IZMIR UNIVERSITY OF ECONOMICS – CHEM100 GENERAL CHEMISTRY

MAKE-UP EXAM **05.06.2017**

Name_____

Signature _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) You have to calculate the mass of a 30.0 mL liquid sample with density of 1.52 g/mL, but you have forgotten the formula. Which way of reasoning would help you in finding the correct mass?
   A) If 1 mL of a liquid has the mass of 1.52 g, then 30.0 mL has the mass of _____ g.
   B) If 1.52 mL of a liquid has the mass of 1 g, then 30.0 mL has the mass of _____ g.

2) The number with the most significant zeros is _____.
   A) 90.300 B) 0.00090 C) 0.08 D) 591 E) 0.008001

3) What is the physical state in which matter has no specific shape but does have a specific volume?
   A) solid B) ice C) liquid D) gas E) salts

4) An object will sink in a liquid if the density of the object is greater than that of the liquid. The mass of a sphere is 9.83 g. If the volume of this sphere is less than _____ cm^3, then the sphere will sink in liquid mercury (density = 13.6 g/cm^3).
   A) 7.48
   B) 0.723
   C) 1.38
   D) 134
   E) none of the above

5) The width, length, and height of a large, custom-made shipping crate are 1.12 m, 1.25 m, and 0.83 m, respectively. The volume of the box using the correct number of significant figures is _____ m^3.
   A) 1.16200 B) 1.2 C) 1.162 D) 1.1620 E) 1.16

6) An unknown element is found to have three naturally occurring isotopes with atomic masses of 35.9675 (0.337%), 37.9627 (0.063%), and 39.9624 (99.600%). Which of the following is the unknown element?
   A) Ca
   B) K
   C) Cl
   D) Ar
   E) None of the above could be the unknown element.

7) A molecule of water contains hydrogen and oxygen in a 1:8 ratio by mass. This is a statement of _____.
   A) the law of conservation of mass
   B) the law of multiple proportions
   C) the law of conservation of energy
   D) the law of constant composition
   E) none of the above

8) Element M reacts with fluorine to form an ionic compound with the formula MF_3. The M-ion has 21 electrons. Element M is _____.
   A) Sc B) Mn C) Fe D) Al E) Cr

9) Which pair of elements is most apt to form an ionic compound with each other?
A) calcium, sodium
B) barium, bromine
C) nitrogen, hydrogen
D) oxygen, fluorine
E) sulfur, fluorine

10) Isotopes are atoms that have the same _____ but differing _____.
A) mass numbers, atomic numbers
B) atomic masses, charges
C) atomic numbers, mass numbers
D) charges, atomic masses
E) mass numbers, charges

11) The element X has three naturally occurring isotopes. The masses (amu) and % abundances of the isotopes are given in the table below. The average atomic mass of the element is _____ amu.

Isotope	Abundance (%)	Mass (amu)
^{15}X	28.60	15.33
^{17}X	13.30	17.26
^{16}X	58.10	18.11

A) 17.20 B) 17.11 C) 17.65 D) 16.90 E) 16.90

12) The formula of nitrobenzene is $C_6H_5NO_2$. The molecular weight of this compound is _____ amu.
A) 107.11 B) 43.03 C) 123.11 D) 109.10 E) 3.06

13) How many atoms of nitrogen are in 10 g of NH_4NO_3?
A) 3.0×10^{23} B) 2 C) 3.5 D) 1.5×10^{23} E) 1.8

14) One mole of _____ contains the smallest number of atoms.
A) NaCl B) S_8 C) Na_3PO_4 D) $C_{10}H_8$ E) $Al_2(SO_4)_3$

15) How many grams of NaOH (MW = 40.0) are there in 200.0 mL of a 0.175 M NaOH solution?
A) 114 B) 0.0350 C) 14.0 D) 1.40 E) .00219

16) The net ionic equation for formation of an aqueous solution of $Al(NO_3)_3$ via mixing solid $Al(OH)_3$ and aqueous nitric acid is _____.
A) $Al(OH)_3\ (s) + 3HNO_3\ (aq) \rightarrow 3H_2O\ (l) + Al(NO_3)_3\ (aq)$
B) $Al(OH)_3\ (s) + 3H^+\ (aq) \rightarrow 3H_2O\ (l) + Al^{3+}\ (aq)$
C) $Al(OH)_3\ (s) + 3NO_3^-\ (aq) \rightarrow 3OH^-\ (aq) + Al(NO_3)_3\ (aq)$
D) $Al(OH)_3\ (s) + 3HNO_3\ (aq) \rightarrow 3H_2O\ (l) + Al^{3+}\ (aq) + NO_3^-\ (aq)$
E) $Al(OH)_3\ (s) + 3NO_3^-\ (aq) \rightarrow 3OH^-\ (aq) + Al(NO_3)_3\ (s)$

17) Oxidation and _____ mean essentially the same thing.
A) metathesis
B) reduction
C) decomposition
D) activity
E) corrosion

18) Oxidation cannot occur without _____.
A) reduction B) water C) air D) acid E) oxygen

19) A sample of aluminum metal absorbs 11.2 J of heat, upon which the temperature of the sample increases from 23.2 °C to 30.5 °C. Since the specific heat capacity of aluminum is 0.90 J/g-K, the mass of the sample is _____ g.
A) 72 B) 65 C) 7.3 D) 1.7 E) 10.

