

Name:

Date:

Period:

Seat #:

Show all work

Assigning oxidation numbers:

Determine the oxidation number of the underlined element.

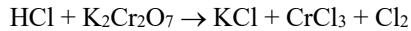
1. <u>Be</u> Cl ₂	2. <u>N</u> O	3. Na ₂ <u>S</u> O ₃	4. H ₂ <u>Q</u> ₂
5. Ag <u>Br</u>	6. <u>Au</u> Cl ₃	7. H <u>NO</u> ₃	8. H ₂ <u>Sn</u> O ₃
9. <u>S</u> O ₃	10. <u>U</u> F ₆	11. Ba <u>Cr</u> O ₄	12. Ca <u>Se</u> O ₄
13. H <u>I</u>	14. H ₂ <u>Se</u>	15. K ₂ P <u>t</u> Cl ₆	16. <u>Ni</u> SO ₄
17. <u>N</u> H ₃	18. H <u>Cl</u> O	19. <u>N</u> H ₄ Cl	20. (NH ₄) ₂ <u>T</u> e

1. +2	2. +2	3. +4	4. -1
5. -1	6. +3	7. +5	8. +4
9. +6	10. +6	11. +6	12. +6
13. -1	14. +2	15. +4	16. +2
17. -3	18. +1	19. -3	20. -2

The Half-Reaction Method:

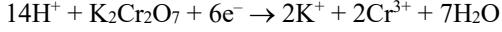
- Write the equation as two half-reactions. Include the particles (atoms, ions, molecules) that are involved in change of oxidation state.
- Balance each half-reaction with respect to atoms and charges; first atoms other than H and O, then O with H₂O and H with H⁺, and ionic charges with electrons (e⁻).
- Equalize the number of electrons lost in the oxidation half-reaction with the number of electrons gained in the reduction half-reaction.
- Add the two half-reactions to form a balanced net ionic equation.

[a]

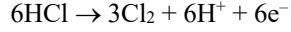


14, 1, 2, 2, 3, 7H₂O

Reduction half-reaction



Oxidation half-reaction



Overall:

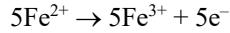


[b]

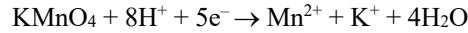


5, 1, 8, 5, 1, 1, 4H₂O

Reduction half-reaction



Oxidation half-reaction



Overall: note → Chlorines are omitted in half reactions b/c their oxidation state does not change



[c]	$\text{CuS} + \text{NO}_3^- \rightarrow \text{Cu}^{2+} + \text{S} + \text{NO}$ 3, 2, 8H⁺, 3, 3, 2, 4H₂O	
Reduction half-reaction		Oxidation half-reaction
$3\text{CuS} \rightarrow 3\text{Cu}^{2+} + 3\text{S} + 6\text{e}^-$	$8\text{H}^+ + 2\text{NO}_3^- + 6\text{e}^- \rightarrow 2\text{NO} + 4\text{H}_2\text{O}$	
Overall:	$3\text{CuS} + 2\text{NO}_3^- + 8\text{H}^+ \rightarrow 3\text{Cu}^{2+} + 3\text{S} + 2\text{NO} + 4\text{H}_2\text{O}$	

Balance the following redox reactions in acidic solutions:

[d] $\text{HNO}_3 + \text{S} \rightarrow \text{NO}_2 + \text{H}_2\text{SO}_4 + \text{H}_2\text{O}$	6HNO₃ + S → 6NO₂ + H₂SO₄ + 2H₂O
[e] $\text{KMnO}_4 + \text{HCl} + \text{H}_2\text{S} \rightarrow \text{KCl} + \text{MnCl}_2 + \text{S}$	2KMnO₄ + 6HCl + 5H₂S → 2KCl + 2MnCl₂ + 5S + 8H₂O
[f] $\text{FeCl}_3 + \text{H}_2\text{S} \rightarrow \text{FeCl}_2 + \text{HCl} + \text{S}$	2FeCl₃ + H₂S → 2FeCl₂ + 2HCl + S
[g] $\text{Cu} + \text{HNO}_3 \rightarrow \text{Cu}(\text{NO}_3)_2 + \text{NO}_2$	Cu + 4HNO₃ → Cu(NO₃)₂ + 2NO₂ + 2H₂O