



1. (a)  $\text{Al(OH)}_3 + 3\text{HCl} \rightarrow \text{AlCl}_3 + 3\text{H}_2\text{O}$  /  $\text{Mg(OH)}_2 + 2\text{HCl} \rightarrow \text{MgCl}_2 + 2\text{H}_2\text{O}$ ; 1  
*Accept ionic equations.*
- (b) less effective **and** (magnesium hydroxide) 2/0.2 mol  $\text{OH}^-$  ions available as compared to (aluminium hydroxide) 3/0.3 mol  $\text{OH}^-$  ions for neutralization / neutralizes  $2\text{H}^+$ /0.2 mol acid as compared to  $3\text{H}^+$ /0.3 mol acid; 1  
*Do not accept aluminium hydroxide can neutralize more acid.*
- (c) strong base / corrosive / harmful to the body; 1
- (d) *Alginates:*  
provide a neutralizing layer on top of the stomach contents / to prevent acid rising up the esophagus / prevents acid reflux/heartburn;  
*Dimethicone:*  
as an anti-foaming agent / to prevent flatulence/gas/bloating; 2
- [5]
2. (a) (i)  $\text{NaHCO}_3 + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O} + \text{CO}_2$ ;  
*Accept  $\text{H}_2\text{CO}_3$  instead of  $\text{H}_2\text{O}$  and  $\text{CO}_2$ .*  
 $\text{Mg(OH)}_2 + 2\text{HCl} \rightarrow \text{MgCl}_2 + 2\text{H}_2\text{O}$ ; 2
- (ii)  $n(\text{NaHCO}_3) = 1.19 \times 10^{-2}$  mol;  
 $n(\text{Mg(OH)}_2) = 8.57 \times 10^{-3}$  mol;  
 $\text{Mg(OH)}_2$  reacts with twice the number of moles of acid / is more effective than  $\text{NaHCO}_3$  / *OWTTE*; 3
- (b) produce a neutralizing layer/(foam) barrier which prevents heartburn/acid rising into the esophagus; 1
- [6]
3. (a) hydrochloric acid; 1
- (b)  $\text{Al(OH)}_3 + 3\text{HCl} \rightarrow \text{AlCl}_3 + 3\text{H}_2\text{O}$ ;  
 $\text{CaCO}_3 + 2\text{HCl} \rightarrow \text{CaCl}_2 + \text{CO}_2 + \text{H}_2\text{O}$ ;  
Ignore state symbols.  
*Award [1 max] for correct reactants and products in both equations if equations are not balanced.* 2



- (c) (i) neutralizes excess stomach acid / produces neutralizing layer;  
prevents acid in stomach from rising / prevents acid reflux; 2
- (ii) prevent flatulence/(stomach) bloating / *OWTTE*;  
dimethicone / polydimethylsiloxane/PDMS; 2
- [7]
4. (a)  $\text{NaHCO}_3 + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O} + \text{CO}_2$  /  $\text{HCO}_3^- + \text{H}^+ \rightarrow \text{H}_2\text{O} + \text{CO}_2$ ;  
*States not required for mark.* 1
- (b)  $\text{CaCO}_3$ ;  
1 mol  $\text{NaHCO}_3$  neutralizes 1 mol  $\text{HCl}$  **and** 1 mol  $\text{CaCO}_3$  neutralizes  
2 mol  $\text{HCl}$  /  $\text{CaCO}_3 + 2\text{HCl} \rightarrow \text{CaCl}_2 + \text{H}_2\text{O} + \text{CO}_2$ ; 2
- [3]
5. (a) magnesium / aluminium / calcium; 1  
*Any two for [1].*
- (b)  $\text{NaHCO}_3 + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O} + \text{CO}_2$ ; 1  
*Do not allow  $\text{H}_2\text{CO}_3$ .*
- (c) acid from the stomach rises into the esophagus; 1
- (d) as an anti-foaming agent / to prevent problem in (c) / to prevent flatulence; 1
- [4]