20) For which one of the following reactions is $\Delta H°_{rxn}$ equal to the heat of formation of the product?
A) 6C (s) + 6H (g) → C_6H_6 (l)
B) 12C (g) + 11H_2 (g) + 11O (g) → $C_6H_{22}O_{11}$ (g)
C) (1/2)N_2 (g) + O_2 (g) → NO_2(g)
D) N_2 (g) + 3H_2 (g) → 2NH_3 (g)
E) P (g) + 4H (g) + Br (g) → PH_4Br (l)

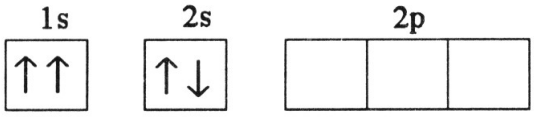
21) ΔH for an endothermic process is _____ while ΔH for an exothermic process is _____.
A) negative, positive
B) zero, negative
C) positive, negative
D) positive, zero
E) zero, positive

22) The specific heat capacity of liquid mercury is 0.14 J/g-K. How many joules of heat are needed to raise the temperature of 6.00 g of mercury from 25.1 °C to 65.3 °C?
A) 5.8×10^{-4} J B) 76 J C) 1.7×10^3 J D) 2.2 J E) 34 J

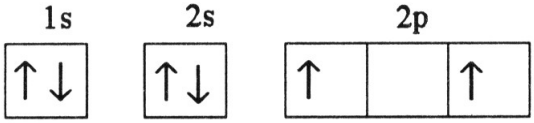
23) The complete electron configuration of vanadium, element 23, is _____.
A) $1s^4 2s^4 2p^6 3s^4 3p5$
B) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^3 4s^2$
C) $1s^4 2s^4 2p^8 3s^4 3p^3$
D) $1s^2 2s^2 2p^{10} 3s^2 3p^7$
E) $1s^4 2s^4 2p^{10} 3s 4 3p1$

24) Which electron configuration represents a violation of Hund's rule for an atom in its ground state?

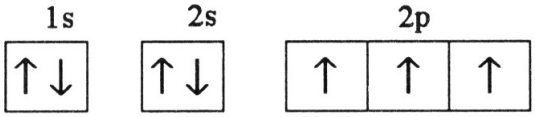
A)



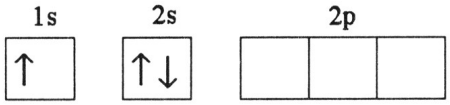
B)



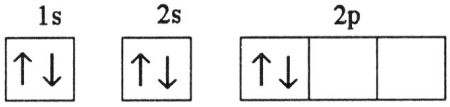
C)



D)



E)



25) The angular momentum quantum number for the outermost electrons in a manganese atom in the ground state is _____.

A) -1 B) 3 C) 2 D) 1 E) 0

26) The pressure exerted by a column of liquid is equal to the product of the height of the column times the gravitational constant times the density of the liquid, $P = ghd$. How high a column of methanol ($d = 0.79\ g/mL$) would be supported by a pressure that supports a 713 mm column of mercury ($d = 13.6\ g/mL$)?

A) 17 mm
B) 9.7×10^3 mm
C) 1.2×10^4 mm
D) 713 mm
E) 41 mm

27) Which noble gas is expected to show the largest deviations from the ideal gas behavior?

A) krypton B) xenon C) helium D) argon E) neon

28) The density of NO_2 in a 4.50 L tank at 760.0 torr and 25.0 °C is _____ g/L.

A) 9.30 B) 1.64 C) 1.68 D) 1.88 E) 3.27

29) How many significant figures should be retained in the result of the following calculation?

$$12.00000 \times 0.9893 + 13.00335 \times 0.0107$$

A) 2 B) 3 C) 4 D) 5 E) 6

30) In the symbol below, X = _____.

$^{13}_{6}X$

A) C
B) N
C) K
D) Al
E) not enough information to determine

31) What is the molecular formula for 1-propanol?

A) CH_4O B) C_3H_8O C) C_2H_6O D) $C_4H_{10}O$ E) $C_5H_{12}O$

32) A nitrogen oxide is 63.65% by mass nitrogen. The molecular formula could be _____.

