

## Section A:

1. Match the quantities below to their correct units.

Mass
$M_r$
Number of moles

no units
mol
g

2. In the box below, write the equation that links number of moles, mass and relative formula mass.

3. Define relative formula mass.

**For any calculations, round final answers to 2 decimal places.**

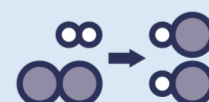
4. Calculate the relative formula mass of the following elements and compounds.
- Oxygen ( $O_2$ )
  - Ammonia ( $NH_3$ )
  - Methane ( $CH_4$ )
  - Sodium hydroxide ( $NaOH$ )
  - Ammonium hydroxide ( $NH_3OH$ )
  - Lithium carbonate ( $Li_2CO_3$ )

5. Calculate the number of moles in:
- 34 g of ammonia

- 120 g of sodium hydroxide

- 100 g of lithium carbonate

6. Calculate the mass of:





a. 0.25 moles of methane

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b. 0.75 moles of ammonium hydroxide

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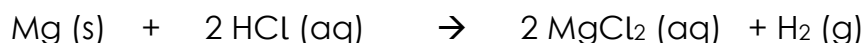
c. 0.1 moles of oxygen

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### Section B

7. Magnesium reacts with hydrochloric acid according to the equation:



a. Explain what is meant by the state symbol (aq).

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b. Calculate the mass of magnesium chloride that could be made from 50 g of magnesium.

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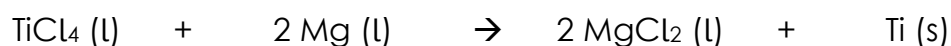
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8. Titanium metal can be obtained from a reaction between molten magnesium and titanium chloride. The equation for the reaction is:

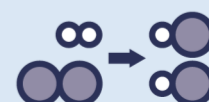


a. Explain what is meant by the term molten.

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b. Calculate the mass of titanium chloride needed to produce 800 g of titanium.



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9. Propane is a fuel that can be burned to release energy. The equation for the reaction is:



- a. Calculate the mass of carbon dioxide that is produced when 250 g of propane is burned.

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- b. Explain why the reaction would need to be carried out in a closed vessel to verify the mass of carbon dioxide produced.

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### Section C

10. Aluminium can be extracted from aluminium oxide by electrolysis. The equation for the process is:



- Calculate the relative formula mass of aluminium oxide.
- Calculate the mass of aluminium oxide required to produce 1 kg of aluminium.
- Explain what has to happen to the aluminium oxide before it can be electrolysed.
- Describe what happens at the positive electrode.
- Write the half equation for this reaction.
- Explain why electrolysis is not used to extract less reactive metals.

