**Task 5: Validation Test Part B (13 marks)**

1. An experimentalist does some experiments with substances W, X, Y and Z.

Melting point NaCl : 800°C Melting point NaOH :318°C

Typical melting points of metals 800°C or more

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **W** | **X** | **Y** | **Z** |
| State: Solid, liquid or gas at room temperature | Solid | Solid | Solid | Solid |
| Appearance | Hard | Hard | Soft |  |
| Scratches it with a diamond knife | No effect | Flakes off or shatters if he/she presses too hard | No effect | No effect |
| Heats it to 250°C  And tries to stretch it out | Some stretching out | No effect | Turns into a liquid | No effect |
| Heats it to 900°C | Melts | Melts | Turns into a gas | solid |
| Measures its conductivity or the current at room temperature | 2000mA | No current | No current | No current |
| Measures its conductivity at 400°C | 4000mA | 270mA | No current | No current |
| Places the substance in water | Nothing happens | Dissolves | Nothing happens | Nothing happens |
| Measures the conductivity (current) of the dissolved substance in water | Won’t dissolve | 330mA | 0mA | Won’t dissolve |

From the results determine the type of bonding that each substance has : [6 marks]

W: \_\_\_*Metallic*\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (1)

X :\_\_\_\_\_*Ionic*\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (1)

Y: \_\_\_\_\_\_*Covalent molecular*\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (1)

Z :\_\_\_\_\_\_\_\_*Covalent network*\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (1)

State the charge carriers in W: \_\_\_*electrons*\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ( 1 mark)

State the charge carriers in X : \_\_\_\_*charged ions*\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (1 mark)

1. a) You are given blue CuSO4 crystals and a piece of blue metal. **In answering the following questions do not choose electrical conduction experiments** [7 marks]

State an experiment that allows you to distinguish between the two: (1)

*Smash with a hammer*

Explain what will happen, and how this allows you to distinguish between the two materials. Make sure you make reference to the materials structure when answering this question.

*The metal will deform (1) because when the cations move the delocalised electrons can move around to maintain the electrostatic attraction (2)*

*The CuSO4 crystals will shatter (1) as the positive ions and negative ions can line up with like charged ions and so repel each other (2)*