A) NO_2
B) NO
C) N_2O
D) N_2O_4
E) either NO_2or N_2O_4

33) What are the respective concentrations (M) of Fe^{3+} and I^- afforded by dissolving 0.200 mol FeI_3 in water and diluting to 725 mL?

A) 0.828 and 0.276
B) 0.276 and 0.276
C) 0.276 and 0.828
D) 0.145 and 0.435
E) 0.145 and 0.0483

34) Which one of the following configurations depicts an excited carbon atom?

A) $1s^22s^22p^1$
B) $1s^22s^22p^13s^1$
C) $1s^22s^22p^2$
D) $1s^22s^22p^3$
E) $1s^22s^23s^1$

35) A temperature of 290. K is the same as _____ °F.

A) 711 B) 260 C) 63 D) 351 E) 81

36) Which one of the following is a metalloid?

A) Se B) Xe C) Hf D) Si E) Zr

37) How many grams of sodium carbonate contain 1.773×10^{17} carbon atoms?

A) 3.121×10^{-5} B) 6.066×10^{-5} C) 1.011×10^{-5} D) 1.517×10^{-5} E) 9.100×10^{-5}

38) The value of $\Delta H°$ for the reaction below is -72 kJ. _____ kJ of heat are released when 5.5 mol of HBr is formed in this reaction.

$$H_2\,(g) + Br_2\,(g) \rightarrow 2HBr\,(g)$$

A) -72 B) 144 C) 198 D) 0.44 E) 72

39) The uncertainty principle states that _____.

A) there can only be one uncertain digit in a reported number
B) matter and energy are really the same thing
C) it is impossible to know anything with certainty
D) it is impossible to know how many electrons there are in an atom
E) it is impossible to know the exact position and momentum of an electron

40) The density (in g/L) of CO_2 at 1106.2 torr and 56.3 °C is _____.

A) 2.37 B) 0.0538 C) 13.9 D) 0.0234

Periodic Table of the Elements

1 IA 1A	2 IIA 2A	3 IIIB 3B	4 IVB 4B	5 VB 5B	6 VIB 6B	7 VIIB 7B	8	9 VIII 8	10	11 IB 1B	12 IIB 2B	13 IIIA 3A	14 IVA 4A	15 VA 5A	16 VIA 6A	17 VIIA 7A	18 VIIIA 8A
1 **H** Hydrogen 1.008																	2 **He** Helium 4.003
3 **Li** Lithium 6.941	4 **Be** Beryllium 9.012											5 **B** Boron 10.811	6 **C** Carbon 12.011	7 **N** Nitrogen 14.007	8 **O** Oxygen 15.999	9 **F** Fluorine 18.998	10 **Ne** Neon 20.180
11 **Na** Sodium 22.990	12 **Mg** Magnesium 24.305											13 **Al** Aluminum 26.982	14 **Si** Silicon 28.086	15 **P** Phosphorus 30.974	16 **S** Sulfur 32.066	17 **Cl** Chlorine 35.453	18 **Ar** Argon 39.948
19 **K** Potassium 39.098	20 **Ca** Calcium 40.078	21 **Sc** Scandium 44.956	22 **Ti** Titanium 47.867	23 **V** Vanadium 50.942	24 **Cr** Chromium 51.996	25 **Mn** Manganese 54.938	26 **Fe** Iron 55.845	27 **Co** Cobalt 58.933	28 **Ni** Nickel 58.693	29 **Cu** Copper 63.546	30 **Zn** Zinc 65.38	31 **Ga** Gallium 69.723	32 **Ge** Germanium 72.631	33 **As** Arsenic 74.922	34 **Se** Selenium 78.971	35 **Br** Bromine 79.904	36 **Kr** Krypton 84.798
37 **Rb** Rubidium 84.468	38 **Sr** Strontium 87.62	39 **Y** Yttrium 88.906	40 **Zr** Zirconium 91.224	41 **Nb** Niobium 92.906	42 **Mo** Molybdenum 95.95	43 **Tc** Technetium 98.907	44 **Ru** Ruthenium 101.07	45 **Rh** Rhodium 102.906	46 **Pd** Palladium 106.42	47 **Ag** Silver 107.868	48 **Cd** Cadmium 112.411	49 **In** Indium 114.818	50 **Sn** Tin 118.711	51 **Sb** Antimony 121.760	52 **Te** Tellurium 127.6	53 **I** Iodine 126.904	54 **Xe** Xenon 131.294
55 **Cs** Cesium 132.905	56 **Ba** Barium 137.328	57-71	72 **Hf** Hafnium 178.49	73 **Ta** Tantalum 180.948	74 **W** Tungsten 183.84	75 **Re** Rhenium 186.207	76 **Os** Osmium 190.23	77 **Ir** Iridium 192.217	78 **Pt** Platinum 195.085	79 **Au** Gold 196.967	80 **Hg** Mercury 200.592	81 **Tl** Thallium 204.383	82 **Pb** Lead 207.2	83 **Bi** Bismuth 208.980	84 **Po** Polonium [208.982]	85 **At** Astatine 209.987	86 **Rn** Radon 222.018
87 **Fr** Francium 223.020	88 **Ra** Radium 226.025	89-103	104 **Rf** Rutherfordium [261]	105 **Db** Dubnium [262]	106 **Sg** Seaborgium [266]	107 **Bh** Bohrium [264]	108 **Hs** Hassium [269]	109 **Mt** Meitnerium [268]	110 **Ds** Darmstadtium [269]	111 **Rg** Roentgenium [272]	112 **Cn** Copernicium [277]	113 **Uut** Ununtrium unknown	114 **Fl** Flerovium [289]	115 **Uup** Ununpentium unknown	116 **Lv** Livermorium [298]	117 **Uus** Ununseptium unknown	118 **Uuo** Ununoctium unknown

