

Chemistry Review Questions
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Grade 10 Nomenclature and Balancing Equations

Oxidation Numbers

1. What is the oxidation number of:

a) U in UCl_3

$$\text{U}=+3$$

b) Sn in SnS_2

$$\text{Sn}=+4$$

c) S in SO_4^{2-}

$$4(-2) + \text{S} = -2$$

$$\text{S}=+6$$

d) C in CO_3^{2-}

$$\text{C} + 3(-2) = -2$$

$$\text{C}=+4$$

Nomenclature of Binary Ionic Compounds

2. Name the following (all possibilities):

a) FeCl_3

Ferric chloride or Iron (III) chloride

b) MgO

Magnesium oxide

c) CuBr

Copper (I) bromide or Cuprous bromide

d) LiF

Lithium fluoride

e) VCl_5

Vanadium (V) chloride

3. Write the chemical formula for the following:

a) Copper (II) bromide



b) Ferrous oxide



c) Calcium chloride



d) Lead (IV) sulfide



e) Barium phosphide



Nomenclature of Binary Covalent Compounds

4. Name the following (all possibilities):



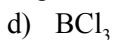
Carbon dioxide



Methane or Carbon tetrahydride

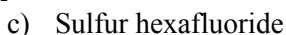
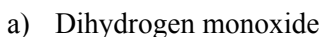


Dinitrogen trioxide



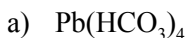
Barium trichloride

5. Write the chemical formula for the following:

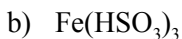


Nomenclature of Compounds with Polyatomic Ions

6. Name the following (all possibilities):



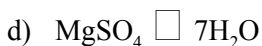
Lead (IV) bicarbonate or Plumbic bicarbonate or Lead (IV) hydrogen carbonate or Plumbic hydrogen carbonate



Iron (III) bisulphite or Ferric bisulphite or Iron (III) hydrogen sulfite or Ferric (III) hydrogen sulfite

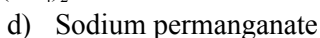
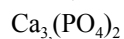
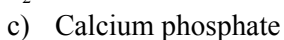
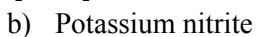
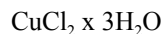


Manganese (II) sulfate



Magnesium sulfate heptahydrate

7. Write the chemical formula for the following:



Nomenclature of Binary and Oxyacids

8. Name the following (all possibilities):



Sulphuric (VI) acid or Sulphuric acid

- b) $\text{HCl}_{(\text{aq})}$
Hydrochloric acid
- c) $\text{HBr}_{(\text{aq})}$
Hydrobromic acid
- d) $\text{H}_3\text{PO}_{4(\text{aq})}$
Phosphoric acid or Phosphoric (IV) acid
- e) $\text{H}_3\text{AsO}_{5(\text{aq})}$
Arsenic acid or Arsenic (VII) acid

9. Write the chemical formula for the following:

- a) Bromic acid
 $\text{HBrO}_{3(\text{aq})}$
- b) Nitric acid
 $\text{HNO}_{3(\text{aq})}$
- c) Hydroiodic acid
 $\text{HI}_{(\text{aq})}$
- d) Acetic acid
 $\text{CH}_3\text{COOH}_{(\text{aq})}$

Balancing Chemical Equations

10. Completely balance each equation and say what type of reaction it is:

- a) $3 \text{O}_2 + 4\text{Al} \rightarrow 2\text{Al}_2\text{O}_3$
- b) $3\text{MnSO}_4 + 2\text{Fe} \rightarrow \text{Fe}_2(\text{SO}_4)_3 + 3\text{Mn}$
- c) $2\text{Na} + \text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2$

Reactivity Series

11. Metals A B C and D are observed in a reaction with the solutions: $\text{A}(\text{NO}_3)$ $\text{B}(\text{NO}_3)$ $\text{C}(\text{NO}_3)$ and $\text{D}(\text{NO}_3)$. The results are as follows:

- Metal C reacts with none of the solutions
- Metal D reacts with $\text{A}(\text{NO}_3)$ and $\text{C}(\text{NO}_3)$
- Metal B reacts with $\text{D}(\text{NO}_3)$
- Metal E reacts with A and C but not with $\text{D}(\text{NO}_3)$

What is the reactivity series order?

The reactivity order is B D E A C. C is the least reactive because it reacts with none of the acids. B is the most reactive because it reacts with D which is less reactive. D is next because it reacts with both A and C. Then E because it reacts with A and C but not B and D.

