10 Chemistry Exam Revision

1. For the following examples determine whether they are a metal, a non-metal, a semi-metal (metalloid), or a noble gas.
   1. Ca metal
   2. Si metalloid
   3. Br non-metal
   4. Co metal
   5. Ar non-metal + noble gas
   6. K metal
   7. O non-metal
   8. Se non-metal
   9. As metalloid
   10. Mn metal
   11. Kr non-metal
   12. H non-metal
2. Using examples, define the terms:
   1. atomic number: the number of protons in an atom
   2. mass number: the number of protons and neutrons in an atom
   3. isotope: versions of an element with the same number of protons but different numbers of neutrons
   4. cation: a positive ion, normally an atom that has lost electrons
   5. anion: a negative ion, normally an atom that has gained electrons
   6. polyatomic ion: an ion made of multiple atoms
   7. soluble: a substance that can dissolve in water
   8. insoluble: a substance that cannot dissolve in water
3. Name the following groups on the periodic table:
   1. 1: alkali metals
   2. 2: alkaline earth metals
   3. 17: halogens
   4. 18: noble gases
4. Complete the table below:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Element | Charge | Mass No. | Atomic No. | No. Protons | No. Neutrons | No. Electrons |
|  | neutral | 59 | 27 | 27 | 32 | 27 |
|  | positive | 112 | 48 | 48 | 64 | 46 |
| 8035Br | neutral | 80 | 35 | 35 | 45 | 35 |
| P3- | negative | 31 | 15 | 15 | 16 | 18 |
| 8838Sr2+ | positive | 88 | 38 | 38 | 50 | 36 |

1. Complete the table below for **ionic compounds:**

Use ions table; Do **not** use mono, di, tri etc.

|  |  |
| --- | --- |
| **Name** | **Formula** |
| Potassium chloride | KCl |
| Magnesium chloride | MgCl2 |
| Aluminium chloride | AlCl3 |
| Sodium nitrate | NaNO3 |
| Sodium carbonate | Na2CO3 |
| Sodium phosphate | Na3PO4 |
| Calcium nitrite | Ca(NO2)2 |
| Calcium nitrate | Ca(NO3)2 |
| Calcium nitride | Ca3N2 |
| Zinc sulphite | ZnSO3 |
| Zinc sulphate | ZnSO4 |
| Zinc sulphide | ZnS |
| Iron (II) oxide | FeO |
| Iron (III) oxide | Fe2O3 |
| Copper (I) hydroxide | CuOH |
| Copper (II) hydroxide | Cu(OH)2 |
| Ammonium nitrate | NH4NO3 |
| Ammonium iodide | NH4I |
| Ammonium sulphate | (NH4)2SO4 |
| silver chloride | AgCl |
| silver acetate | AgCH3COO |
| silver oxide | Ag2O |
| magnesium oxide | MgO |
| magnesium phosphate | Mg3(PO4)2 |
| tin (II) carbonate | SnCO3 |
| sin (IV) chloride | SnCl4 |
| sodium hydrogencarbonate | NaHCO3 |
| barium acetate | Ba(CH3COO)2 |

1. Complete the table below for **covalent compounds**:

Do not use ions table; Use mono, di, tri, tetra, penta, hexa, hepta, octa, nona, deca

|  |  |
| --- | --- |
| **Name** | **Formula** |
| sulfur dioxide | SO2 |
| sulfur trioxide | SO3 |
| Carbon monoxide | CO |
| Carbon dioxide | CO2 |
| Trisulfur octaoxide | S3O8 |
| diphosphorous hexafluoride | P2F6 |
| dinitrogen pentoxide | N2O5 |
| dinitrogen trioxide | N2O3 |

1. Balance the following equations:

2 H2(g) + O2(g) → 2 H2O(g)

N2(g) + 3 H2(g) → 2 NH3(g)

2 C4H10(g) + 13 O2(g) → 8 CO2(g) + 10 H2O(*l*)

2 NaMnO4(aq)+ H2O2(*l*) + 3 H2SO4(aq) → 2 MnSO4(aq) + Na2SO4(aq) + 3 O2(g) + 4 H2O(*l*)

4 NH3(g) + 5 O2(g) → 4 NO(g) + 6 H2O(*l*)

1. Write balanced chemical equations for the following reactions:
2. The decomposition of aluminium carbonate forming aluminium oxide and carbon dioxide.

