

1. Which expression correctly represents a balanced reduction half-reaction?

- A) $\text{Na}^+ + \text{e}^- \rightarrow \text{Na}$ B) $\text{Na} \rightarrow \text{Na}^+ + \text{e}^-$
 C) $\text{Cl}_2 + 2\text{e}^- \rightarrow \text{Cl}^-$ D) $2 \text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$

2. Which half-reaction shows conservation of charge?

- A) $\text{Cu} + \text{e}^- \rightarrow \text{Cu}^+$ B) $\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$
 C) $\text{Cu}^+ \rightarrow \text{Cu} + \text{e}^-$ D) $\text{Cu}^{2+} \rightarrow \text{Cu} + 2\text{e}^-$

3. Which equation shows conservation of charge?

- A) $\text{Fe} \rightarrow \text{Fe}^{2+} + \text{e}^-$ B) $\text{Fe} + 2\text{e}^- \rightarrow \text{Fe}^{2+}$
 C) $\text{Fe} \rightarrow \text{Fe}^{2+} + 2\text{e}^-$ D) $\text{Fe} + 2\text{e}^- \rightarrow \text{Fe}^{3+}$

4. When an equation is correctly balanced, it must show conservation of

- A) charge but not of mass
 B) mass but not of charge
 C) both charge and mass
 D) neither charge nor mass

5. A chemical reaction always demonstrates the conservation of what?

- A) temperature B) volume
 C) matter D) nothing

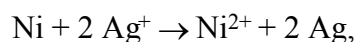
6. Which half-reaction for the reduction of Al^{3+} to Al is correctly balanced?

- A) $\text{Al}^{3+} + 3\text{e}^- \rightarrow \text{Al}$ B) $\text{Al}^{3+} + 3\text{e}^- \rightarrow 3 \text{Al}$
 C) $\text{Al}^{3+} \rightarrow \text{Al} + 3\text{e}^-$ D) $\text{Al}^{3+} \rightarrow 3 \text{Al} + 3\text{e}^-$

7. How many moles of electrons are needed to reduce 1 mole of Fe^{3+} to Fe^{2+} ?

- A) 1 B) 2 C) 3 D) 5

8. In the reaction



what is the total number of moles of electrons lost by 1 mole of Ni?

- A) 1 B) 2 C) 0.5 D) 4

9. Compared to the amount of mass and total charge at the beginning of a redox reaction, the amount of mass and total charge upon completion of the reaction is

- A) less B) greater
 C) the same

10. Which half-reaction shows both the conservation of mass and the conservation of charge?

- A) $\text{Cl}_2 + 2\text{e}^- \rightarrow 2 \text{Cl}$ B) $\text{Cl}_2 \rightarrow \text{Cl}^- + 2\text{e}^-$
 C) $2 \text{Br}^- + 2\text{e}^- \rightarrow \text{Br}_2$ D) $\text{Br}^- \rightarrow \text{Br}_2 + 2\text{e}^-$

11. How many moles of electrons would be required to completely reduce 1.5 moles of Al^{3+} to Al?

- A) 0.50 B) 1.5 C) 3.0 D) 4.5

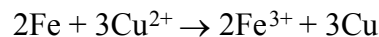
12. How many moles of electrons would be required to completely reduce 1.5 moles of Al^{3+} to Al?

- A) 0.50 B) 1.5 C) 3.0 D) 4.5

13. Which ionic equation is balanced?

- A) $\text{Fe}^{3+} + \text{Al} \rightarrow \text{Fe}^{2+} + \text{Al}^{3+}$
 B) $\text{Fe}^{3+} + 3\text{Al} \rightarrow \text{Fe}^{2+} + 3\text{Al}^{3+}$
 C) $3\text{Fe}^{3+} + \text{Al} \rightarrow 3\text{Fe}^{2+} + \text{Al}^{3+}$
 D) $3\text{Fe}^{3+} + \text{Al} \rightarrow \text{Fe}^{2+} + 3\text{Al}^{3+}$

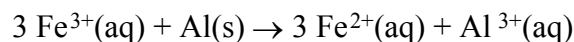
14. Given the balanced equation representing a reaction:



When the iron atoms lose six moles of electrons, how many moles of electrons are gained by the copper ions?

- A) 12 moles B) 2 moles
 C) 3 moles D) 6 moles

15. Given the balanced equation:



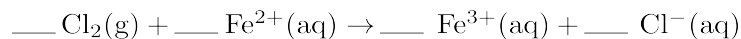
What is the total number of moles of electrons lost by 2 moles of Al(s)?

- A) 1 mole B) 6 moles
 C) 3 moles D) 9 moles

16. Which redox equation is correctly balanced?

- A) $\text{Cr}(\text{s}) + 3 \text{Fe}^{2+}(\text{aq}) \rightarrow 2 \text{Cr}^{3+}(\text{aq}) + \text{Fe}(\text{s})$
 B) $\text{Pb}(\text{s}) + 2 \text{H}^+(\text{aq}) \rightarrow \text{Pb}^{2+}(\text{aq}) + \text{H}_2(\text{g})$
 C) $\text{Pb}(\text{s}) + \text{Ag}^+(\text{aq}) \rightarrow \text{Pb}^{2+}(\text{aq}) + \text{Ag}(\text{s})$
 D) $\text{Zn}(\text{s}) + \text{Br}_2(\text{aq}) \rightarrow \text{Zn}^{2+}(\text{aq}) + \text{Br}^-(\text{aq})$

17. Given the reaction:



When the equation is correctly balanced using *smallest* whole numbers, the coefficient of $\text{Cl}^{-}(\text{aq})$ will be

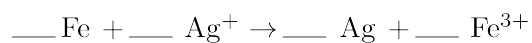
- A) 1 B) 2 C) 6 D) 7
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18. What is the coefficient of H^{+} when the redox equation below is correctly balanced with whole number coefficients?



- A) 14 B) 2 C) 7 D) 12

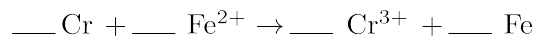
19. Given the unbalanced equation:



When the equation is correctly balanced using smallest whole numbers, the coefficient of Ag^{+} is

- A) 5 B) 2 C) 3 D) 4

20. Given the reaction:



When the reaction is completely balanced using the smallest whole number coefficients, the sum of the coefficients is

- A) 10 B) 6 C) 3 D) 4
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