Quantities in Chemistry

Moles

1. What is the value of one mole (N_A)?
 6.02×10^{23} particles

2. For 3.00 moles of Ca, how many atoms?
 $N = nN_A$

$$N=(3.00)(6.02 \times 10^{23})$$

$$N=1.81 \times 10^{24} \text{ atoms}$$

3. How many moles are there when given 1.56×10^{22} atoms of H_2O ?

$$N=nN_A$$

$$(1.56 \times 10^{22}) = n(6.02 \times 10^{23})$$

$$2.59 \times 10^{-2} \text{ mol} = n$$

4. When given 8.77 moles of Iron, what are the number of atoms?

$$N=(8.77)(6.02 \times 10^{23})$$

$$N=5.27954 \times 10^{24} \text{ atoms}$$

5. What is the mass of aluminium when given 8.00 moles?

$$m=nM$$

$$m=(8.00)(26.981538)$$

$$m=216 \text{ g}$$

6. What is the mass of potassium when given 4.87 moles of the K metal?

$$m=nM$$

$$m=(4.87)(39.0983)$$

$$m=190.41 \text{ g}$$

7. How many moles of lead in are there in 7.66g of lead metal?

$$n=m/M$$

$$n=(7.66)/(207.2)$$

$$n=0.0371 \text{ mol}$$

8. How many moles are there in 2.35g of lithium?

$$n=m/M$$

$$n=(2.35)/(6.941)$$

$$n=0.339 \text{ mol}$$

Percentage Composition

9. Calculate the percentage composition of N in NH_4NO_3

$$\% \text{ composition} = 2N/M$$

$$\% \text{ composition} = 2(14.00674)/80.0432$$

$$\% \text{ composition} = 35.0\%$$

10. Calculate the percentage composition of N in $(\text{NH}_4)_2\text{CO}_3$

$$\% \text{ composition} = 2N/M$$

$$\% \text{ composition} = 2(14.00674)/96.0858$$

$$\% \text{ composition} = 29.1\%$$

11. Calculate the percentage composition of N in $((\text{NH}_4)_3\text{PO}_4)$

$$\% \text{ composition} = 3N/M$$

$$\% \text{composition} = 3(14.00674)/149.08626$$

$$\% \text{composition} = 28.3\%$$

Empirical Formula

12. Determine the empirical formula when given 63.0% carbon, 3.3% hydrogen and 8.2% nitrogen and 25.5% oxygen

Let 100% = 100g

So... 3.3g of carbon, 63.0g of hydrogen, 8.2g of nitrogen and 25.5g of oxygen

Change g to mol:

$$n = (63.0)/(12.0107) \quad n = (3.3)/(1.0079) \quad n = (8.2)/(14.00674) \quad n = (25.5)/(15.9994)$$

$$n = 5.2453 \text{ mol} \quad n = 3.374 \text{ mol} \quad n = 0.5854 \text{ mol} \quad n = 1.5938$$

Divide each one by the smallest

$$5.2453/0.5854 \quad 3.374/0.5854 \quad 0.5854/0.5854 \quad 1.5938/0.5854$$

$$= 8.960 \quad = 5.764 \quad = 1 \quad = 2.723$$

Therefore the empirical formula would be $\text{C}_9\text{H}_6\text{NO}_3$

13. What is the molecular formula when given 7.88g of S and 13.45g of O and their total molar mass is 260g/mol.

Change from g to mol

$$n = 7.88/32.066 \quad n = 13.45/15.9994$$

$$n = 0.2457 \quad n = 0.8407$$

Divide by the smallest

$$0.2457/0.2457 \quad 0.8407/0.2457$$

$$= 1 \quad = 3.4217$$

The empirical formula would be SO_3

To get molecular formula you have to find the multiple value

Multiple value = molar mass given / molar mass empirical

$$\text{Multiple value} = 260/80.0642$$

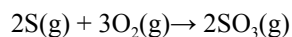
$$\text{Multiple value} = 3.247$$

So multiple SO_3 by 3 and then the molecular formula is S_3O_9

Stoichiometric Relationships

Mole to Mole Ratio

1. What mass of $\text{SO}_3(\text{g})$ is formed when excess Sulfur(g) is reacted with 3.45mol of Oxygen (g)?



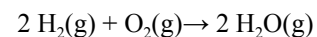
$$3.45 : x$$

$$3 \quad 2$$

$$3x = 6.9$$

$$x = 2.3 \text{ mol}$$

2. Calculate the mass of O_2 in 8.7mol of water in the following reaction:



$$x : 8.7$$

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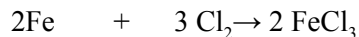
$$1 \quad 2$$

$$2x=8.7$$

$$x=4.35\text{mol}$$

LR vs XS Problems

3. Calculate in the following reaction:



$$0.889\text{mol} \quad 0.789\text{mol}$$

- a) The LR
- b) The XS
- c) The number of moles in FeCl_3
- d) The mass of FeCl_3

