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

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| 1. | Which of the following is a strong electrolyte in aqueous solution? | |
| A) | CH3OH |
| B) | NaCl |
| C) | H2O |
| D) | CH3OCH3 |
| E) | CH3CH2OH |

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| 2. | Which of the following ions is most likely to form an insoluble sulfate? | |
| A) | K+ |
| B) | Li+ |
| C) | Ca2+ |
| D) | S2– |
| E) | Cl– |

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| 3. | A student is given a sample in lab that contains one of the ions listed below. After adding a few drops of AgNO3 solution to a portion of the unknown sample, the student got a greyish precipitate. After adding a few drops of Mg(NO3)2 solution to another portion of the unknown sample, the student got a black precipitate. Based on these observations, the only possible ion in this student’s sample is | |
| A) | Cl–. |
| B) | C2H3O2–. |
| C) | F–. |
| D) | S2–. |
| E) | SO42–. |

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| 4. | The net ionic equation for the reaction of calcium bromide and sodium phosphate contains which of the following species? | |
| A) | Ca2+(*aq*) |
| B) | PO43–(*aq*) |
| C) | 2Ca3(PO4)2(*s*) |
| D) | 6NaBr(*aq*) |
| E) | 3Ca2+(*aq*) |

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| 5. | In a volumetric analysis experiment, an acidic aqueous solution of methanol (CH3OH) is titrated with a solution of potassium dichromate (K2Cr2O7) according to the following balanced chemical equation:  2K2Cr2O7(*aq*) + 8H2SO4(*aq*) + 3CH3OH(*aq*)  2Cr2(SO4)3(*aq*) + 11H2O(*l*) + 3HCOOH(*aq*) + 2K2SO4(*aq*)  What volume of 0.00176 *M* K2Cr2O7 is required to titrate 1.03 g of CH3OH dissolved in 20.0 mL of solution? | |
| A) | 390 mL |
| B) | 27.4 mL |
| C) | 20.0 mL |
| D) | 12.2 mL |
| E) | 878 mL |

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| 6. | The reaction of HCl with NaOH is represented by the equation  HCl(*aq*) + NaOH(*aq*) → NaCl(*aq*) + H2O(*l*)  What volume of 0.831 *M* HCl is required to titrate 49.5 mL of 0.818 *M* NaOH? | |
| A) | 49.5 mL |
| B) | 50.3 mL |
| C) | 33.6 mL |
| D) | 48.7 mL |
| E) | 1.20 mL |

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| 7. | What volume of 0.54 *M* NaCl may be prepared by dilution of 0.100 L of a 6.0 *M* NaCl solution? | |
| A) | 1.1 L |
| B) | 0.91 L |
| C) | 0.90 L |
| D) | 0.54 L |
| E) | 1.9 L |

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| 8. | What is the reduction half-reaction for the reaction of zinc with hydrochloric acid?  Zn(*s*) + 2H+(*aq*) + 2Cl–(*aq*) → Zn2+(*aq*) + 2Cl––(*aq*) + H2(*g*) | |
| A) | Zn(*s*) → Zn2+(*aq*) + 2e– |
| B) | Zn(*s*) → Zn2+(*aq*) + 2Cl–(*aq*) + 2e– |
| C) | 2H+(*aq*) + 2e– → H2(*g*) |
| D) | 2H+(*aq*) + 2e– + 2Cl–(*aq*) → H2(*g*) + 2Cl–(*aq*) |
| E) | 2H+(*aq*) + 2e–(*aq*) → H2(*g*) + 2Cl–(*aq*) |

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| 9. | All of the following reactions can be described as displacement reactions except | |
| A) | Zn(*s*) + FeCl2(*aq*) → ZnCl2(*aq*) + Fe(*s*). |
| B) | CuSO4(*aq*) + Fe(*s*) → Cu(*s*) + FeSO4(*aq*). |
| C) | 2Na(*s*) + 2H2O(*l*) → 2NaOH(*aq*) + H2(*g*). |
| D) | C6H6(*l*) + Cl2(*g*) → C6H5Cl(*l*) + HCl(*g*). |
| E) | Cu(*s*) + 2AgNO3(*aq*) → Cu(NO3)2(*aq*) + 2Ag(*s*). |

