**Year 10 Chemical Science Exam Revision**

1. Two different types of atoms are isolated and their atomic and mass numbers are identified.

If the atoms can be represented as  and 

Determine (using a Periodic Table where necessary):

1. Number of **protons** in each type of atom

X: \_\_\_\_\_\_\_\_\_\_\_\_\_

D: \_\_\_\_\_\_\_\_\_\_\_\_\_

1. Number of **neutrons** of each atom

X \_\_\_\_\_\_\_\_\_\_\_\_\_

D \_\_\_\_\_\_\_\_\_\_\_\_\_

1. **Sketch** the two isotopes of oxygen  and  showing the sub-atomic particles contained in each isotope.
2. **Complete** the following table:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Particle | Number of Protons | Number of Neutrons | Number of Electrons | Atomic No. |
| 14  7  N |  |  |  |  |
| 23  11  Na+ |  |  |  |  |
| 35  17  Cl - |  |  |  |  |
|  | 14 | 15 | 10 |  |

1. Construct a table to show the properties of metallic and non-metallic substances.
2. Complete the following sentences.

The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ on the periodic table tells us how many electrons are in the outer shell of an element.

The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ on the periodic table tells us how many shells contain electrons.

Non-metals become \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ reactive as the periods increase.

Metals become \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ reactive as the periods increase.

On the periodic table, Potassium is found in group \_\_\_\_\_\_\_\_ and period \_\_\_\_\_\_\_.

1. Complete the general equations listed here.
2. ACID + METAL → \_\_\_\_\_\_\_\_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. ACID + BASE → \_\_\_\_\_\_\_\_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. ACID + CARBONATE → \_\_\_\_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Classify the following as acids, bases or salts.
   1. NaOH \_\_\_\_\_\_\_\_\_\_\_
   2. CaO \_\_\_\_\_\_\_\_\_\_\_
   3. CH3COOH \_\_\_\_\_\_\_\_\_\_\_
   4. CaCl2 \_\_\_\_\_\_\_\_\_\_\_\_
   5. HNO3 \_\_\_\_\_\_\_\_\_\_\_
   6. CuSO4 \_\_\_\_\_\_\_\_\_\_
   7. Mg(OH)2 \_\_\_\_\_\_\_\_\_\_
   8. H2CO3 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   9. Zn(NO3)2 \_\_\_\_\_\_\_\_\_\_
   10. H3PO4 \_\_\_\_\_\_\_\_\_\_

1. Use your solubility table to classify the following salts as either soluble, insoluble or slightly soluble. Place a tick in the correct column.

|  |  |  |  |
| --- | --- | --- | --- |
| Salt | Soluble | Insoluble | Slightly soluble |
| AgBr |  |  |  |
| BaSO4 |  |  |  |
| NaCl |  |  |  |
| Mg(OH)2 |  |  |  |
| PbCl2 |  |  |  |
| ZnCO3 |  |  |  |
| Na2CO3 |  |  |  |
| AgCl |  |  |  |
| K3PO4 |  |  |  |
| MgSO4 |  |  |  |
| CaSO4 |  |  |  |

1. What is collision theory? State the two requirements that allow reactants to form products.
2. What factors can increase the rate of a chemical reaction?
3. In each of the following situations, circle the correct explanation.
   1. A mug of hot water and a mug of cold water dissolve a teaspoon of coffee.
      1. The mug of hot water will dissolve the coffee faster, due to the increased temperature and greater kinetic energy.
      2. The cold water will dissolve the coffee faster because the lower temperature will cause the particles to move or shiver with cold.
   2. A whole cube of sugar and a teaspoon of granulated sugar dissolve in a cup of room-temperature water
      1. The whole cube of sugar will dissolve more quickly because it is larger so it has a larger surface.
      2. Granulated sugar will dissolve faster as it has a greater surface area. This means there is more reactant to collide with and there will be more collisions.
   3. Two teabags are placed in two cups of hot water. One is stirred, one is not.
      1. The stirred tea will dissolve faster as particles have more kinetic energy. This makes particles move faster and therefore have more successful collisions.
      2. The unstirred tea will dissolve faster because the particles are slower in the water. This means the tea particles can move faster and have more collisions.
4. Match each explanation to the observation that it best explains in terms of collision theory.

|  |  |  |
| --- | --- | --- |
| **Observation** |  | **Explanation** |
| A strip of magnesium dissolves faster in 3M HCl than in 1M HCl. (temp = controlled variable) |  | This is due to the lowering of the activation energy for the reaction, so that less energy is needed by the colliding particles when they break the existing bonds. |
| Milk goes sour much faster if it is left out on a bench, than if is kept cool in a refrigerator. |  | A higher surface area will mean an increase in the rate of collision as more of the surface is exposed, this increases the rate of successful collisions, thus reaction rate increases. |
| A teaspoon of powdered calcium carbonate reacts faster with 1 M HCl than the same amount of marble chips reacts with the same 1 M HCl. |  | An increase in concentration causes an increase in rate of collision between reacting particles and therefore increases the rate of successful collisions. |
| To keep chemical reactions in the human body occurring at a high rate without the body being warmer than 360C important chemical catalysts called enzymes are needed. |  | The collisions are occurring with much higher energy, therefore there is an increase in the proportion of successful collisions, this increases the rate of successful collisions. |

**Science Inquiry Exam Revision**

Hydrochloric acid reacts with sodium carbonate, producing sodium chloride, water and carbon dioxide gas. The balanced chemical equation for this reaction is:

2HCl + Na2CO3 → 2NaCl + H2O + CO2

A student conducted an experiment where 10.0 mL of 1.0 M acid was added to different masses of sodium carbonate. The student measured the volume of carbon dioxide gas produced in each case and recorded the results in a table:

|  |  |
| --- | --- |
| Mass of Na2CO3 (g) | Volume of CO2 produced (mL) |
| 0.05 | 11.5 |
| 0.10 | 23.0 |
| 0.20 | 46.0 |
| 0.25 | 57.5 |
| 0.30 | 61.2 |
| 0.35 | 61.2 |
| 0.40 | 61.2 |
| 0.45 | 61.2 |

1. Write a suitable hypothesis for this experiment
2. State the independent and dependent variable in this experiment:

Independent: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Dependent: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. State 2 variables which **must** be controlled in order for the experiment to be fair:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Construct a suitable graph of the data collected by the student on the graph paper provided below.

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1. What volume of carbon dioxide gas is produced when 0.15 g of sodium carbonate is added to the hydrochloric acid?
2. Write an inference as to why the volume of carbon dioxide produced did not increase after 0.3g of sodium carbonate was used.