Find the LR using mol to mol ratio



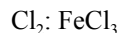
$$0.889 : 0.789$$

$$2 \quad 3$$

$$0.4445 : 0.263$$

Therefore chlorine is the LR and iron is the excess

Use the LR to find the number of moles in Iron (III) chloride



$$0.789 : x$$

$$3 \quad 2$$

$$3x=0.3945$$

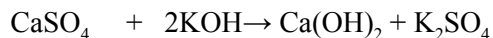
$$x=0.1315\text{mol is the number of moles in FeCl}_3$$

$$m=nM$$

$$m=(0.1315)(162.2031)$$

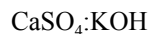
$$m=21.3\text{g}$$

4. Complete the following:



A reaction took place where 0.456mol of CaSO_4 reacted with 0.678mol of KOH .

- a) Calculate the mass of the XS reactant used
- b) Calculate the percent yield if in an experiment 14.05g of K_2SO_4 was produced
- c) Calculate the percent error if in an experiment 14.05g of K_2SO_4 was produced



$$0.456 : 0.678$$

$$1 \quad 2$$

$$0.456 : 0.339$$

Therefore KOH is the LR and CaSO_4 is the excess



$$0.678 : x$$

$$2 \quad 1$$

$$2x=0.678$$

$$x=0.339$$

$$\text{XS remaining} = \text{XS initial} - \text{XS consumed}$$

$$= 0.456 - 0.339$$

$$= 0.117$$

$$m=nM$$

$$m=0.117(136.1116)$$

$$m=15.93\text{g}$$

$$\text{PY} = \frac{m}{\text{theo}} \times 100$$

$$\text{PY} = \frac{14.05}{15.93} \times 100$$

$$\text{PY} = 88.21\%$$

$$\text{PE} = \frac{\text{theo} - m}{\text{theo}} \times 100$$

$$\text{PE} = \frac{15.93 - 14.05}{15.93} \times 100$$

$$\text{PE} = 11.80\%$$

Solution Chemistry

Concentration

1. A solution of magnesium hydroxide has a concentration of 3.45 molar and is made by dissolving 2.78 moles of magnesium hydroxide. What what is the volume prepared?

$$c=n/v$$

$$3.45=2.78/v$$

$$1.241\text{L}=v$$

2. If the concentration of a substance is 0.89M and the volume is 440ml, how many moles are there?

$$c=n/v$$

$$0.89=n/0.440$$

$$2.023\text{mol}=n$$

3. What is a solute?

The dissolved part of a solution

4. What is a solvent?

The part that takes up the majority of the solution. The solute is dissolved in the solvent.

5. What is/are :

- a) Saturated vs unsaturated?

Saturated means a solution has residue at the bottom and cannot hold more solvent and unsaturated means that the solution can hold more solvent.

- b) Homogeneous vs heterogeneous?

Homogenous means that you cannot see the parts of the solution and they appear as one unit. Heterogeneous means that you can visibly see the parts of the solution.

- c) Name 3 factors that affect the rate of dissolving

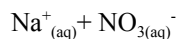
1. Agitation

2. Heat
3. Pressure

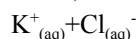
Dissociation

6. Dissociate the following compounds:

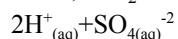
a) $\text{NaNO}_3 (\text{aq})$



b) $\text{KCl} (\text{aq})$



c) $\text{H}_2\text{SO}_4 (\text{aq})$

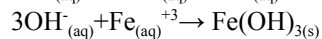
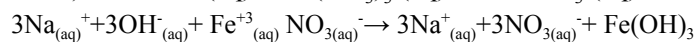


7. What is a polar covalent bond?

A polar covalent bond is where atoms that are shared by atoms spend more time near the oxygen nucleus than the hydrogen one. The electrons are therefore shared unequally.