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| 10. | What is the balanced oxidation half-reaction for the following reaction?  Cu2+(*aq*) + Fe(*s*) → Cu(*s*) + Fe2+(*aq*) | |
| A) | Cu2+(*aq*) + 2e– → Cu(*s*) |
| B) | Fe2+(*aq*) + 2e– → Fe(*s*) |
| C) | Fe(*s*) → Fe2+(*aq*) + 2e– |
| D) | Cu(*s*) + 2e– → Cu(*s*) |
| E) | Cu(*s*) → Cu2+(*aq*) + 2e– |

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| 20. | The empirical formula of propylene is CH3. An experimental determination of the molar mass of propylene by a student yields the value of 42 g/mol. What is the molecular formula of propylene? | |
| A) | CH3 |
| B) | C3H6 |
| C) | C3H8 |
| D) | C5H10 |
| E) | C6H9 |

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| 21. | An atom of an element weighs 6.28  10-23 g. What is the atomic mass of this element in atomic mass units? |

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| 22. | NaHCO3 is the active ingredient in baking soda. How many grams of oxygen are present in 0.78 g of NaHCO3? |

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| 23. | What is the mass percentage of carbon in the compound C6H8O2? | |
| A) | 64.3% |
| B) | 28.6% |
| C) | 12.5% |
| D) | 71.4% |
| E) | 7.1% |

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| 24. | Calculate the number of moles of bromine present in 17.5 mL of Br2(*l*), whose density is 3.12 g/mL. |

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| 25. | How many moles of pentane, C5H12, are contained in a 17-g sample? |

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| 26. | The total number of oxygen atoms in 1.03 g of CaCO3 (MM = 100.0 g/mol) is |

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| 27. | A compound has a molar mass of 180.7 g/mol and contains 53.13% oxygen atoms by mass. How many oxygen atoms are in each molecule of this compound? | |
| A) | 9 |
| B) | 5 |
| C) | 8 |
| D) | 6 |
| E) | 3 |

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| 28. | A compound containing only carbon, hydrogen, and oxygen is subjected to elemental analysis. Upon complete combustion, a 0.4675-g sample of the compound produced 0.7905 g of CO2 and 0.3236 g of H2O. What is the empirical formula of the compound? | |
| A) | CH2O3 |
| B) | C2H2O |
| C) | C4H8O3 |
| D) | C3H6O3 |
| E) | C3H3O |

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| 29. | The commercial production of phosphoric acid, H3PO4, can be represented by the equation   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | 1600 g | 791 g | 306 g | 1150 g | 280 g |  | | Ca3(PO4)2 + | 3SiO2 + | 5C + | 5O2 + | 3H2O | 3CaSiO3 + 5CO2 + 2H3PO4 | | 310 g/mol | 60.1 g/mol | 12.0 g/mol | 32.0 g/mol | 18.0 g/mol |  |   The molar mass for each reactant is shown below the reactant, and the mass of each reactant for this problem is given above. Which substance is the limiting reactant? |

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| 30. | A 5.95-g sample of AgNO3 is reacted with BaCl2 according to the equation    to give 3.69 g of AgCl. Balance the equation. Name all the compounds in this chemical reaction. What is the percent yield of AgCl? |

**Answer Key**

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| 1. | B | |
| 2. | C | |
| 3. | D | |
| 4. | E | |
| 5. | D | |
| 6. | D | |
| 7. | A | |
| 8. | C | |
| 9. | D | |
| 10. | C | |
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| 20. | B |
| 21. | 37.8 amu |
| 22. | 0.45 g |
| 23. | A |
| 24. | 0.342 mol |
| 25. | 0.24 mol |
| 26. | 1.86  1022. |
| 27. | D |
| 28. | C |
| 29. | SiO2 |
| 30. | 73.5 % |
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