



**KWAZULU-NATAL PROVINCE**

EDUCATION  
REPUBLIC OF SOUTH AFRICA

**NATIONAL  
SENIOR CERTIFICATE**

**GRADE 10**



**MARKS: 75**

**DURATION: 1½ hours**

**This marking guideline consists of 5 pages.**

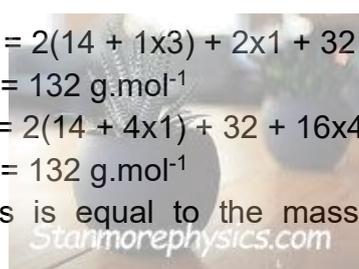


**QUESTION 1:**

- 1.1 C ✓✓ (2)
  - 1.2 C ✓✓ (2)
  - 1.3 A ✓✓ (2)
  - 1.4 B ✓✓ (2)
  - 1.5 D ✓✓ (2)
- [10]**

**QUESTION 2**

- 2.1
  - 2.1.1 Oak (chip). ✓  
The density of oak is less than the density of water. ✓ (2)
  - 2.1.2 Aluminium. ✓  
Aluminium has a lower density than lead. ✓  
For a constant mass, the density is inversely proportional to the volume. ✓ (3)
- 2.2
  - 2.2.1 Pure Substance ✓ (1)
  - 2.2.2  $4\text{Al} + 3\text{O}_2 \rightarrow 2\text{Al}_2\text{O}_3$  LHS ✓  
RHS ✓  
Balancing ✓ (3)
- 2.3
  - 2.3.1 Physical (change) ✓ (1)
  - 2.3.2 Decomposition ✓  
A single reactant is broken down into multiple products. ✓ (2)
- 2.4
  - Mass of reactants =  $2(14 + 1 \times 3) + 2 \times 1 + 32 + 16 \times 4$  ✓  
=  $132 \text{ g} \cdot \text{mol}^{-1}$
  - Mass of products =  $2(14 + 4 \times 1) + 32 + 16 \times 4$  ✓  
=  $132 \text{ g} \cdot \text{mol}^{-1}$
  - Mass of reactants is equal to the mass of products. Therefore mass is conserved. ✓ (3)



**[15]**

**QUESTION 3**

- 3.1 Melting. ✓ (1)
- 3.2 Thermometer ✓ (1)
- 3.3 Crushed ice allows for easier transfer of heat energy from one particle to the next. ✓✓
- or
- Use crushed ice because it is easier for the thermometer to measure the temperature ✓✓ (2)
- 3.4 The temperature of the substance increases. ✓  
The average kinetic energy of the particles increases. ✓  
Particles move faster. ✓ (3)
- 3.5 The water has reached room temperature ✓ and there isn't an external heat source. ✓ (2)
- 3.6 Liquid. ✓ (1)
- [10]**

**QUESTION 4**

- 4.1
- 4.1.1 A larger atomic radius results in lower first ionisation energy. ✓ (1)
- 4.1.2 As you move from left to right across a period the effective nuclear charge increase ✓  
The force of attraction between the nucleus and the outer orbital increases. ✓
- or
- Cl has a smaller atomic radius than Mg ✓✓ (2)
- 4.1.3 Decrease ✓  
As you move down the group the atomic radius increases. ✓  
The force of attraction between the nucleus and valence electrons decreases. ✓ (3)
- 4.1.4 The outermost energy level is full in noble gases ✓ resulting in a stable electronic configuration ✓
- or
- Noble gases have the smallest atomic radius ✓ for the elements in the same period. ✓ (2)
- 4.2 The energy released when an electron is attached to an atom or molecule to form a negative ion. ✓✓ (2)

4.3 Halogen ✓

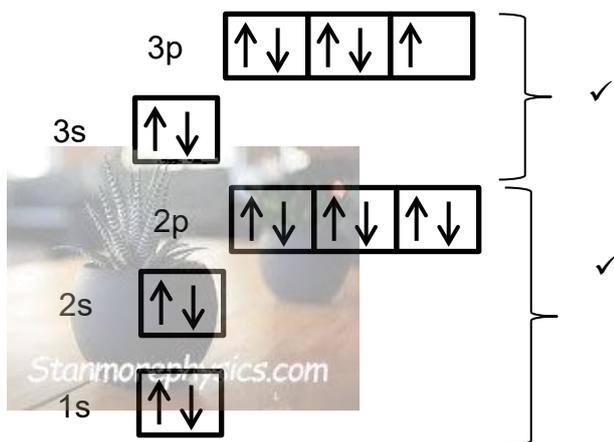
(1)  
[11]

**QUESTION 5**

5.1

5.1.1 18 ✓  
5.1.2

(1)



sp-notation:  $1s^2 2s^2 2p^6 3s^2 3p^5$  ✓

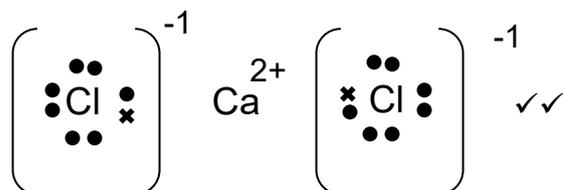
(3)

5.1.3 Ionic bonds ✓

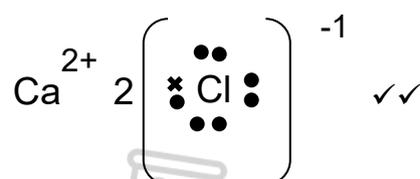
(1)

5.1.4

**OPTION 1**



**OPTION 2**



(2)

5.2 Let the 2<sup>nd</sup> isotope be Copper – X  
 % Copper – X = 100 – 25 ✓ = 75%

$$63,5 = 65 \times \frac{25}{100} + X \left( \frac{75}{100} \right)$$

$$x = 63$$

$$\text{number of neutrons} = 63 - \underline{29} \checkmark$$

$$= 34 \checkmark$$

(6)

5.3

5.3.1 MgO ✓✓

(2)

5.3.2 (NH<sub>4</sub>)<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> ✓✓

(2)

5.4 Copper (II) nitrate ✓✓ **Note:** Copper nitrate ✓

(2)

**[19]**

### QUESTION 6

6.1

$$6.1.1 \quad M(\text{CaCO}_3) = 40 + 12 + 16 \times 3 \checkmark$$

$$= 100 \text{ g.mol}^{-1} \checkmark$$

(2)

#### Positive marking from 6.1.1

$$6.1.2 \quad n(\text{CaCO}_3) = \frac{m}{M} \checkmark$$

$$n(\text{CaCO}_3) = \frac{50}{100} \checkmark$$

$$n(\text{CaCO}_3) = 0,5 \text{ mol}$$

$$n(\text{CaCO}_3) = \frac{N}{N_A} \checkmark$$

$$0,5 = \frac{N}{6,02 \times 10^{23}} \checkmark$$

$$N = 3,01 \times 10^{23} \text{ molecules} \checkmark$$

(5)

$$6.2 \quad n(\text{CO}_2) = \frac{V}{V_m} \checkmark$$

$$0,5 = \frac{V}{22,4} \checkmark$$

$$V = 11,2 \text{ dm}^3 \checkmark$$

(3)

**[10]**

**TOTAL: 75**