Atomic Number
Symbol
Name
Atomic Mass

Lanthanide Series	57 **La** Lanthanum 138.905	58 **Ce** Cerium 140.116	59 **Pr** Praseodymium 140.908	60 **Nd** Neodymium 144.243	61 **Pm** Promethium 144.913	62 **Sm** Samarium 150.36	63 **Eu** Europium 151.964	64 **Gd** Gadolinium 157.25	65 **Tb** Terbium 158.925	66 **Dy** Dysprosium 162.500	67 **Ho** Holmium 164.930	68 **Er** Erbium 167.259	69 **Tm** Thulium 168.934	70 **Yb** Ytterbium 173.055	71 **Lu** Lutetium 174.967
Actinide Series	89 **Ac** Actinium 227.028	90 **Th** Thorium 232.038	91 **Pa** Protactinium 231.036	92 **U** Uranium 238.029	93 **Np** Neptunium 237.048	94 **Pu** Plutonium 244.064	95 **Am** Americium 243.061	96 **Cm** Curium 247.070	97 **Bk** Berkelium 247.070	98 **Cf** Californium 251.080	99 **Es** Einsteinium [254]	100 **Fm** Fermium 257.095	101 **Md** Mendelevium 258.1	102 **No** Nobelium 259.101	103 **Lr** Lawrencium [262]

TABLE 4.1 • Solubility Guidelines for Common Ionic Compounds in Water

Soluble Ionic Compounds		Important Exceptions
Compounds containing	NO_3^-	None
	CH_3COO^-	None
	Cl^-	Compounds of Ag^+, Hg_2^{2+}, and Pb^{2+}
	Br^-	Compounds of Ag^+, Hg_2^{2+}, and Pb^{2+}
	I^-	Compounds of Ag^+, Hg_2^{2+}, and Pb^{2+}
	SO_4^{2-}	Compounds of Sr^{2+}, Ba^{2+}, Hg_2^{2+}, and Pb^{2+}
Insoluble Ionic Compounds		**Important Exceptions**
Compounds containing	S^{2-}	Compounds of NH_4^+, the alkali metal cations, Ca^{2+}, Sr^{2+}, and Ba^{2+}
	CO_3^{2-}	Compounds of NH_4^+ and the alkali metal cations
	PO_4^{3-}	Compounds of NH_4^+ and the alkali metal cations
	OH^-	Compounds of NH_4^+, the alkali metal cations, Ca^{2+}, Sr^{2+}, and Ba^{2+}

Table 5.3 Units for the Gas Constant, *R*

***R* has the value**	**When**
0.082058 L atm mol^{-1} K^{-1}	*P* is in atm
62.364 L Torr mol^{-1} K^{-1}	*P* is in torr
8.3145 J mol^{-1} K^{-1}	*P* is in Pa; *V* is in m^3

TABLE 6.1 Some Common Pressure Units

Atmosphere (atm)	
Millimeter of mercury (mmHg)	1 atm = 760 mmHg
Torr (Torr)	= 760 Torr
Newton per square meter (N/m^2)	= 101,325 N/m^2
Pascal (Pa)	= 101,325 Pa
Kilopascal (kPa)	= 101.325 kPa
Bar (bar)	= 1.01325 bar
Millibar (mb)	= 1013.25 mb

1) A
2) A
3) C
4) B
5) B
6) D
7) D
8) E
9) B
10) C
11) A
12) C
13) D
14) A
15) D
16) B
17) E
18) A
19) D
20) C
21) C
22) E
23) B
24) E
25) C
26) C
27) B
28) D
29) B
30) A
31) B
32) C
33) C
34) B
35) C
36) D
37) A
38) C
39) E
40) A