Do not write outside the box

0 6 Bleach is a solution of sodium hypochlorite (NaClO).

Chlorine gas is produced when bleach reacts with hydrochloric acid.

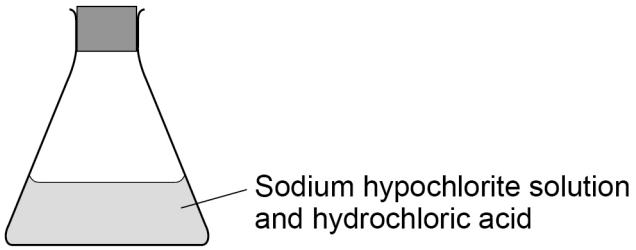
$$NaClO(aq) + 2HCl(aq) \rightleftharpoons NaCl(aq) + H_2O(l) + Cl_2(g)$$

0 6 . 1 Give the test and result for chlorine gas.

[2 marks]

Figure 8 shows a sealed flask of sodium hypochlorite and hydrochloric acid at equilibrium.

Figure 8



0 6 . 2 Explain why equilibrium is reached in this reaction.

[2 marks]

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0 6 . 3 The stopper in **Figure 8** is removed and hydrochloric acid is added.

The stopper is replaced.

Explain what happens to the equilibrium.

[4 marks]

Question 6 continues on the next page

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Chlorine gas is also produced when hydrogen chloride decomposes.

$$2HCl(g) \rightleftharpoons H_2(g) + Cl_2(g)$$

The forward reaction is endothermic.

0 6 . 4 Predict the effect of increasing the temperature on the amount of chlorine gas produced at equilibrium.

Explain your answer using Le Chatelier's Principle.

[2 marks]

0 6 . 5 Explain the effect of increasing the pressure on this equilibrium.

[2 marks]

12

END OF QUESTIONS

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	damp / moist litmus paper	ignore colour of litmus paper	1	AO1 5.8.2.4
	bleaches / goes white		1	
06.2	forward and reverse rates equal		1	AO1 5.6.2.1 5.6.2.3
	because no escape of reactants or products	allow closed system allow particles for reactants or products	1	AO2 5.6.2.1 5.6.2.3
06.3	equilibrium shifts	allow no longer in equilibrium	1	AO3 5.6.2.3 5.6.2.4 5.6.2.5 5.6.2.7
	to right-hand side	allow in favour of forward reaction	1	
	to produce more of any products **or** to reduce any reactants	allow correct references to Le Chatelier's Principle	1	
	(new) equilibrium will be established		1	
06.4	amount of chlorine gas increases		1	AO2 5.6.2.4 5.6.2.6
	(because) system shifts to counteract the change	allow (because) system shifts to take in energy allow (because) system shifts in endothermic direction	1	AO1 5.6.2.4 5.6.2.6
06.5	no change		1	AO2 5.6.2.4 5.6.2.7
	because equal numbers of molecules **or** moles (of gas) on each side		1	AO1 5.6.2.4 5.6.2.7
Total			**12**	