

2 Calcium is an element in Group II of the Periodic Table.

(a) Identify the element in Group II which has only five occupied electron shells.

..... [1]

(b) Name and describe the type of bonding found in elements in Group II.

name .....

description .....

.....

.....

.....

[4]

(c) When a piece of calcium is added to some cold water containing universal indicator a reaction takes place.

(i) Give **three** observations when this reaction takes place.

1 .....

2 .....

3 .....

[3]

(ii) Name the **two** products of this reaction.

..... and .....

[2]

(d) Calcium burns in oxygen.

(i) State the colour of the flame.

..... [1]

(ii) Write the symbol equation for this reaction.

..... [2]

(e) Crystals of hydrated calcium nitrate contain water molecules.

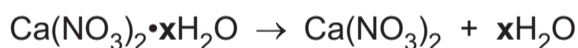
The formula of hydrated calcium nitrate is  $\text{Ca}(\text{NO}_3)_2 \cdot x\text{H}_2\text{O}$ .

$x$  is a whole number.

(i) State the term given to the water molecules present in hydrated crystals.

..... [1]

(ii) When hydrated calcium nitrate is heated gently, the following reaction occurs.



A sample of hydrated calcium nitrate is heated gently. 3.28 g of  $\text{Ca}(\text{NO}_3)_2$  forms and the mass of the crystals decreases by 1.44 g.

[ $M_r$ :  $\text{Ca}(\text{NO}_3)_2$ , 164;  $\text{H}_2\text{O}$ , 18]

Determine the value of  $x$  in  $\text{Ca}(\text{NO}_3)_2 \cdot x\text{H}_2\text{O}$  using the following steps.

- Calculate the number of moles of  $\text{Ca}(\text{NO}_3)_2$  that remain.

..... mol

- Calculate the number of moles of  $\text{H}_2\text{O}$  given off.

..... mol

- Determine the value of  $x$ .

$x =$  .....

[3]

[Total: 17]