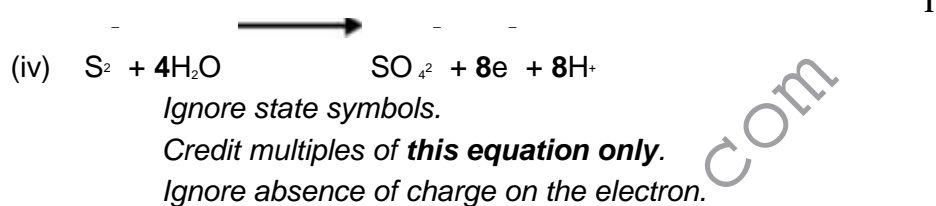
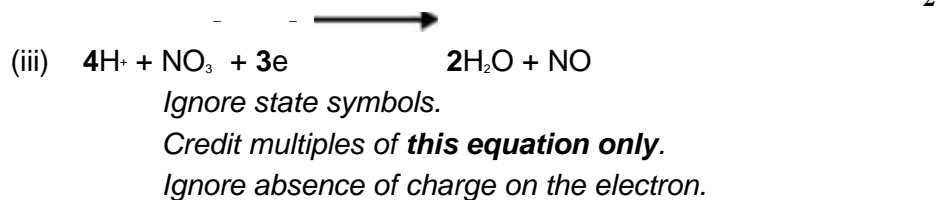
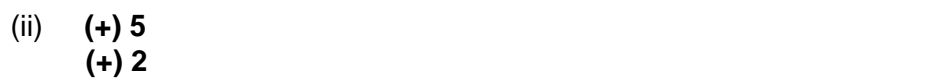



**MEGA LECTURE**

TOPIC 6 TEST MS



→ **[5]**



→ **[3]**



3. (a) (i)  $\text{SrCl}_2(\text{aq}) + \text{Na}_2\text{SO}_4(\text{aq}) \rightarrow \text{SrSO}_4(\text{s}) + 2\text{NaCl}(\text{aq})$   
*Allow multiples, including fractions.*  
*Allow ionic equations.*  
*Lose this mark if any of the state symbols are missing or incorrect.* 1
- (ii) Add nitric acid to the mixture (until in excess)  
*Do not allow any suggestion that the solution is an emetic.* 1
- Filter (to isolate strontium sulfate) 1
- (b) Insoluble barium sulfate is formed  
*Allow 'removes barium ions as a precipitate'.* 1
- (c) Add silver nitrate, then dilute ammonia (solution) **M1**  
*Do not allow answers which imply silver nitrate and ammonia are added at the same time.*  
*Allow 'add silver nitrate, then concentrated ammonia (solution)'.*  
*Can score **M1** in the answer for **M3*** 1
- Cream precipitate **M2**  
*Allow 'off white precipitate'.* 1
- No visible change or precipitate dissolves slightly in dilute ammonia **M3**  
*Allow 'soluble / colourless solution / precipitate dissolves in concentrated ammonia'.*  
*Allow 3 marks for:*  
*Add dilute ammonia (solution), then silver nitrate **M1***  
*No visible change **M2***  
*Cream / off white precipitate with silver nitrate **M3*** 1
- [7]



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4. (a) **M1 (could be scored by a correct mathematical expression)**

*Correct answer to the calculation gains all of M1, M2 and M3*

$$M1 \quad H = \frac{H_f(\text{products})}{H_f(\text{reactants})}$$

*Credit 1 mark for 101 (kJ mol<sup>-1</sup>)*

**OR** a correct cycle of balanced equations

$$M2 = 1669 - 3(590)$$

$$= 1669 + 1770$$

(This also scores M1)

$$M3 = +101 \text{ (kJ mol}^{-1}\text{)}$$

**Award 1 mark ONLY for 101**

*For other incorrect or incomplete answers, proceed as follows*

- check for an arithmetic error (AE), which is either a transposition error or an incorrect multiplication; this would score 2 marks (M1 and M2)
- If no AE, check for a correct method; this requires either a correct cycle with 3Sr and 2Al OR a clear statement of M1 which could be in words and scores **only M1**

