SULTAN QABOOS UNIVERSITY

COLLEGE OF SCIENCE

DEPARTMENT OF CHEMISTRY

CHEM 2101

GENERAL CHEMISTRY I

TEST1-THURSDAY 5TH MARCH 2009

Spring 2009	**Test 1**	1 hour 15 min
Name : **MODEL ANSWERS**		ID : .....
Section : *10, 20, 30, 40*	Instructor : ..... *Suliman, Al-Shihi, Fatope, Mohammed*	

Constants:

$N_A = 6.022 \times 10^{23}$ $\qquad$ $1\ g = 6.022 \times 10^{23}$ amu

1 **H** 1.008																	2 **He** 4.003
3 **Li** 6.941	4 **Be** 9.012											5 **B** 10.81	6 **C** 12.01	7 **N** 14.01	8 **O** 16.00	9 **F** 19.00	10 **Ne** 20.18
11 **Na** 22.99	12 **Mg** 24.31											13 **Al** 26.98	14 **Si** 28.09	15 **P** 30.97	16 **S** 32.07	17 **Cl** 35.45	18 **Ar** 39.95
19 **K** 39.10	20 **Ca** 40.08	21 **Sc** 44.96	22 **Ti** 47.88	23 **V** 50.94	24 **Cr** 52.00	25 **Mn** 54.94	26 **Fe** 55.85	27 **Co** 58.93	28 **Ni** 58.69	29 **Cu** 63.55	30 **Zn** 65.38	31 **Ga** 69.72	32 **Ge** 72.59	33 **As** 74.92	34 **Se** 78.96	35 **Br** 79.90	36 **Kr** 83.80
37 **Rb** 85.47	38 **Sr** 87.62	39 **Y** 88.91	40 **Zr** 91.22	41 **Nb** 92.91	42 **Mo** 95.94	43 **Tc** (98)	44 **Ru** 101.1	45 **Rh** 102.9	46 **Pd** 106.4	47 **Ag** 107.9	48 **Cd** 112.4	49 **In** 114.8	50 **Sn** 118.7	51 **Sb** 121.8	52 **Te** 127.6	53 **I** 126.9	54 **Xe** 131.3
55 **Cs** 132.9	56 **Ba** 137.3	57 **La*** 138.9	72 **Hf** 178.5	73 **Ta** 180.9	74 **W** 183.9	75 **Re** 186.2	76 **Os** 190.2	77 **Ir** 192.2	78 **Pt** 195.1	79 **Au** 197.0	80 **Hg** 200.6	81 **Tl** 204.4	82 **Pb** 207.2	83 **Bi** 209.0	84 **Po** (209)	85 **At** (210)	86 **Rn** (222)
87 **Fr** (223)	88 **Ra** 226	89 **Ac**† (227)															

***Lanthanides**	58 **Ce** 140.1	59 **Pr** 140.9	60 **Nd** 144.2	61 **Pm** (145)	62 **Sm** 150.4	63 **Eu** 152.0	64 **Gd** 157.3	65 **Tb** 158.9	66 **Dy** 162.5	67 **Ho** 164.9	68 **Er** 167.3	69 **Tm** 168.9	70 **Yb** 173.0	71 **Lu** 175.0
†**Actinides**	90 **Th** 232.0	91 **Pa** (231)	92 **U** 238.0	93 **Np** (237)	94 **Pu** (244)	95 **Am** (243)	96 **Cm** (247)	97 **Bk** (247)	98 **Cf** (251)	99 **Es** (252)	83 **Fm** (257)	101 **Md** (258)	102 **No** (259)	103 **Lr** (260)

Question 1 **20 marks**

1) Which of the following is an example of a quantitative observation?

a) The volume of a glass tube is 25 mL
b) Butter tastes better than margarine
c) The salt burns with a blue flame
d) The solution in the buret is blue
e) None of the above

2) Using the rules of significant figures calculate the following: 4.0021 m – 0.004 m

a) 3.998 m
b) 4 m
c) 3.9981 m
d) 4.00 m
e) 4.0 m

3) A set of gold necklace with a total mass of 17 g is dropped into 46.3 mL of water in a graduated cylinder. The water level in the cylinder rises to 48.6 mL. The density of the gold is

a) 7.391 g/mL
b) 7.3 g/mL
c) 0.35 g/mL
d) 7.4 g/mL
e) 0.37 g/mL

4) 1.0 g of an element was obtained from 660 kg of an ore. The percentage by mass of the element in this ore is

a) 1.52×10^{-4} %
b) 1.0 %
c) 6.6 %
d) 1.5×10^{-4} %
e) 1.5×10^{-6} %

5) What do these ions have in common?

S^{2-} Cl^{-} K^{+} Ca^{2+}

a) The same number of protons
b) The same number of electrons
c) The same number of neutrons
d) The same chemical reaction
e) They are isotopes

6) An element X has 30 protons, 35 neutrons and 28 electrons. The element is

a) A cation
b) An anion
c) A neutral element
d) An inert element
e) An alkaline earth metal

7) Which of the following statements is not true?

a) Ions are formed by adding or removing protons and electrons from atoms
b) The atomic number increases across a period
c) The mass number increases down a group
d) Elements from the same group have similar chemical properties
e) Group 8A elements are called noble gases

8) In a titration experiment, repeated four times, a student recorded the following as the volume of 0.05 M base needed to neutralize 15.00 mL of an Acid:

14.92 mL, 14.91 mL, 14.88 mL and 14. 91 mL.

