1. A student added some pure potassium nitrate crystals to cold water and stirred the mixture. A few of the crystals did not dissolve at room temperature.

a) i) Give a reason why some crystals did not dissolve. (2mk)

ii) What would happen if the contents of the mixture in a beaker were warmed? Explain.(2mks)

2. Explain why concentrated sulphuric acid is a weaker acid than dilute sulphuric acid? (3mks)

3. A bee keeper found that when stung by a bee, application of a little solution of sodium hydrogen Carbonate help to relieve the irritation from the affected area. Explain. (2mks)

4. a) Fractional distillation of liquid air usually produces nitrogen and oxygen as the major by-product.

i) Name one substance that is used to remove carbon (IV) Oxide from air before it is changed into liquid. (2mk)

ii) Describe how liquid Nitrogen gas is obtained from liquid air. Boiling points; Nitrogen = -1960C; Oxygen = -1830C. (3mk)

5. Complete the table below. (6 mks)

|  |  |
| --- | --- |
| Isotope | Number of |
|  | Protons | Neutrons | Electrons |
| 59 *Co*27 |  |  |  |

6. The electron arrangement of ions X3 + and Y2- is 2:8 and 2:8:8 respectively.

a) Write the electron arrangement of elements “X” and “Y” (4mks)

b) Write the formula of the compound that would be formed between X and Y. (2mk)

7. With reference to its atomic number of one explain why hydrogen can be placed in either group I or VII on the periodic table. (2mks)

8. An element Y has the electronic configuration of 2:8:5

a) Which period of the periodic table does the element belong? (2mk)

b) Write the formula of the most stable anion formed when element Y ionizes. (2mk)

c) Explain the difference between the atomic radius of element Y and ionic radius. (2mk)

9. An ion of phosphorous can be presented as P 3- (15)

Draw a diagram to show the distribution of the electrons and the composition in the nucleus of the ion of phosphorous. (2mks)

10. The grid below shows part of the periodic table. The letters do not represent the actual symbols of the element.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  | G |  |  |  |  |
|  |  |  |  |  | H |  |  | I |  |
| F |  |  |  |  |  |  |  |  |  |

a) Select

i) Element which has the largest atomic radius (2mk)

ii) Most reactive non- metal (2mk)

b) Show on the grid the position of element “J” which forms J-2 ions with electronic configuration 2:8:8:8 (2mk)

11. Study the information in the table below and answer questions that follows;

|  |  |  |
| --- | --- | --- |
| Ions | Electron arrangement | Ionic radius |
| Na+ | 2,8 | 0.95 |
| K2+ | 2,8,8 | 0.133 |
| Mg2+ | 2,8 | 0.065 |

Explain why the ionic radius of

a) K+ is greater than that of Na+ (2mk)

b) Mg2+ is smaller than that of Na+ (2mks)

12. Use dot (.) and crosses (x) to represent electrons, show bonding in the compounds formed when the following elements reacts (Si= 4, Na = 11, Cl = 17)

 a) Sodium and chlorine (2mk)

 b) Silicon and chlorine (2mk)

**Marking scheme (50marks)**

1. (a) (i) The solution was saturated

(ii) The remaining solid will dissolves. This is because increase in

 temperature increases the solubility of potassium nitrate.

(iii) Crystals will be formed

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2. Concentrated sulphuric acid is a covalent compound. Dilute sulphuric acid is an ionic compound. It ionizes fully producing more hydrogen ions (H+)

3. Sting from the bee contains Histamine which is acidic. This causes irritation. Sodium hydrogen carbonate being alkaline/ basic neutralizes the acid to remove the irritation.

4. (a) Pb2+

 (b) Zn2+

 (c) Co3-2(a) + Zn2+(aq) → ZnCO3(s)

5. Proton = 27

Neutrons =32

Electrons = 27

6. a) X= 2:8::3

 Y= 2:8:6

 b) X2Y3

7. Hydrogen can gain one electron when combined with electronegative element to form H. Hence behave like group seven elements can also lose one electron to form H+ i.e, behave like group one element.

8. a) Period 3

 b) Y-3

c) The ionic radius of Y is greater than its atomic radius Y reacts by gaining three electrons. The electrons added increases the repulsion / screening effect between the adjacent energy levels.

 9.

10. a) i) F, (ii) i

 b) J is in-group VI, period 3

11. a) K+ has many electrons thus many energy levels. Na+ has few number of

electrons and thus few energy levels.

b) Mg2+ contain large number of protons compared to Na+ i.e the effective nuclear charge of Mg+2 ions is high, thus results into strong force of attraction between the nucleus and the electrons in their energy levels. Hence they are pulled close to the nucleus.

 22, 2, 12, 19, 7, 1, 2, 3, 4, 5, 6, 7,