**M4 - Using powders**

Any **one** from

- To increase collision frequency / collisions in a given time / rate of collisions
- To increase the surface contact / contact between the solids / contact between (exposed) particles  
*Ignore dividing final answer by 3*  
*Penalise M4 for reference to molecules.*

5

**M5 Major reason for expense of extraction**

Any **one** from

- Aluminium is extracted by electrolysis OR aluminium extraction uses (large amounts of) electricity
- Reaction / process / It / the mixture requires heat



- It is endothermic

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- (b) Calcium has a higher melting point than strontium, because  
*Ignore general Group 2 statements.*

**Correct reference to size of cations / proximity of electrons**

M1 (For Ca) delocalised electrons closer to cations / positive ions  
/ atoms / nucleus

**OR** cations / positive ions / atoms are smaller

**OR** cation / positive ion / atom or it has fewer (electron) shells / levels

*Penalise M1 if either of Ca or Sr is said to have more or less delocalised electrons OR the same nuclear charge.*

*Ignore reference to shielding.*

**Relative strength of metallic bonding**

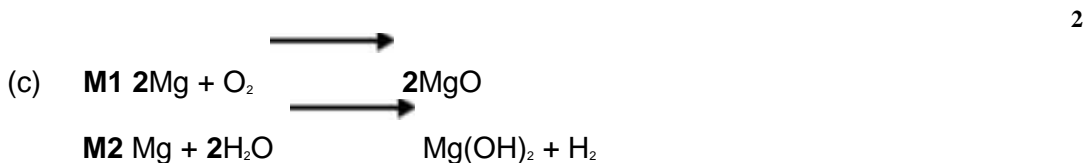
M2 (Ca) has stronger attraction between the cations / positive ions / atoms / nucleus and the delocalised electrons

**OR**

stronger metallic bonding

(assume argument refers to Ca but credit converse argument for Sr)

**CE= 0** for reference to molecules or Van der Waals forces or intermolecular forces or covalent bonds.



*Credit multiples of the equations.*

**M3** Magnesium hydroxide is used as an antacid / relieve indigestion (heartburn) / neutralise (stomach) acidity / laxative

*Not simply "milk of magnesia" in M3*

3 [10]

5.  $\text{Mg}^{2+}$  and  $\text{Cl}^-$

*Do not allow names.*

[1]

6. (a) sulfuric acid /  $\text{H}_2\text{SO}_4$

1

- (b) hydriodic acid / HI **OR** hydrobromic acid / HBr

1



(c) add **dilute** ammonia solution

**Notes**

\* do not allow 'concentrated ammonia' or 'ammonia'

1

precipitate / ppt disappears / dissolves **OR** colourless solution forms

1

(d) would react with the acid / no gas evolved in tests

1

[5]

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7. (a) decreases; 1
- increase in shielding ; 1
- (or atomic radius)  
less attraction for bonding (or shared) electrons; 1
- (b) brown solution; 1
- 
- (or black solid)  
 $\text{Cl}_2 + 2\text{KI} \rightarrow 2\text{KCl} + \text{I}_2$ ;
- (or ionic equation) 1
- (c)  $\text{SO}_2$ ; 1
- $\text{SO}_4^{2-} + 4\text{H}^+ + 2\text{e}^- \rightarrow \text{SO}_2 + 2\text{H}_2\text{O}$  ; 1
- S (also  $\text{H}_2\text{S}$ ); 1
- $\text{SO}_4^{2-} + 8\text{H}^+ + 6\text{e}^- \rightarrow \text{S} + 4\text{H}_2\text{O}$  (or  $\text{SO}_4^{2-} + 10\text{H}^+ + 6\text{e}^- \rightarrow \text{H}_2\text{S} + 4\text{H}_2\text{O}$ )  
→ 1
- (d)  $\text{Cl}_2 + 2\text{NaOH} \rightarrow \text{NaCl} + \text{NaOCl} + \text{H}_2\text{O}$ ; 1
- sodium chloride; 1
- 1; 1
- sodium chlorate(I) (or bleach etc); 1
- +1; 1
- [14]**
8. C [1]
9. A [1]



- |       |     |
|-------|-----|
| 10. C | [1] |
| 11. D | [1] |
| 12. C | [1] |

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