KING FAHD UNIVERSITY OF PETROLEUM AND MINERALS

CHEMISTRY DEPARTMENT

EXAM

THE 1ST MAJOR EXAM

COURSE
CHEM101 - 051

TEST CODE NUMBER
000

STUDENT NUMBER: _____

NAME : _____

SECTION NUMBER: _____

INSTRUCTIONS

1. Type your student number, name, and section number on the *EXAM COVER* page.
2. Type your student number, section number, your name, and your test code number on your *EXAM ANSWER* form.
3. With your pencil, bubble your student number, your section number, and test code number on the *EXAM ANSWER* form.
4. With your pencil, bubble your answer's selections on the *EXAM ANSWER* form. You must not give more than *ONE* answer per question.
5. Return the *EXAM* booklet and *ANSWER* form to the proctor of the exam when you have finished.

Important constants

Gas Constant (R)	= 0.0821	L.atm/(mol.K)
	= 8.31	J/(mol.K)
	= 8.31 x 10^7	g.cm^2/(sec^2.mol.K)
Planck's Constant (h)	= 6.626 x 10^{-34}	J.sec/particle
	= 6.626 x 10^{-34}	kg.m^2/(sec.particle)
Velocity of light (c)	= 2.998 x 10^8	m/sec
Avogadro's number (N)	= 6.022 x 10^{23}	particles/mol
Bohr's Constant (R_H)	= 2.179 x 10^{-18}	J/particle
Faraday (F)	= 96485	Coulombs
Specific heat of H_2O	= 4.18	J/(g.ºC)

PERIODIC TABLE OF THE ELEMENTS

IA																	VIII A
1 **H** 1.0079	IIA											IIIA	IVA	VA	VIA	VIIA	2 **He** 4.0026
3 **Li** 6.941	4 **Be** 9.0122											5 **B** 10.811	6 **C** 12.011	7 **N** 14.007	8 **O** 15.999	9 **F** 18.998	10 **Ne** 20.180
11 **Na** 22.990	12 **Mg** 24.305	IIIB	IVB	VB	VIB	VIIB		VIIIB		IB	IIB	13 **Al** 26.982	14 **Si** 28.086	15 **P** 30.974	16 **S** 32.066	17 **Cl** 35.453	18 **Ar** 39.948
19 **K** 39.098	20 **Ca** 40.078	21 **Sc** 44.956	22 **Ti** 47.867	23 **V** 50.942	24 **Cr** 51.996	25 **Mn** 54.938	26 **Fe** 55.845	27 **Co** 58.933	28 **Ni** 58.693	29 **Cu** 63.546	30 **Zn** 65.39	31 **Ga** 69.723	32 **Ge** 72.61	33 **As** 74.922	34 **Se** 78.96	35 **Br** 79.904	36 **Kr** 83.80
37 **Rb** 85.468	38 **Sr** 87.62	39 **Y** 88.906	40 **Zr** 91.224	41 **Nb** 92.906	42 **Mo** 95.94	43 **Tc** (98)	44 **Ru** 101.07	45 **Rh** 102.91	46 **Pd** 106.42	47 **Ag** 107.87	48 **Cd** 112.41	49 **In** 114.82	50 **Sn** 118.71	51 **Sb** 121.76	52 **Te** 127.60	53 **I** 126.90	54 **Xe** 131.29
55 **Cs** 132.91	56 **Ba** 137.33	57 **La*** 138.91	72 **Hf** 178.49	73 **Ta** 180.95	74 **W** 183.84	75 **Re** 186.21	76 **Os** 190.23	77 **Ir** 192.22	78 **Pt** 195.08	79 **Au** 196.97	80 **Hg** 200.59	81 **Tl** 204.38	82 **Pb** 207.2	83 **Bi** 208.98	84 **Po** (209)	85 **At** (210)	86 **Rn** (222)
87 **Fr** (223)	88 **Ra** (226)	89 **Ac**** (227)	104 **Rf** (261)	105 **Db** (262)	106 **Sg** (263)	107 **Bh** (264)	108 **Hs** 265	109 **Mt** (268)	110 **Uun** (269)	111 **Uuu** (272)	112 **Uub** (277)	113	114	115	116	117	118

