

2005 CLEARVIEW, OHIO, INVITATIONAL

ANSWER KEY

SCHOOL NAME _____

TEAM NUMBER _____

PART I: MULTIPLE CHOICE QUESTIONS:

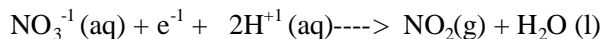
1. E 5. B 9. A 13. C 17. A
2. I 6. D 10. D 14. A 18. C
3. C 7. J 11. E 15. C 19. A
4. D 8. E 12. C 16. A 20. D

PART II: LAB SIMULATION #1: COPPER RECYCLING!

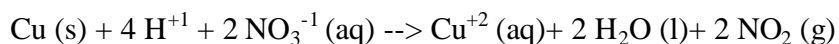
- Q1. What substance is being oxidized? Cu
Q2. What substance is being reduced? HNO₃ or NO₃⁻¹ or Nitrogen (N)
Q3. Write the balanced oxidation half reaction in acidic solution:
(use of (aq, s, l) consistently is Tie Breaker)



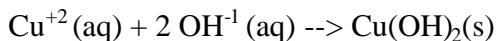
- Q4. Write the net ionic balanced reduction half reaction in acidic solution:



- Q5. Write the balanced overall net ionic equation for this reaction.



- Q6. Write the balanced net ionic equation for this reaction.

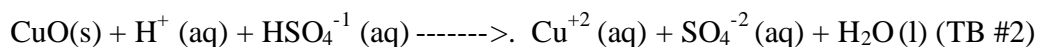


- Q 7: What spectator ions was/were removed when the sample was washed?



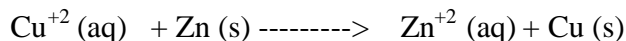
- Q 8: What does the term “decanted” mean? To pour off the liquid from a solid sample (the supernatant liquid)

Q. 9: What is the net ionic reaction for this step in the procedure?

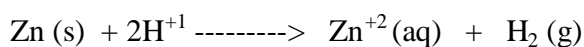


[Reactions using $2\text{H}^+ (\text{aq}) + \text{SO}_4^{-2} (\text{aq})$ also accepted but will lose the TB]

Q.10: Write the balanced net ionic redox equation for the formation of the pure copper.



Q.11: Write the balanced net ionic equation for the redox reaction in the formation of the hydrogen gas. Note: it is the excess zinc that reacts with the acid for form H_2 .



Q. 12: What is the percent yield of this copper recycling process?

$$\% \text{ yield} = \frac{\text{mass of recovered copper}}{\text{initial mass of copper}} \cdot 100\% \quad \text{or } 0.40\text{g} / 0.50\text{g} \times 100\% = 80. \% \text{ yield}$$

PART III: MOLECULAR MODEL PROBLEM #1

1. DRAW YOUR MOLECULE HERE ---> trans-2-penten-1-ol

2. B 5. D

3. D 6. G

4. A 7. B

PART IV: MOLECULAR MODELING PROBLEM #2

Draw the Lewis Dot structure for the CNO^{-1} ion here and show resonance structures only if they exist.

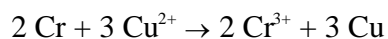
2. hybridization is _____

PART V: OXIDATION NUMBERS:

1. +5 2. -3 3. -3 4. 0 5. +6

PART VI: CHEMICAL CELLS

1. Write a balanced net ionic equation for the spontaneous reaction that occurs as the cell operates.



2. What is the oxidizing agent? Cu^{2+}
3. What is the reducing agent? Cr
4. What metal acts as the cathode? Cu
5. What additional component is necessary to make the cell operate? salt bridge
6. What is the cell voltage produced? +1.08 v
7. B (decreases) (multiple choice)

PART VII: FUEL CELLS

1. D 2. D 3. A 4. B