
b) K and Ca
c) P and Ar
d) Ba and S

A-15 Two isotopes of the same element differ only in their

a) Number of neutron
b) Atomic number
c) Number of protons
d) Number of electron

A-16 What is the mass in grams of one atom of iron (Fe)?

a) 6.02×10^{23} g
b) 1.66×10^{-24} g
c) 9.3×10^{-23} g
d) 55.85 g

A-17 A 4.691 g sample of $MgCl_2$ is dissolved in enough water to give 750 mL of solution. What is the molarity of this solution?

a) 3.70×10^{-2} M
b) 1.05×10^{-2} M
c) 6.58×10^{-2} M
d) 4.93×10^{-2} M

A-18 Calculate the percent composition by mass of C in picric acid ($C_6H_3N_3O_7$)?

a) 1.3 % b) 18.3 % c) 31.4 % d) 48.9 %

A-19 How many molecules of ethane (C_2H_6) are present in 0.30 g of C_2H_6?

a) 1.20×10^{22} b) 1.00×10^{22} c) 8.03×10^{21} d) 6.02×10^{21}

A-20 The empirical formula of an organic compound with 85.7% C and 14.3% H is

a) CH b) CH_2 c) C_2H d) CH_4

A-21 After balancing the following equation, the coefficients are:

$$a\ C_3H_8 + b\ O_2 \rightarrow c\ CO_2 + d\ H_2O$$

a) a=1, b=5, c=2, d=4 b) a=2, b=5, c=3, d=4

c) a =1, b=3, c=3, d=4 d) a=1, b=5, c=3, d=4

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A-22 Calculate the number of O atoms in 2.50 g of sucrose ($C_{12}H_{22}O_{11}$)

a) 3.87×10^{22} b) 4.84×10^{22} c) 5.81×10^{22} d) 6.78×10^{22}

A-23 An empirical formula of an organic compound is $C_3H_4O_2$, if the molecular weight of the compound is (360 g/mol), the molecular formula of the compound will be:

a) $C_6H_8O_4$ b) $C_{12}H_{16}O_8$ c) $C_9H_{12}O_6$ d) $C_{15}H_{20}O_{10}$

A-24 How many moles of $FeSO_4$ are present in a 500 mg of this salt?

a) 1.64×10^{-3} b) 2.30×10^{-3} c) 3.29×10^{-3} d) 4.93×10^{-3}

A-25 How many milliliter of water must be added to 200 mL of 0.15M Na_2CO_3 to prepare 0.05 M Na_2CO_3?

a) 200 mL b) 300 mL c) 400 mL d) 450 mL

A-26 What is the theoretical yield of chromium (Cr) that can be produced by the reaction of 40.0 of Cr_2O_3 with 8.00 g of aluminum (Al) according to the chemical reaction?

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$$2\ Al + Cr_2O_3 \rightarrow Al_2O_3 + 2\ Cr$$

8g 40g 0526

a) 15.4 g b) 17.33 g c) 19.4 g d) 13.48 g

0.296 0.263 0.296

A-27 If the actual yield for the experiment in question (26) produced 13.0g, what is the percentage yield?

a) 84.4% b) 75.0% c) 67% d) 96.4%

A-28 The mass of Na that will react with excess of water to produce 16.0 g NaOH is

$$2Na(s) + 2H_2O(l) \rightarrow H_2(g) + 2NaOH(aq)$$

a) 5.75 g b) 6.90 g c) 8.05 g d) 9.20 g

A-29 A 100.0 mL of 0.25 M HCl is diluted with water to a total volume of 200.0 mL. What is the final concentration in the resulting solution?

a) 0.125M b) 0.083 M c) 0.05 M d) 0.0625 M

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A-30 What is the mass of carbon in 10 g carbon dioxide (CO_2)?

a) 4.1 g b) 2.73 g c) 6.82 g d) 5.45 g