58 *****Ce** 140.12	59 **Pr** 140.91	60 **Nd** 144.24	61 **Pm** (145)	62 **Sm** 150.36	63 **Eu** 151.96	64 **Gd** 157.25	65 **Tb** 158.93	66 **Dy** 162.50	67 **Ho** 165.93	68 **Er** 167.26	69 **Tm** 168.93	70 **Yb** 173.04	71 **Lu** 174.97
90 ******Th** 232.04	91 **Pa** 231.04	92 **U** 238.03	93 **Np** (237)	94 **Pu** (244)	95 **Am** (243)	96 **Cm** (247)	97 **Bk** (247)	98 **Cf** (251)	99 **Es** (252)	100 **Fm** (257)	101 **Md** (258)	102 **No** (259)	103 **Lr** (262)

1. Complete the following sentence. A *scientific law* is:

   A) a statement describing a relationship between phenomena that is always the same under the same conditions.
   B) a tentative explanation for a set of observations that can be tested by further experimentation.
   C) a unifying principle that explains a body of facts and relations.
   D) a model used to visualize the invisible.
   E) a descriptive mathematical relation of experimental trends.

2. The "normal" lead content in human blood is about 0.40 part per million (ppm) (that is, 0.40 g of lead per million grams of blood). How many grams of lead are contained in 6.0×10^3 g of blood (the amount in an average adult) if the lead content is 0.47 ppm?

   A) 2.8×10^{-3} g Pb
   B) 5.6×10^3 g Pb
   C) 9.3×10^{-2} g Pb
   D) 3.7×10^{-3} g Pb
   E) 1.1×10^{-3} g Pb

3. Radio waves travel at the speed of light, which is 3.00×10^8 m/s. How many minutes does it take for a radio message to reach Earth from Mars if Mars is 3.5×10^8 km from Earth?

   A) 19.4 min
   B) 5.5×10^{-3} min
   C) 0.33 min
   D) 1.8×10^{21} min
   E) 5.5 min

4. Ammonia NH_3 boils at –28.1°F. What temperature is this in °C?

A) – 33.4°C
B) – 60.1°C
C) – 92.1°C
D) – 18.5°C
E) +13.5°C

5. A cylindrical glass tube 12.7 cm in length is filled with mercury. The mass of mercury needed to fill the tube is 135.7 g. What is the inner diameter of the tube? (The density of mercury = 13.6 g/mL.)

A) 1.00 cm
B) 0.882 cm
C) 1.34 cm
D) 0.441 cm
E) 1.27 cm

6. It is very difficult to separate **chemically** isotopes of an element from each other because

A) isotopes of an element contain the same number of electrons.
B) isotopes of an element contain the different number of protons.
C) isotopes of an element have the same atomic mass.
D) isotopes of an element contain the same number of neutrons.
E) isotopes of an element have different atomic sizes.

7. Which names of the following elements are **correctly** matched with their symbols?

　I. Ca, carbon　　II. Mn, manganese　　III. P, potassium　IV. Sn, tin

A) II and IV
B) I and IV
C) III and IV
D) II and III
E) I and III

8. Two elements, X and Y react to form compounds A and B:
- Compound A: 2.59 g of Y combine with 1.00 g of X
- Compound B: 1.55 g of Y combine with 1.00 g of X

The ratio of Y in compound B to Y in compound A that demonstrate the law of multiple proportions is:

A) 3/5
B) 13/8
C) 5/2
D) 2/3
E) 5/ 7

9. Name the following compound and indicate whether it is ionic or molecular.

$$P_2I_4$$

A) diphosphorus tetraiodide; molecular
B) phosphorus tetraiodide; molecular
C) diphosphorus iodide; ionic
D) phosphorus iodide; ionic
E) phosphorus tetraiodine; molecular

10. The species containing 17 protons, 18 neutrons and 18 electrons is **correctly** represented by which of the following symbols?

