

Brett Robbins Academic Consulting

Chemistry 30 Practice Test

Unit B: Electrochemical Changes

25 Questions

Original practice questions written to the Alberta curriculum, in the style of past diploma examinations. Work through each question, then check your answers with the key at the end.

This practice test was made by AI and there may be mistakes. If a question or answer looks wrong, contact Brett for clarification.

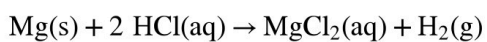
Question 1

The oxidation number of manganese in $\text{KMnO}_4(\text{s})$ is

- A) +2
- B) +5
- C) +7
- D) -7

Question 2

In the reaction represented by the equation

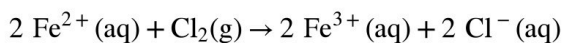


the species that is oxidized is

- A) $\text{Mg}(\text{s})$
- B) $\text{H}^+(\text{aq})$
- C) $\text{Cl}^-(\text{aq})$
- D) $\text{H}_2(\text{g})$

Question 3

In the reaction represented by the equation

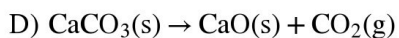
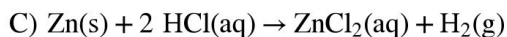
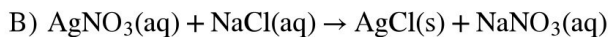
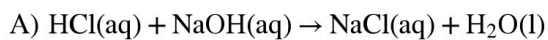


the reducing agent is

- A) $\text{Cl}_2(\text{g})$
- B) $\text{Fe}^{2+}(\text{aq})$
- C) $\text{Fe}^{3+}(\text{aq})$
- D) $\text{Cl}^-(\text{aq})$

Question 4

Which of the following equations represents a redox reaction?



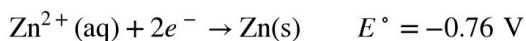
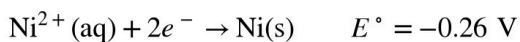
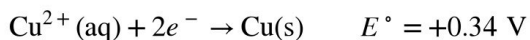
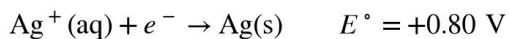
Question 5

The oxidation number of nitrogen in $\text{HNO}_2\text{(aq)}$ is + ____

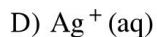
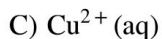
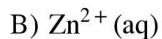
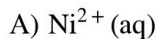
Record the single digit that completes the oxidation number.

Question 6

Use the following standard reduction potentials to answer this question.

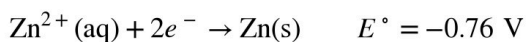
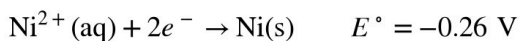
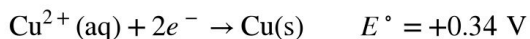
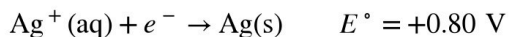


The strongest oxidizing agent in the table is

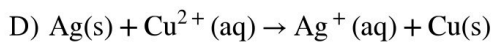
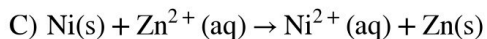
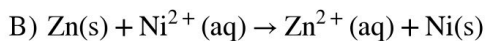
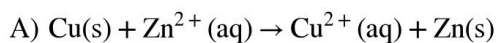


Question 7

Use the following standard reduction potentials to answer this question.

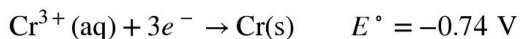


Which of the following reactions is spontaneous under standard conditions?



Question 8

A voltaic cell is constructed from the following half reactions.



