

Answers to Exercise 7.4 Predicting Whether or Not a Reaction Occurs

1.
 - (a) ionic compound
 - (b) F₂, Cl₂, Br₂, I₂, O₂
 - (c) N₂ (not the only element that fits this description, but the main one we discussed)
 - (d) He, Ne, Ar, Kr, Xe, Rn
 - (e) H₂
 - (f) H₂
 - (g) H₂O
 - (h) a metal hydroxide
 - (i) CO₂
 - (j) ...the gas produced is CO₂, and the solid produced is a metal oxide.

2.

	Cl ₂ (g)	Br ₂ (l)	I ₂ (s)	O ₂ (g)	N ₂ (g)	H ₂ O(l)	H ⁺ (aq)	OH ⁻ (aq)
Li(s)	LiCl(s)	LiBr(s)	LiI(s)	Li ₂ O(s)	Li ₃ N(s)	LiOH(aq) and H ₂ (g)	Li ⁺ (aq) and H ₂ (g)	*
Na(s)	NaCl(s)	NaBr(s)	NaI(s)		no rxn ^x	NaOH(aq) and H ₂ (g)	Na ⁺ (aq) and H ₂ (g)	*
K(s)	KCl(s)	KBr(s)	KI(s)		no rxn ^x	KOH(aq) and H ₂ (g)	K ⁺ (aq) and H ₂ (g)	*
Mg(s)	MgCl ₂ (s)	MgBr ₂ (s)	MgI ₂ (s)	MgO(s)	Mg ₃ N ₂ (s)	Mg(OH) ₂ (s) and H ₂ (g)	Mg ²⁺ (aq) and H ₂ (g)	*
Ca(s)	CaCl ₂ (s)	CaBr ₂ (s)	CaI ₂ (s)	CaO(s)	Ca ₃ N ₂ (s)	Ca(OH) ₂ (s) and H ₂ (g)	Ca ²⁺ (aq) and H ₂ (g)	*
Al(s)	AlCl ₃ (s)	AlBr ₃ (s)	AlI ₃ (s)	no rxn due to surface layer of Al ₂ O ₃	no rxn ^x	no rxn due to surface layer of Al ₂ O ₃	Al ³⁺ (aq) and H ₂ (g)	[Al(OH) ₄] ⁻ (aq) and H ₂ (g)
Li₂O(s)				no rxn ^o	no rxn ^x	LiOH(aq)	Li ⁺ (aq) and H ₂ O(l)	no rxn
BeO				no rxn ^o	no rxn ^x	no rxn ^y	Be ²⁺ (aq) and H ₂ O(l)	[Be(OH) ₄] ²⁻ (aq)
MgO(s)				no rxn ^o	no rxn ^x	Mg(OH) ₂ (s)	Mg ²⁺ (aq) and H ₂ O(l)	no rxn
CaO(s)				no rxn ^o	no rxn ^x	Ca(OH) ₂ (s)	Ca ²⁺ (aq) and H ₂ O(l)	no rxn
Al₂O₃(s)				no rxn ^o	no rxn ^x	no rxn ^y	Al ³⁺ (aq) and H ₂ O(l)	[Al(OH) ₄] ⁻ (aq)

^o Metal oxides will not react with more oxygen unless the metal can adopt a more positive charge.

^x Very few things react with N₂(g).

^y Unlike most metal oxides, BeO and Al₂O₃ do not react with water. They do, however, react with both acids and bases (whereas most metal oxides only react with acids).

*These metals wouldn't react with OH⁻ but they would react with the water it's dissolved in.