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| Year 12 Chemistry Validation 1  **Le Chatlier's Principle** | | |
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| **Name:** | **Teacher:** | **Mark / 25** |
| **Comment:** | | |

One equation for the equilibrium involving chromate and dichromate ion is

2 CrO42- + 2H+ ←→ Cr2O72- + H2O

Yellow Orange

A solution is prepared which contains 0.05 molar of both potassium chromate and potassium dichromate.

Two samples of this mixture are taken and to each of them the following are added.

Sample 1: Excess 0.2 molar hydrochloric acid

1. What colour is the final solution? \_\_\_\_\_\_\_ **ORANGE** \_\_\_\_\_\_\_\_\_

(1 mark)

Sample 2: Excess 0.2 molar sodium hydroxide

2. What colour is the final solution? \_\_\_\_\_\_\_**Yellow** \_\_\_\_\_\_\_\_\_\_\_

(1 mark)

3. Explain the observations for both samples of the solution

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| **↑[H+] (1) equl shifts to favour the forward reaction to reduce [H+] (1) PoE shifts** |
| **right towards orange products (1) hence the solution turns an orange colour (1)** |
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| **↓[H+] (OH- + H+ →H2O) or mention neutralization (1) shifts to favour reverse** |
| **reaction to ↑[H+] (1) PoE shifts left towards yellow reactants (1) hence the** |
| **solution turns an yellow colour (1)** |
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(8 marks)

The equilibrium of cobalt(II) chloride – 6 water and CoCl42- ion is:

Co(H2O)62+(aq) + 4 Cl- (aq) ↔ CoCl42-(aq) + 6H2O (l).

If CoCl2.6H2O is added to water.

4. What colour would the solution be? \_\_\_\_\_\_ **Pink** \_\_\_\_\_\_ (1 mark)

If sufficient HCl is added to the solution to bring about a colour change.

5. What colour will the solution become? \_\_\_\_\_ **Blue** \_\_\_\_\_\_ (1 mark)

6. In terms of Le Chatliers principle, explain the colour change that occurred with

the addition of HCl. (4 marks)

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| **Addition of HCl ↑ [Cl-] (1) LCP favour a ↓ [Cl-] so favour the forward Rx (1)** |
| **Equilibrium will shift to the right (1/2) producing more blue CoCl42-(aq) (1/2)** |
| **which turns the solution a blue colour (1)** |
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The **final** solution is heated gently **and** then cooled in an ice bath.

7. Describe the colour changes that would occur.

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| **Starting blue (1) to Slightly darker blue (1) then to pink (1)** |
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(3 marks)

8. Explain the colour changes that occurred in relation to Le Chatlier’s principle.

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| **Increase Temp: According to LCP when the temperature is increased the system favours the endothermic reaction to reduce temp (1).** |
| **The forward Rx is endothermic so it is favoured (1).** |
| **PoE shifts right and increases conc of blue product so solution becomes darker blue (1).** |
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| **Decrease Temp: According to LCP when the temperature is decreased the system favours the exothermic reaction to increase temp (1).** |
| **The reverse Rx is exothermic so it is favoured (1).** |
| **PoE shifts left and increases conc of pink reactant so solution becomes pink (1).** |

(6 marks)

**End of Lab Validation**

**Total Mark / 25**