The standard cell potential, E°_{cell} , is

A) $+0.60 \text{ V}$

B) $+0.88 \text{ V}$

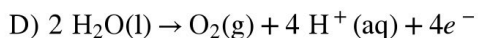
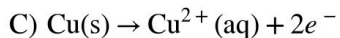
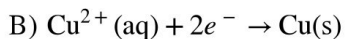
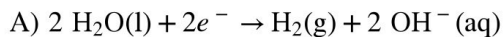
C) -0.60 V

D) -0.88 V

Question 9

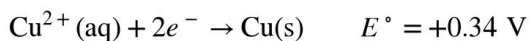
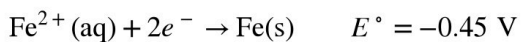
An electrolytic cell contains aqueous copper(II) sulfate and inert electrodes.

The reaction that occurs at the cathode is



Question 10

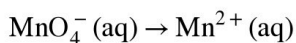
A voltaic cell is based on the half reactions



The value of E°_{cell} , in volts, is

Question 11

When the half reaction



is balanced in acidic solution using the lowest whole number coefficients,

the coefficient of $\text{H}^+(\text{aq})$ is

A) 4

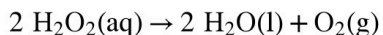
B) 5

C) 10

D) 8

Question 12

Hydrogen peroxide decomposes according to the equation

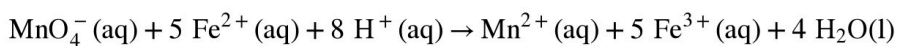


In this reaction, the oxygen in hydrogen peroxide is

- | | |
|------------------------------|---------------------------------|
| A) oxidized only | B) reduced only |
| C) both oxidized and reduced | D) neither oxidized nor reduced |

Question 13

A 20.00 mL sample of $\text{Fe}^{2+}(\text{aq})$ is titrated with 0.0100 mol/L $\text{KMnO}_4(\text{aq})$ in acidic solution. The endpoint is reached when 16.00 mL of titrant is added.



The concentration of the $\text{Fe}^{2+}(\text{aq})$ solution is

- | | |
|------------------|------------------|
| A) 0.00800 mol/L | B) 0.0400 mol/L |
| C) 0.200 mol/L | D) 0.00160 mol/L |

Question 14

A current of 2.50 A is passed through molten aluminum chloride for 30.0 min.

The half reaction is $\text{Al}^{3+}(\text{l}) + 3e^- \rightarrow \text{Al}(\text{l})$, and $F = 9.65 \times 10^4 \text{ C/mol } e^-$, with the molar mass of aluminum equal to 26.98 g/mol.

The mass of aluminum produced, in grams, is

Question 15

A current of 1.20 A is used to plate silver from a solution of $\text{AgNO}_3(\text{aq})$

for 45.0 min. $\text{Ag}^+(\text{aq}) + e^- \rightarrow \text{Ag}(\text{s})$, $F = 9.65 \times 10^4 \text{ C/mol } e^-$,

and the molar mass of silver is 107.87 g/mol.

The mass of silver plated is

- | | |
|-----------|-------------|
| A) 3.62 g | B) 1.81 g |
| C) 7.24 g | D) 0.0336 g |

Question 16

In an operating voltaic cell,

- A) electrons flow through the external circuit from the cathode to the anode
- B) cations in the salt bridge migrate toward the cathode
- C) oxidation occurs at the cathode
- D) the anode is the positive electrode

Question 17

The standard reduction potential of $\text{Cu}^{2+}(\text{aq})/\text{Cu}(\text{s})$ is +0.34 V

when the standard hydrogen electrode is assigned a potential of 0.00 V.

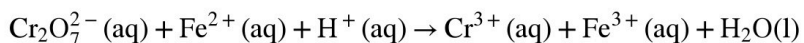
If the hydrogen electrode were instead assigned +0.50 V,

the reduction potential of $\text{Cu}^{2+}(\text{aq})/\text{Cu}(\text{s})$ would be

- | | |
|------------|------------|
| A) -0.16 V | B) +0.34 V |
| C) +1.18 V | D) +0.84 V |

Question 18

When the equation



is balanced using the lowest whole number coefficients, the coefficient of $\text{H}_2\text{O}(\text{l})$ is

Question 19

Concentrated aqueous sodium chloride is electrolyzed using inert electrodes.

