A

King Abdulaziz University

Faculty of Science - Chemistry Department

Thursday 23 /01 /1435 H

Chem-110, Second 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,	$m_e = 9.11\times10^{-31}$ kg
Gas constant,	$R = 0.082$ L atm K^{-1} mol^{-1}

PERIODIC TABLE

Key: 12 / C / Carbon / 6 → Relative atomic mass to nearest whole number; → Symbol; → 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

Choose the correct answer

A-1 1.3 atm is equivalent to:

a- 988 torr **b- 98.8 torr** **c- 87.1 torr** **d- 77.940 torr**

A-2 What is the volume occupied by 2 mole of HCl gas at STP?

a- 22.4 L **b- 44.8 mL** **c- 44.8 L** **d- 4.48m L**

A-3 A sample of oxygen gas at 1 atm and 27^0C was occupying a volume of 2 L. The sample was cooled down to -73^0C at the same pressure. What is the final volume?

a- 1.33 L **b- 5.4 L** **c- 5.1 L** **d- 3 L**

A-4 What is the density of nitric oxide (NO) in g/L at 780 mmHg and 60^0C?

a- 12.89 g/L **b- 11.30 g/L** **c- 1.13 g/L** **d- 10.89 g/L**

A-5 Two moles of a gas with 0.5 g/L at STP has a mass of:

a- 44.7 g **b- 22.39 g** **c- 5.04 g** **d- 0.504 g**

A-6 Calculate the volume of water vapor produced by burning 10 g of ethane (C_2H_6) at standard temperature and pressure?

$$2\ C_2H_6\ (g) + 7\ O_2\ (g) \rightarrow 6\ H_2O\ (g) + 4\ CO_2\ (g)$$

a- 29 L **b- 1 L** **c- 22.4 L** **d- 34 L**

A-7 Element that forms diatomic gas is:

a- Pd **b- Al** **c- N** **d- Xe**

A-8 A mixture of gasses contains 4.46 moles of Ne, 0.74 mole of Ar, and 2.15 moles of Xe. Calculate the partial pressures of Ar if the total pressure is 2.00 atm at a certain temperature?

a- 0.2 atm b- 0.12 atm c- 0.8 atm d- 0.59 atm

A-9 Which of the following sets of quantum numbers refers to an electron in a 4d orbital?

a- n = 4, l = 0, ml = 0, ms = + 1/2 b- n = 2, l = 1, ml = 0, ms = + 1/2

c- n = 4, l = 2, ml = 1, ms = + 1/2 d- n = 4, l = 3, ml = 3, ms = + 1/2

A-10 The electronic configuration of Sn^{2+} is:

a- [Kr] $4d^{10}\ 5p^2$ b- [Kr] $5s^2\ 4d^8$ c- [Kr] $5s^2\ 4d^{10}\ 5p^2$ d- [Kr] $5s^2\ 4d^{10}$

A-11 The O^{2-} ion, is isoelectronic with

a- S^{2-} b- Cl^- c- Na^+ d- K^+

A-12 What is the total capacity of electrons in an orbital with n = 2, l = 1?

a- 2 b- 6 c- 10 d- 14

A-13 What is the energy of radiation that has a frequency of $6.912 \times 10^{14}\ s^{-1}$?

a- 1.447×10^{-15} J b- 4.337×10^{2} J

c- 4.58×10^{-19} J d- 3.53×10^{-19} J

A-14 Complete this sentence: Atoms emit visible and ultraviolet light

a- as electrons jump from lower energy levels to higher levels.

b- as the atoms condense from a gas to a liquid.

c- as electrons jump from higher energy levels to lower levels.

d- as they are heated and the solid melts to form a liquid.

A-15 The second line of the Balmer series occurs at a wavelength of 486.1 nm. What is the energy difference between the initial (n=4) and final levels in this emission process?

a- 2.44×10^{18} J b-4.09×10^{-19} J c-4.09×10^{-22} J d-4.09×10^{-28} J

A-16 Calculate the wavelength associated with a $^{20}Ne^{+}$ ion moving at a velocity of 2.0×10^{5} m/s. The mass of $^{20}Ne^{+}$ ion is 3.32×10^{-23} g.

a- 1.0×10^{-13} m b- 1.0×10^{-16} m c-1.0×10^{-18} m d- 9.7×10^{12} m

A-17 Which one of the following sets of quantum numbers is not possible?

	n	l	m_l	m_s
Row 1	4	3	−2	+1/2
Row 2	3	0	1	−1/2
Row 3	3	0	0	+1/2
Row 4	2	1	1	−1/2
Row 5	2	0	0	+1/2

a- Row 1 b- Row 2 c- Row 3 d- Row 4 and Row 5

A-18 What is the total number of orbitals associated with the principal quantum number n = 3?

a- 3 b- 9 c- 10 d- 14

A-19 The orbital diagram for a ground-state nitrogen atom is

	1s	2s	2p		
Row 1	↑↓	↑↓	↑	↑	↑
Row 2	↑↓	↑↓	↑↓	↑	
Row 3	↑↓	↑	↑	↑	↑
Row 4	↑↓	↑↓	↑↓	↑	↑

a- Row 1. **b- Row 2.** **c-Row 3.** **d-Row 4.**

A-20 Which of these ground-state atoms is diamagnetic?

a- Ca **b-As** **c-Cu** **d-Fe**

A-21 Which of the following groups of elements is arranged correctly in order of increasing first ionization energy?

a-Cl < S < Na < K **b-Na < S < Cl < K**

c-K < Na < S < Cl **d-Na < S < K < Cl**

A-22 Which of these atoms has the smallest radius?

a- Al **b-P** **c-As** **d-Sb**

A-23 In what group of the periodic table is the element with the electron configuration: $[Ar]4s^2 3d^{10} 4p^3$?

a- 2A **b- 3A** **c-5A** **d-7A**

A-24 Lewis described the ---------- bond as a complete transfer of electrons from one atom to another.

a- Covalent **b- polar covalent** **c- coordinate covalent** **d-ionic**

A-25 The non polar covalent bond of the following is:

a- C—Li **b- C—C** **c- C—Rb** **d- C—Cu**

A-26 Which of the following atoms is more likely to from electron-deficient compounds (does not complete the octet)?

a- B **b- C** **c- N** **d- Si**

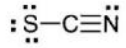
A-27 The only compound that will conduct electricity as a liquid is:

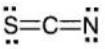
a- LiCl **b- CO_2** **c- SO_2** **d- PCl_3**

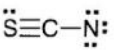
A-28 How many total valence electrons are available in SCN^-:

a- 20 **b- 16** **c- 15** **d- 14**

A-29 The preferred Lewis structure of SCN^- based on the formal charge is:

a- 

b- 

c- 

d- all the three has the same stability

A-30 The formal charge on the carbon atom in SCN^- is:

a- (0) **b- (-2)** **c- (-1)** **d- (+1)**