Al2(CO3)3 → Al2O3 + 3 CO2

1. The decomposition of tin (IV) hydrogencarbonate forming water, carbon dioxide and tin (IV) oxide.

Sn(HCO3)4 → SnO2 + 4 CO2 + 2 H2O

1. Chromium is added to bromine gas forming chromium bromide.

2 Cr + 3 Br2 → 2CrBr3

1. The decomposition of lithium hydrogencarbonate, forming lithium oxide, water and carbon dioxide.

2 LiHCO3 → Li2O + H2O + 2 CO2

1. Ammonium carbonate solution reacts with manganese (II) iodide solution.

(NH4)2CO3(aq) + MnI2(aq) → MnCO3(s) + 2 NH4I(aq)

1. Aluminium nitrate solution reacts with potassium hydroxide solution.

Al(NO3)3(aq) + 3 KOH(aq) → 3 KNO3(aq) + Al(OH)3(s)

1. Sodium bromide solution is added to zinc sulfate solution.

no observable change

1. Solid lead (II) nitrate is dissolved in water.

Pb(NO3)2(s) → Pb2+(aq) + 2 NO3-(aq)

1. Name the common chemical tests for the following gases
   1. carbon dioxide – limewater test
   2. hydrogen – pop test
   3. oxygen – glowing splint test
2. Write the electron configurations for the following substances.
3. C 2,4
4. Ne 2,8
5. Na 2,8,1
6. O2- 2,8
7. Ca2+ 2,8,8
8. N3- 2,8
9. Draw Lewis (electron dot) diagrams for the following:



1. C­*l*

Cl



1. A*l*

Al



1. Mg2+

Mg



1. F‒

F



1. S2-

S



1. He

He



1. Using examples, describe the relationship between the number of energy shells (levels) and valence electrons an atom has and its position on the periodic table.

Number of electrons determine the group number and number of electron shells determine the period. E.g., silicon is in group 14 because it has 4 valence electrons and is in period 3 because it has 3 electron shells.

1. In the following reaction; CaCO3(s) + 2HC*l*(aq) → CaC*l*2(aq) + CO2(g) + H2O(*l*) , describe:
2. Two ways to measure the reaction rate.

time how long it takes CaCO3 to dissolve, time how long it takes to stop bubbling, time how long it takes to displace water out of a test tube

1. Explain three ways to speed this reaction up (i.e., describe how the reaction rate increases rather than just listing how it could be sped up).

Heat the solution, crush the CaCO3 or shake the solution, see question 15 answers for explanations.

1. List the 3 requirements for a reaction to occur according to collision theory.
   1. reactants must collide
   2. reactants must collide with sufficient energy (activation energy)
   3. reactants must collide with a favourable orientation
2. Use collision theory to explain in detail how each of the following factors can increase reaction rate:
   1. Temperature

Increasing temperature increases the kinetic energy of the particles, increasing the proportion of collisions that have sufficient kinetic energy to meet the activation energy which increases the rate of successful collisions and so increases the reaction rate.   
Also, the particles move faster and so the rate of collisions increases which also increases the reaction rate.

* 1. Concentration

Increasing concentration decreases the distance between the particles which increases the rate of collisions which increases the reaction rate.

* 1. Agitation

Agitation increases the number of reactant particles exposed to each other at the same time which increases the rate of collisions which increases the reaction rate.

* 1. Surface area

Increasing the surface area exposes more reactant particles to each other at the same time which increases the rate of collisions which increases the reaction rate.

* 1. Catalysts

Catalysts provide an alternate reaction pathway with a lower activation energy. This means a greater proportion of reactant particles will have sufficient kinetic energy to meet the activation energy which increases the rate of successful collisions which increases the reaction rate.

