A

King Abdulaziz University

Faculty of Science - Chemistry Department

Thursday 24 /06 /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 Fluorine 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

A

Choose the correct answer

A-1 What process will be observed in a hydrogen atom when its electron drops from the n = 5 state to the n = 3 state.

a) A photon with energy 1.55×10^{-19} J will be absorbed.
b) A photon with energy 1.55×10^{-19} J will be emitted.
c) A photon with energy 6.54×10^{-19} J will be absorbed.
d) A photon with energy 6.54×10^{-19} J will be emitted

A-2 Calculate De Broglie wavelength of a proton; having a velocity equal to 300 m/s and a mass of 1.67×10^{-24} g?

a) 1.32×10^{-12} m b) 1.67×10^{-30} m c) 1.67×10^{-27} m d) 1.32×10^{-9} m

A-3 What set of quantum numbers is most likely to be associated with the last electron in sodium element?

a) n=3, l=0, m_l=0, m_s=½ b) n=3, l=0, m_l=0, m_s=1 c) n=3, l=0, m_l=1, m_s=½ d) n=3, l=1, m_l=0, m_s=½

A-4 Which of the following elements is a representative element?

a) Hg b) Ti c) H d) U

A-5 Which element exists as a diatomic gas?

a) O b) Na c) Ar d) Si

A-6 What species is isoelectronic with Mg^{2+}?

a) Ne b) Na c) Cl^- d) C

A-7 The metal with the electronic configuration $[Ar]3d^3$ is

a) Sc b) Cr^{3+} c) Ti^+ d) K^+

A-8 The correct order of radius of the following is

a) $O^{2-} < F^- < Na^+ < Mg^{2+}$ b) $O^{2-} > F^- > Na^+ > Mg^{2+}$
c) $O^{2-} < F^- < Mg^{2+} < Na^+$ d) $F^- < O^{2-} < Na^+ < Mg^{2+}$

A-9 Electron affinity is the energy liberated when an atom forms a

a) Negative ion b) Positive ion c) Molecule d) Covalent bond

A-10 Which one of the following is a *gas* under normal atmospheric conditions?

a) Cl_2 b) B c) Na d) S

A-11 If the volume of N_2 gas is 10 L at 800 torr, what will be its volume at 500 torr if the temperature is kept constant?

a) 5 L b) 8 L c) 20 L d) 16 L

A-12 A 0.401 g of gaseous compound occupies 256 mL at 373 K and 750 torr. The molar mass of this compound is:

a) 48.6 g/mol b) 97.1 g/mol c) 145.7 g/mol d) 194.2 g/mol

A-13 200 mL of a gas at 303 K and 710 torr is compressed to a volume of 125 mL and the temperature is raised to 400 K. What is the new pressure of the gas?

a) 1500 torr b) 1389 torr c) 1293 torr d) 1209 torr

A-14 Which one of the following atoms is a p-block element?

a) Fe b) Ce c) Se d) Na

A-15 When acting as central atom, which of the following may not obey the octet rule?

a) C b) S c) N d) F

A-16 A polar covalent bond would form in :

a) Cl—Cl b) H—H c) Na—Cl d) P—Cl

A-17 What are the standard temperature and pressure (STP)?

a) 273 °C, 1 atm b) 0 K, 1 torr c) 0 °C, 1 atm d) 0 K, 1 atm

A-18 What is the pressure of 1.0 mole of H_2 when placed in 1.0 L container at 27 °C?

a) 24.6 atm b) 12.3 atm c) 8.2 atm d) 6.15 atm

A-19 Which of the following pure gases has the greatest density at 1.0 atm and 305 K?

a) He b) CO_2 c) N_2 d) CF_4

A-20 For a mixture of N_2 (3 moles) and O_2 (2 moles) in 3L container at 298K, what is the total pressure?

a) 30.2 atm b) 40.7 atm c) 20.6 atm d) 9.3 atm

A-21 Which of the following statements is the best definition of valence electrons?

a) The electrons in the p orbitals
b) The electrons that are paired.
c) The electrons occupying the highest energy (outermost) level.
d) The electrons those are unpaired.

A-22 "No two electrons in the same atom can have the same four quantum numbers" is a statement of:

a) The Pauli exclusion principle.
b) Wavelength
c) Wave
d) Frequency

A-23 Calculate the energy of a photon with $\lambda = 650\,nm$.

a) 3.06×10^{-34} J
b) 1.2×10^{-19} J
c) 3.06×10^{-19} J
d) 3.06×10^{-28} J

A-24 What is the correct Lewis dot symbol for O?

a) 
b) 
c) 
d) 

A-25 Which of the following elements has the smallest first ionization energy?

a) F
b) Li
c) Be
d) B

A-26 What is the total number of valence electrons in SO_2?

a) 12
b) 16
c) 20
d) 18

A-27 How many bonding electrons around the sulfur atom in SO_2?

a) 1
b) 6
c) 3
d) 2

A-28 How many nonbonding electrons around the sulfur atom in SO_2?

a) 2
b) 1
c) 0
d) 6

A-29 The formal charge on the sulfur atom in SO_2 is

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

A-30 Which of the following is an example of paramagnetic element?

a) He
b) Be
c) K
d) Rn