

Chemistry 12  
**Electrochemistry**

Blue  
version 1

Name: Keyz  
Block: \_\_\_\_\_

**Part 1: Multiple Choice**

Outcome 1

1. C
2. C
3. A
4. D
5. B
6. D
7. B
8. C
9. A
10. D

Outcome 2

11. A
12. A
13. B
14. D
15. B
16. B
17. D
18. C
19. D
20. A

Outcome 3

21. D
22. C
23. D
24. C
25. D
26. B
27. D
28. A
29. B
30. A

Review

31. A
32. D
33. B
34. C
35. C
36. D
37. C
38. D
39. B
40. A

Name: Key

Date: \_\_\_\_\_

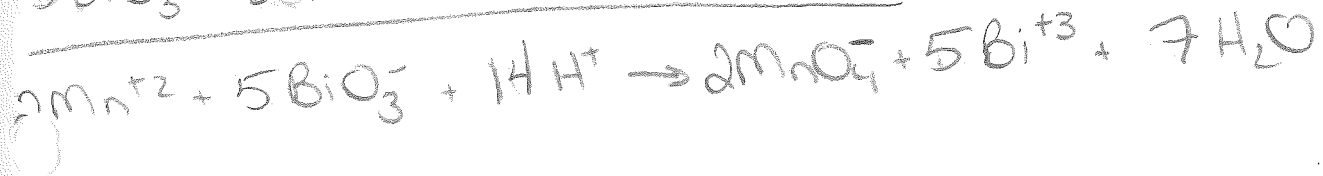
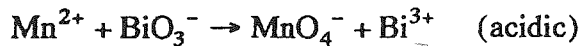
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## Electrochemistry Test

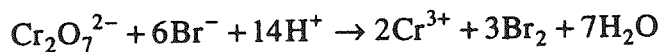
### Written Part

1. Balance the following redox reaction:

(4 marks)



2. Consider the following reaction:



In a redox titration, 15.58 mL of 0.125 M  $\text{Cr}_2\text{O}_7^{2-}$  was needed to completely oxidize the  $\text{Br}^-$  in a 25.00 mL sample of NaBr. Calculate the  $[\text{Br}^-]$  in the original solution.

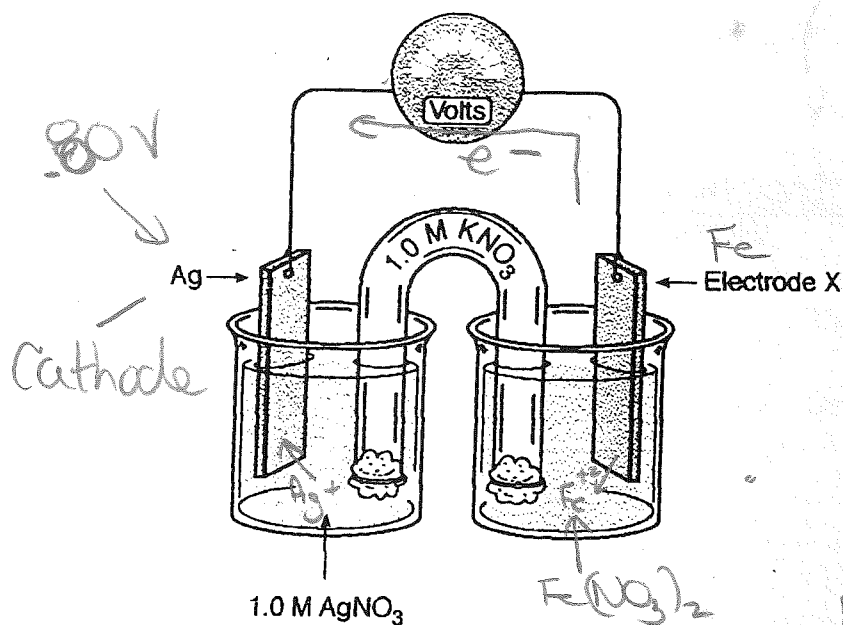
(3 marks)

$$\begin{aligned} \text{mol Cr}_2\text{O}_7^{2-} &= 0.125 \text{ M} (0.01558 \text{ L}) \\ &= 0.0019479 \text{ mol} \end{aligned}$$

$$0.0019479 \text{ mol Cr}_2\text{O}_7^{2-} \left( \frac{6 \text{ mol Br}^-}{1 \text{ mol}} \right) = 0.011689 \text{ mol Br}^-$$

$$\frac{0.011689 \text{ mol Br}^-}{0.025 \text{ L}} = \underline{0.467 \text{ M Br}^-}$$