The products formed at the cathode and the anode, respectively, are

A) $\text{H}_2(\text{g})$ and $\text{O}_2(\text{g})$

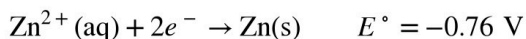
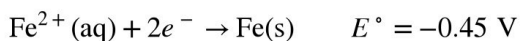
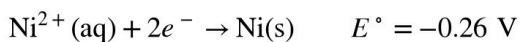
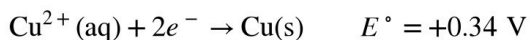
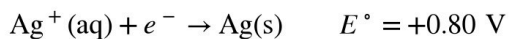
B) $\text{Na}(\text{s})$ and $\text{Cl}_2(\text{g})$

C) $\text{H}_2(\text{g})$ and $\text{Cl}_2(\text{g})$

D) $\text{Na}(\text{s})$ and $\text{O}_2(\text{g})$

Question 20

Use the following standard reduction potentials.



An aqueous solution of copper(II) sulfate could be stored without reacting

in a container made of

A) $\text{Zn}(\text{s})$

B) $\text{Fe}(\text{s})$

C) $\text{Ni}(\text{s})$

D) $\text{Ag}(\text{s})$

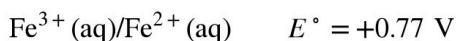
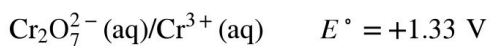
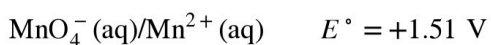
Question 21

A voltaic cell is based on the reduction of $X^{2+}(\text{aq})$ at the cathode and the oxidation of tin at the anode, where $\text{Sn}^{2+}(\text{aq}) + 2e^{-} \rightarrow \text{Sn}(\text{s})$ has $E^{\circ} = -0.14 \text{ V}$.

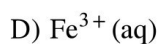
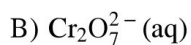
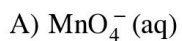
If $E^{\circ}_{\text{cell}} = +0.59 \text{ V}$, then the standard reduction potential of $X^{2+}(\text{aq})/\text{X}(\text{s})$, in volts, is

Question 22

Use the following standard reduction potentials.



The species that can oxidize $\text{Cl}^{-}(\text{aq})$ to $\text{Cl}_2(\text{g})$ is



Question 23

In the reaction represented by the equation



the total number of moles of electrons transferred when 3 mol of copper reacts is

Question 24

In an operating electrolytic cell, the electrode connected to the positive terminal of the power supply is the *i*, and at that electrode *ii* occurs.

The statement is completed by the information in row

A) anode

oxidation

B) cathode

oxidation

C) anode

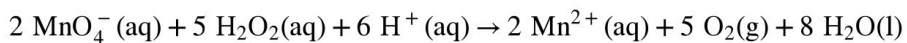
reduction

D) cathode

reduction

Question 25

A 25.00 mL sample of hydrogen peroxide solution is titrated with 0.0150 mol/L $\text{KMnO}_4(\text{aq})$ in acidic solution, and the endpoint is reached at 22.40 mL.



The concentration of the hydrogen peroxide solution, in mol/L, is

Answer Key

- | | | |
|------|-----------|------------|
| 1. C | 10. 0.79 | 19. C |
| 2. A | 11. D | 20. D |
| 3. B | 12. C | 21. 0.45 |
| 4. C | 13. B | 22. A |
| 5. 3 | 14. 0.419 | 23. 6 |
| 6. D | 15. A | 24. A |
| 7. B | 16. B | 25. 0.0336 |
| 8. A | 17. D | |
| 9. B | 18. 7 | |

This practice test was made by AI and there may be mistakes. If a question or answer looks wrong, contact Brett for clarification.