Science Department

Year 12 Chemistry

Test 1: Chemical Fundamentals

Name: _____

Teacher: _____

Instructions to Students:

1. 50 minutes permitted
2. Attempt all questions
3. Write in the spaces provided
4. Show all working when required
5. All answers to be in blue or black pen, diagrams in pencil.

TOTAL	Final Percentage
/50	

Section 1

Multiple Choice section (use the attached answer sheet)

1. Which of the lists below indicate in correct order the colours of the following 1 mol L^{-1} solutions of ions?

$$CrO_4^{2-}{}_{(aq)},\ Mn^{2+}{}_{(aq)},\ Fe^{2+}{}_{(aq)},\ Zn^{2+}{}_{(aq)}$$

   a) orange, purple, brown, colourless
   b) yellow, pale pink, pale green, colourless
   c) orange, colourless, pale green, colourless
   d) yellow, pale pink, pale brown, colourless

2. Which of the lists below only contains green solids:

   a) Copper Sulfate, Copper Carbonate, Nickel Sulfate
   b) Nickel Carbonate, Copper Carbonate, Iron (II) Sulfate
   c) Copper Sulfate, Iron (III) Chloride, Cobalt(II) Chloride
   d) Chlorine, Copper Carbonate, Nickel Sulfate

3. Which of the lists below only contains colourless gases?

   a) NO_2, Cl_2 and NH_3
   b) N_2O, NO_2 and N_2O_4
   c) CO_2, Cl_2 and NO_2
   d) SO_2, NO and NH_3

4. In each of the five lists below, 0.1 mol L^{-1} samples of the three solutions shown are mixed together in equal proportions. Which combination will not produce a white precipitate?

   a) $Na_2CO_{3(aq)}$, $(NH_4)_2CO_{3(aq)}$, $K_2CO_{3(aq)}$
   b) $Ba(OH)_{2(aq)}$, $Pb(NO_3)_{2(aq)}$, $NH_{3(aq)}$
   c) $NH_4NO_{3(aq)}$, $(NH_4)_2CO_{3(aq)}$, $Zn(NO_3)_{2(aq)}$
   d) $H_2SO_{4(aq)}$, $KOH_{(aq)}$, $BaCl_{2(aq)}$

5. Which list provides the colours for gaseous chlorine, chlorine dissolved in water and chlorine dissolved in organic solvent in the correct sequence?

a) Yellow, colourless, pale yellow

b) Greenish yellow, pale yellow, colourless

c) Greenish yellow, pale yellow, greenish yellow

d) Colourless, pale yellow, colourless

6. Which of the following contains the least number of molecules?

a) 1g of H_2

b) 2g of N_2

c) 4g of O_2

d) 8g of O_3

7. What mass of NaCl is needed to prepare 500 mL of a 4 M NaCl solution?

a) 117 g

b) 2.00 g

c) 58.5 g

d) 4.00 g

8. Which of the following contains the greatest number of molecules at STP?

a) 16 g of oxygen gas

b) 4.0 g of helium gas

c) 40 L of hydrogen gas

d) 1.5 moles of carbon dioxide gas

9. The volume of 16 g of oxygen gas at STP is:

a) 11.36 L

b) 4.48 L

c) 44.80 L

d) 4.00 L

10. STP refers to the following conditions: (Chose the correct option)

a) 25 ^{0}C, 1 kPa
b) 273.15 K, 100 kPa
c) 20 ^{0}C, 100 kPa
d) 25 ^{0}C, 0 kPa

Section 2: Short Answer Questions **(33)**

11. Calculate the relative molecular mass of each of the following compounds: (3)

a) Urea ($(NH_2)_2CO$)

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b) Hydrated copper sulfate ($CuSO_4.5H_2O$)

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c) Ammonium sulfate ($(NH_4)_2SO_4$)

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12. Calculate the number of moles of: (2)

a) 80.2 g Calcium

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b) 250 g of barium sulfate $BaSO_4$

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13. Calculate the mass of the following: (2)

a) 20.0 mol of lead (II) nitrate $Pb(NO_3)_2$

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b) 3.5 mol of octane (C_8H_{18})

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14. What is the concentration, in mol L^{-1}, of a solution in which 40.0 g of sucrose ($C_{12}H_{22}O_{11}$) is dissolved in 300 mL of the solution? (3)

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15. What volume of sodium hydroxide solution with a concentration of 0.0606 mol L^{-1} contains 1.50 g of sodium hydroxide? (2)

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16. 46 g of potassium sulfate is dissolved in 570 mL of water to make a solution. Calculate the concentration of potassium ions (K^+) in mol L^{-1}. (2)

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17. A saturated solution of calcium carbonate ($CaCO_3$) was found to contain 0.0198 g of calcium carbonate in 2000 g of solution. Calculate the concentration of calcium carbonate in this solution. (2)

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18. Balance the following chemical equations. (5)

a) $CaCO_{3(s)} + HCl_{(aq)} \rightarrow CaCl_{2(aq)} + CO_{2(g)} + H_2O_{(l)}$

b) $Na_2SO_{4(aq)} + Pb(NO_3)_{2\ (aq)} \rightarrow PbSO_{4(s)} + NaNO_{3(aq)}$

c) $Mg(NO_3)_{2(aq)} + Na_3PO_{4(aq)} \rightarrow Mg_3(PO_4)_{2(s)} + NaNO_{3(aq)}$

d) $N_{2\ (g)} + H_{2\ (g)} \rightarrow NH_{3\ (g)}$

e) $Mg_{\ (s)} + HCl_{\ (aq)} \rightarrow MgCl_{2\ (aq)} + H_{2\ (g)}$

19. Write balanced ionic equations for the following reactions.(Note: a correctly balanced molecular equation including state symbols will attract two marks, a third mark is given for an ionic equation.)

(12)

a) Reacting solid aluminium with dilute hydrochloric acid to produce aqueous aluminium chloride and hydrogen gas.

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b) Adding a solution of silver nitrate to a solution of sodium chloride to form a precipitate of silver chloride and aqueous sodium nitrate.

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c) Butane (C_4H_{10}) burns in an excess of oxygen to form carbon dioxide and water.

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d) When sodium is added to water, the products are a solution of sodium hydroxide (NaOH) and hydrogen gas

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END OF TEST