If the actual volume of base required for neutralization is 15.70 mL. What conclusion can you draw about the accuracy and precision of these results?

a) The results are precise and accurate
b) The results are not precise but accurate
c) The results are precise but inaccurate
d) The results are accurate
e) The results neither precise nor accurate

9) Which of the following is a chemical element?

a) Salt water
b) Water
c) Gold
d) Iron ore
e) Coffee

10) An isotope X has atomic number of 7 and a mass number of 15. Therefore,

a) X is an isotope of nitrogen
b) X has 8 neutrons per atom
c) X has an atomic mass of 14.0067
d) a and b
e) a, b and c

11) Which of the following name(s) is(are) correct?

I. sulfide S^{2-}
II. ammonium nitride NH_4NO_3
III. acetic acid $HC_2H_3O_2$
IV. barium oxide BaO

a) all
b) I, II, III
c) I, II
d) I, III, IV
e) III, IV

12) Which of the following statements are true of uranium-238 (^{238}U)?

I. Its chemical properties will be exactly like those of uranium-235.
II. Its mass will be slightly different from that of an atom of uranium-235.
III. It will contain a different number of protons than uranium-235.
IV. It is more abundant in nature than uranium-235.

a) III, IV
b) I, II, III
c) I, II, IV
d) II, III, IV
e) All of these

13) The formula of water, H_2O, suggests

a) there is twice as much mass of hydrogen as oxygen in each molecule.
b) there are two hydrogen atoms and one oxygen atom per mole of water molecules.
c) there is twice as much mass of oxygen as hydrogen in each molecule.
d) there are one mole of oxygen atoms and two moles of hydrogen atom per one mole of water molecules.
e) None of these

14) The formula for Beryllium selenate is

a) $BeSnO_4$
b) $BSnO_4$
c) $BeSeO_4$
d) $BSnO_4$
e) None of these

15) Which of the following is correctly named?

a) $NiBr_2$, Nickel bromide
b) LiSCN, Lithium sulfur cyanide
c) SO_4^{3-}, sulfate ion
d) $Mn(OH)_2$, magnesium hydroxide
e) NO_2^-, nitrite ion

16) Gallium consists of two isotopes of masses 68.95 amu and x amu with abundances of 60.16% and 39.84%, respectively. What is the x?

a) 70.95
b) 69.00
c) 71.95
d) 68.95
e) 69.55

17) What is the mass of 10 atoms of copper?

a) 600 g
b) 1×10^{-21} amu
c) $1 \times 10^{+23}$ amu
d) 635.5 g
e) 1×10^{-21}g

18) In the blood of an adult human, there are approximately 2.60×10^{13} red blood cells with a total of 2.90 g of iron. On the average, how many iron atoms are present in each red blood cell? (molar mass of iron = 55.85 g)

a) 8.33×10^{-10}
b) 1.20×10^{9}
c) 3.12×10^{22}
d) 2.60×10^{13}
e) 5.19×10^{-2}

19) A Chemical compound has the formula $C_3H_8NO_5P$. How many moles are there in a 500. g sample of this compound?

a) 0.338
b) 1.75
c) 2.96
d) 84.5
e) None of the above

20) Which compound contains the highest percent by mass of hydrogen?

a) HCl
b) H_2O
c) H_2SO_4
d) H_2S
e) HF

Question 2 **9 marks**

1. Group the following elements *in pairs* that are expected to show similar chemical properties: K, F, P, Na, Cl, N, Kr, Rn

   K, Na F,Cl N, P Kr, Rn *(2 marks)*

2. The symbol for an element or ion that has 61 neutrons, 47 protons and 46 electrons is $^{108}_{47}Ag^{+}$ *(1 marks)*

3. A 20.0 mL of a sample of glycerol has a mass of 25.2 grams. Hence the density of glycerol in ounces/quart = 41.9 *(2 marks)*

   (Given: 1.00 Ounce = 28.4 grams; 1.00L = 1.06 quarts)

4. The answer of the following calculation is =390 OR 3.9×10^2 cm *(2 marks)*

$$\frac{(55.0\ cm + 53.0\ cm + 63.0\ cm)}{(0.0453L - 0.0323L)} \times (16\ mL + 14\ mL)$$

5. The measurement of 2309002.0 mm has three captive zeros and one

trailing zero (or decimal place) and eight significant figures. This measurement = 2.3090020 km *(2 marks)*

Question 3 **11 marks**

1. Write the name of each of the following. *(4 marks)*

i) $Cu_2Cr_2O_7$ Copper(I) dichromate

ii) F_2O Difluorine monoxide

iii) $Sr(IO_2)_2$ Strontium iodite

iv) Sb_2O_5 Diantimony pentoxide or Antimony(V) oxide

2. Write the formula of each of the following. *(4 marks)*

1) Phosphoric acid H_3PO_4

2) Bismuth(III) acetate $Bi(C_2H_3O_2)_3$

3) Germanium dioxide GeO_2

4) Silicon carbide SiC

3. A sample of a compound with the formula $VOBr_x$ contains 3.0×10^{21} molecules. This sample weighs 1.130 g, calculate *x*. *(3 marks)*

$$3.0\times10^{21}\ \text{molecules}\times\frac{1\text{mol}}{6.022\times10^{23}\,molecules}=4.9(8173)\times10^{-3}\,mol$$

$$molar\ mass=\frac{1.130g}{4.9(8173)\times10^{-3}\,mol}=22(6.829)g/mol$$

$$molar\ mass\ of\ \ Br_x=22(6.829)g/mol-50.94g/mol-16.00g/mol$$

$$=15(9.889)g/mol$$

$$x=\frac{15(9.889)g/mol}{79.9g/mol}=2.0$$

$$\therefore compound\ is\ VOBr_2$$