1. A group of students carried out an investigation to see how the concentration of acid affects the rate of the reaction between hydrochloric acid and chalk. Chalk contains calcium carbonate. They dropped a 3 cm piece of chalk into hydrochloric acid of different concentrations. They caught and measured the amount of carbon dioxide that was produced in 1 minute.
   1. Name the following **variables** in this experiment:
      1. Independent: Hydrochloric acid concentration
      2. Dependent: volume of CO2, or reaction rate
      3. **Two (2)** controlled variables: temperature of acid, surface area of chalk, agitation

**Results:**

|  |  |
| --- | --- |
| **Concentration**  **(%)** | **Volume of CO2 generated**  **(cm3)** |
| 50 | 200 |
| 30 | 130 |
| 15 | 65 |
| 10 | 38 |
| 5 | 22 |

* 1. Draw a graph of the results.

* 1. Write a conclusion for the experiment. As the concentration of hydrochloric acid increases, the reaction rate with chalk increases. OR As the concentration of hydrochloric acid increases, the volume of CO2 generated in one minute.

**Extension**

1. Write balanced ionic equations for the following reactions:
   1. solutions of iron (II) sulfate and barium hydroxide are mixed

Fe2+(aq) + SO42-(aq) Ba2+(aq) + 2 OH-(aq) → BaSO4(s) + Fe(OH)2(s)

* 1. solutions of calcium chloride and potassium phosphate are mixed

3 Ca2+(aq) + 2 PO43-(aq) → Ca3(PO4)2(s)

* 1. solutions of calcium nitrate and sodium chloride are mixed

no reaction

* 1. solution of potassium chloride and silver nitrate are mixed

Ag+(aq) + Cl-(aq) → AgCl(s)

* 1. solutions of sodium sulfide and nickel (II) sulfate are mixed

Ni2+(aq) + S2-(aq) → NiS(s)

* 1. solutions of ammonium sulfate and barium chloride are mixed

Ba2+(aq) + SO42-(aq) → BaSO4(s)

* 1. solutions of sodium sulfide and zinc sulfate are mixed

Zn2+(aq) + S2-(aq) → ZnS(s)

* 1. solutions of aluminium nitrate and sodium phosphate are mixed

Al3+(aq) + PO43-(aq) → AlPO4(s)

* 1. solutions of ammonium carbonate and magnesium sulfate are mixed

Mg2+(aq) + CO32-(aq) → MgCO3(s)

* 1. solutions of sodium sulfate and potassium sulfide are mixed

no observable change

* 1. solutions of lead (II) nitrate and lithium iodide are mixed

Pb2+(aq) + 2 I-(aq) → PbI2(s)

1. Calculate the molar mass of the following:
   1. KMnO4

M=39.1+54.94+4x16=157.5 g/mol

* 1. lithium nitrite

M=6.94+14.01+2x16=52.95 g/mol

* 1. PbO2

M=207.2+2x16=239.2 g/mol

* 1. iron (III) hydroxide

M=55.85+3x(1.008+16)=106.874 g/mol

* 1. dinitrogen tetroxide

M=2x14.01+4x16=92.02 g/mol

1. Calculate the number of moles of the following:
2. SO3 molecules in 143.4 g of SO3

M=32.06+3x16=80.06 g/mol

n=143.3/80.06=1.79 mol

1. Li3PO4 formula units in 796.2 g of Li3PO4

M=3x6.94+30.97+4x16=115.79 g/mol

n=796.2/115.79=6.88 mol

1. O atoms in 963.4 g of Sr3(PO4)2

M=3x87.62+2x30.97+8x16=452.8 g/mol

n=963.4/452.8=2.13 mol

nO = 2.13 x 8 = 17.02 mol

1. Calculate the mass of the following:
2. 6.53×104 mol of Zn(NO2)2

M=65.38+2x14.01+4x16=157.4 g/mol

m=6.53x104x157.4=10278220 g

1. 2.67×10-2 mol of CrI3

M=52+3x126.9=432.7 g/mol

m=2.67x10-2x432.7=11.55 g

1. Sn(OH)4 that contains 32.7 mol of H atoms

M=118.7+4x(16+1.008)=186.7 g/mol

m=32.7x186.7=6106 g

1. O atoms in 986.5g of Fe(HSO4)3

M=55.85+3x1.008+3x32.06+12x16=347.05 g/mol

n=986.5/347.05=2.84 mol

n of O=12x2.84=34.1 mol

m=34.1x16=545.8 g

1. Define the mole.

A mole is a number, known as Avogadro’s number: 6.022 x1023.