3. Consider the following electrochemical cell:



$$1.25 = x - .8$$

$$x = 2.05$$

↳ none

$$E^{\circ} = E_{\text{c}} - E_{\text{o}}$$

$$1.25 \text{ V} = .80 - x$$

$$x = -.45 = \text{Fe}$$

a) The initial cell voltage in the diagram above is 1.25 V. Identify electrode X.

(1 mark)

Fe (iron)

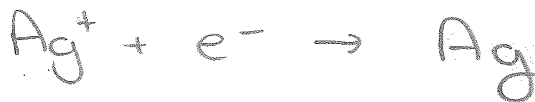
b) Towards which electrode will the  $\text{K}^+$  ions migrate?

(1 mark)

Ag

c) Write the equation for the reduction half-reaction that occurs.

(1 mark)



d) On the diagram, indicate the direction of electron flow.

(1 mark)

4. Using  $E^\circ$  values, explain why Cu will react with 1.0 M  $\text{HNO}_3$ , but not with 1.0 M  $\text{HCl}$ .

(3 marks)

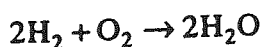
$$\begin{aligned} \text{Cu} + \text{HNO}_3 \\ E^\circ = R - O \\ = .8 - .34 \\ = .46 \text{ V} \end{aligned}$$

↳ produces  $\text{e}^-$   
∴ spontaneous

$$\begin{aligned} \text{Cu} + \text{HCl} \rightarrow \text{H}^+ \text{ is it} \\ E^\circ = R - O \\ = 0 - .34 \\ = -.34 \text{ V} \end{aligned}$$

↳ requires  $\text{e}^-$   
∴ not

5. The overall reaction in a fuel cell is:



(spontaneous)

- a) Write the equation for the half-reaction at the anode. ox.

(1 mark)

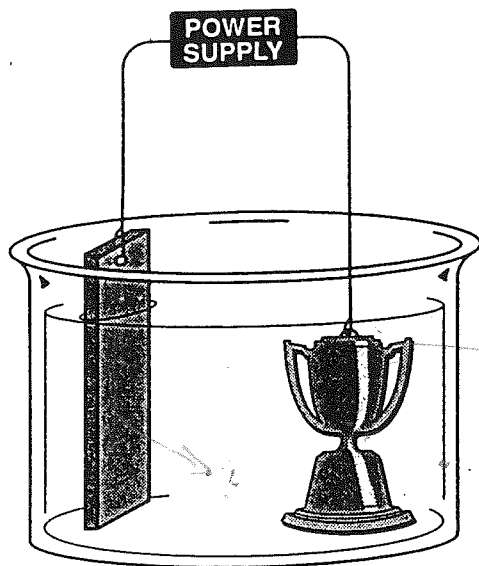


- b) Is the overall reaction spontaneous? Explain.

(1 mark)

yes. because  $\text{O}_2 = \text{reduced}$ ,  $\text{H}_2 = \text{oxidized}$   
∴  $E^\circ = .82 + .41 = 1.23 \text{ V}$   
↳ since  $E^\circ$  is +ve energy is produced ∴ spontaneous.

6. A trophy manufacturer electroplates an iron trophy with gold.



a) Write the equation for the half-reaction that occurs at the iron trophy. (1 mark)



b) Identify an appropriate electrolyte. (1 mark)



c) Identify the cathode. (1 mark)

- trophy.

d) Explain how to maintain a constant metal ion concentration in the electrolyte. (1 mark)

- the anode should be made of Au(s)