8. Dissociate the following equation completely and then write the Net Ionic Equation:

a) $3\text{NaOH} (\text{aq}) + \text{Fe}(\text{NO}_3)_3 (\text{aq}) \rightarrow 3\text{NaNO}_3 (\text{aq}) + \text{Fe}(\text{OH})_3 (\text{s})$



Dilution

8. You have 32.0L of a 0.70 M solution. What is the concentration of the final solution prepared of a 67.0L solution?

$$V_1C_1 = V_2C_2$$

$$(32)(0.7) = (67)C_2$$

$$22.4 = 67C_2$$

$$C_2 = 0.3343\text{M}$$

9. If a solution with 0.754 M is produced by adding 0.222 M with a volume of 56.0L what is the volume of the original solution?

$$V_1C_1 = V_2C_2$$

$$V_1(0.754) = (56)(0.222)$$

$$V_1 = 16.49\text{L}$$

Acids and Bases

Acid vs Base

1. Name 3 characteristics of an acid and 3 of a base.

ACID	BASE
- Sour - Red indicator paper - Lower PH number	- Bitter - Blue indicator paper - Higher PH number

2. Compare weak and strong electrolytes in a table.

Strong Electrolytes	Weak Electrolytes
- Greater number of ions - acid/base undergoes total dissociation or ionization - Brighter which means a better conductor	- Less number of ions - acid/base undergoes partial dissociation - Less bright which means a weaker conductor - Partial reversible reaction

3. What are the main acids?

- Sulfuric: H₂SO₄
- Chloric: HClO₃
- Carbonic: H₂CO₃
- Phosphoric: H₃PO₄
- Nitric: HNO₃

4. What is the equivalence point?

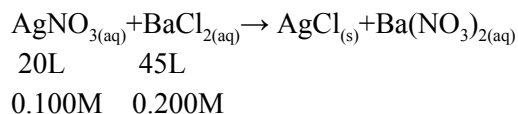
The equivalence point is the point at which chemically equivalent quantities of bases and acids have been mixed (mol to mol ratio is the same).

5. What is titration?

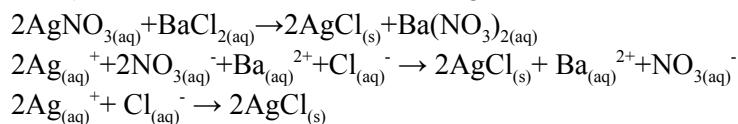
The process of determining a concentration by slowly adding another substance until it reacts

6. Potassium hydroxide reacts with Sulfuric acid:

- Write a balanced equation
- Write a total dissociation equation
- Write the NET ionic equation



- Moles of the reactant remaining



Find the number of moles

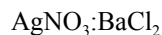
$$c=n/v$$

$$c=n/v$$

$$0.100=n/20 \quad 0.200=n/45$$

$$0.005=n \quad 0.0044=n$$

Find the LR and XS



$$0.005:0.0044$$

$$2 \quad 1$$

$$0.0025:0.0044$$

Therefore AgNO₃ is the LR and BaCl₂ is the XS

LR:XS

0.005:x

2 1

2x=0.005

x=0.0025

XS remaining=XS initial- XS consumed

= 0.0044-0.0025

= 0.0019mol

PH

7. The hydroxide ion concentration of fish is 1.67×10^{-11} , calculate the ph of the fish.

ph=-log[H₃O⁺]

ph=-log[1.67×10^{-11}]

ph=10.78

ph=14-10.78

ph=3.22

8. Your chicken has a poh of 4.56. What is the hydronium ion concentration?

ph=14-4.56

ph=9.44

H₃O=10^{-pOH}

H₃O=10^{-9.44}

= 3.631×10^{-10}

Gases

1. Tires have a volume of 25.00L and temperature of -10 degrees celsius and later is 10 degrees celsius. What is the final volume of the tires?

$V_1/T_1 = V_2/T_2$

$(25.00)(-10+273) = V_2(10+273)$

$V_2 = 23.23L$

2. A balloon has a pressure of 15 kPa and temperature of 273 degree k. It later has a temperature of 289 degrees k. What is the final pressure?

$P_1 V_1 = P_2 V_2$

$(15)(273) = P_2(289)$

$P_2 = 14.17kPa$

3. A balloon is 23 degrees c, 12 L and has a pressure of 35 kPa. After it is 2 degrees c and has pressure of 6 kPa, what is the volume?

$P_1 V_1 = P_2 V_2$
----- = -----

$T_1 \quad T_2$
 $(35)(12) \quad (6)V_2$

$$\frac{\text{-----}}{(23+273)} = \frac{\text{-----}}{(273+2)}$$

$$V_2 = 65.03 \text{ L}$$

4. A substance has a pressure of 200 kPa, 600 mol and is at 45 degrees c. What is the volume?

$$PV = nRT$$

$$(200)V = (600)(0.8314)(45+273)$$

$$V = 793.1556 \text{ L}$$