A) $_{17}^{35}\text{Cl}^-$

B) $_{17}^{18}\text{Cl}^-$

C) $_{18}^{35}\text{Ar}$

D) $_{17}^{35}\text{Br}^-$

E) $_{36}^{84}\text{Cl}$

11. How many nitrogen atoms are there in 2.000 mol $(NH_4)_2SO_4$?

A) 2.409×10^{24}
B) 6.022×10^{23}
C) 4.818×10^{24}
D) 8×10^{23}
E) 4×10^{24}

12. Chlorine gas consists of two isotopes; Cl-35 (atomic mass = 34.980) and Cl-37 (atomic mass = 36.980). Estimate the percentage of the most abundant isotope.

A) 76.5 %
B) 47.0 %
C) 1.27 %
D) 23.5 %
E) 36.9 %

13. When the following equation:

$$Cl_2 + KOH \rightarrow KClO_3 + KCl + H_2O$$

is balanced with whole number coefficients, the coefficient of KCl is:

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

14. When 4.50 g of pure Fe_2O_3 was treated with excess $H_2(g)$ at high temperatures, 3.00 g of iron metal was recovered. Calculate the percent yield for the reaction.

$$Fe_2O_3 (s) + 3 H_2 (g) \rightarrow 2Fe (s) + 3 H_2O(g)$$
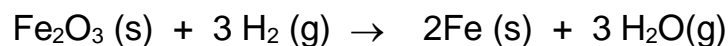
A) 95.2
B) 70.0
C) 60.5
D) 82.5
E) 31.5

15. A 0.537 g sample of a compound containing only carbon, hydrogen, and oxygen was burned in air to produce 1.030 g CO_2 and 0.632 g H_2O. What is the empirical formula of this compound?

A) C_2H_6O
B) CH_6O_2
C) CH_5O
D) C_3H_5O
E) $C_2H_5O_2$

**16.** Phosphorus forms many oxoacids. Indicate the oxidation number of phosphorus in HPO_3, H_3PO_2, and $H_5P_3O_{10}$, respectively.

A) +5, +1, +5
B) +6, +4, +20
C) +5, +3, +5
D) +5, +3, +7
E) +6, +3, +1

17. How many grams of H_2O will be formed when 35.0 ml of 0.100 M HNO_3 solution is completely neutralized by NaOH?

A) 0.0630
B) 0.0450
C) 0.450
D) 0.250
E) 18.0

18. In the following reaction calculate how many mL of 0.250 M $Cr_2(SO_4)_3$ solution is required to react completely with 225 mL of 0.400 M $BaCl_2$?

$$Cr_2(SO_4)_3(aq) + 3BaCl_2(aq) \rightarrow 3BaSO_4 (s) + 2CrCl_3(aq)$$
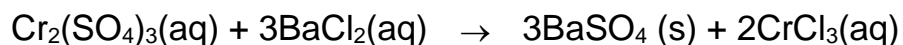
A) 120 mL
B) 160 mL
C) 250 mL
D) 400 mL
E) 140 mL

19. A 35.2 mL, 1.66 M $KMnO_4$ solution is mixed with 167.0 mL of 0.892 M $KMnO_4$ solution. Calculate the concentration of the final solution.

A) 1.03 M
B) 0.638 M
C) 2.55 M
D) 1.28 M
E) 1.41 M

20. Which of the following aqueous solutions would you expect to be the best conductor of electricity at 258° C?

A) 0.20 M $Mg(NO_3)_2$
B) 0.60 M CH_3COOH
C) 0.25 M HCl
D) 0.20 M $NaCl$
E) 0.20 M $NaOH$

Answer Key

1. A
2. A
3. A
4. A
5. A
6. A
7. A
8. A
9. A
10. A
11. A
12. A
13. A
14. A
15. A
16. A
17. A
18. A
19. A
20. A