

Wg. Pazdro K.M., Rola-Noworyta A., Akademicki zbiór zadań z chemii ogólnej, Oficyna Edukacyjna \* Krzysztof Pazdro, Warszawa 2013.

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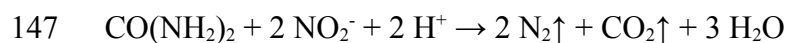
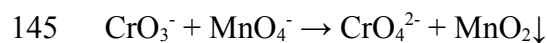
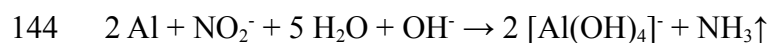
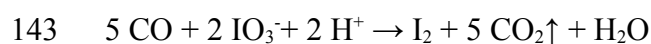
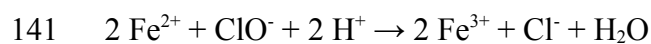
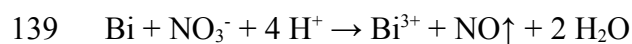
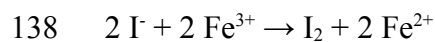
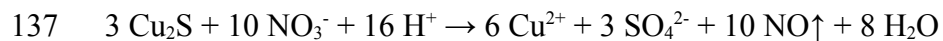
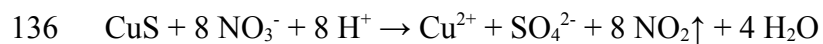
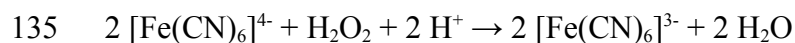
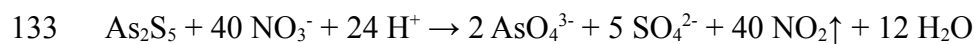
Nr      Reakcja

- 1       $2 \text{ Al} + 3 \text{ S} \rightarrow \text{Al}_2\text{S}_3$
- 2       $2 \text{ ZnS} + 3 \text{ O}_2 \rightarrow 2 \text{ ZnO} + \text{SO}_2\uparrow$
- 3       $\text{Fe}_3\text{O}_4 + 4 \text{ CO} \rightarrow 3 \text{ Fe} + 4 \text{ CO}_2\uparrow$
- 4       $3 \text{ Fe} + 4 \text{ H}_2\text{O} \rightarrow \text{Fe}_3\text{O}_4 + 4 \text{ H}_2\uparrow$
- 5       $\text{CaH}_2 + 2\text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2 + 2 \text{ H}_2\text{O}$
- 6       $2 \text{ FeS}_2 + 5\frac{1}{2} \text{ O}_2 \rightarrow \text{Fe}_2\text{O}_3 + 4 \text{ SO}_2\uparrow$
- 7       $4 \text{ H}_3\text{PO}_3 \rightarrow 3 \text{ H}_3\text{PO}_4 + \text{PH}_3\uparrow$
- 8       $2 \text{ Al} + 6 \text{ HCl} \rightarrow 2 \text{ AlCl}_3 + 3 \text{ H}_2\uparrow$
- 9       $2 \text{ H}_2\text{S} + 3 \text{ O}_2 \rightarrow 2 \text{ SO}_2\uparrow + 2 \text{ H}_2\text{O}$
- 10      $2 \text{ AsH}_3 + 3 \text{ O}_2 \rightarrow \text{As}_2\text{O}_3 + 3 \text{ H}_2\text{O}$
- 11      $2 \text{ H}_2\text{SO}_4 + \text{S} \rightarrow 2 \text{ H}_2\text{O} + 3 \text{ SO}_2\uparrow$
- 12      $2 \text{ KOH} + \text{Cl}_2 \rightarrow \text{KCl} + \text{KClO} + \text{H}_2\text{O}$
- 13      $2 \text{ B} + 3 \text{ Na}_2\text{O}_2 \rightarrow 2 \text{ NaBO}_2 + 2 \text{ Na}_2\text{O}$
- 14      $2 \text{ HCN} + \text{H}_2\text{SO}_4 + 2\text{H}_2\text{O} \rightarrow (\text{NH}_4)_2\text{SO}_4 + 2 \text{ CO}\uparrow$
- 15      $4 \text{ KCN} + 2 \text{ SnO}_2 \rightarrow 4 \text{ KCNO} + 2 \text{ Sn}$
- 16      $3 \text{ Fe(CN)}_2 \rightarrow \text{Fe}_3\text{C} + \text{C} + 2 (\text{CN})_2\uparrow + \text{N}_2\uparrow$
- 17      $2 \text{ Cu} + 8 \text{ KCN} + 2\text{H}_2\text{O} \rightarrow 2 \text{ K}_3[\text{Cu(CN)}_4] + 2 \text{ KOH} + \text{H}_2\uparrow$
- 18      $2 \text{ Pb(NO}_3)_2 \rightarrow 2 \text{ PbO} + 4 \text{ NO}_2\uparrow + \text{O}_2$
- 19      $4 \text{ HNO}_3 + 3 \text{ C} \rightarrow 2 \text{ H}_2\text{O} + 4 \text{ NO}\uparrow + 3 \text{ CO}_2$
- 20      $20 \text{ HNO}_3 + 3 \text{ P}_4 + 8 \text{ H}_2\text{O} \rightarrow 12 \text{ H}_3\text{PO}_4 + 20 \text{ NO}\uparrow$
- 21      $6 \text{ HNO}_3 + 3 \text{ S} \rightarrow 3 \text{ H}_2\text{SO}_4 + 6 \text{ NO}\uparrow$
- 22      $10 \text{ HNO}_3 + 3 \text{ I}_2 \rightarrow 6 \text{ HIO}_3 + 10 \text{ NO}\uparrow + 2 \text{ H}_2\text{O}$
- 23      $2 \text{ HNO}_3 + 2 \text{ HI} \rightarrow \text{I}_2 + 2 \text{ NO}\uparrow + 2 \text{ H}_2\text{O}$
- 24      $2 \text{ HNO}_3 + \text{H}_2\text{S} \rightarrow \text{S} + 2 \text{ NO}\uparrow + 2 \text{ H}_2\text{O}$
- 25      $8 \text{ HNO}_3 + 6 \text{ KI} \rightarrow 6 \text{ KNO}_3 + 3 \text{ I}_2 + 2 \text{ NO}\uparrow + 4 \text{ H}_2\text{O}$
- 26      $\text{NH}_4\text{Cl} + \text{NaNO}_2 \rightarrow \text{N}_2\uparrow + \text{NaCl} + 2 \text{ H}_2\text{O}$
- 27      $3 \text{ Si} + 4 \text{ HNO}_3 + 18 \text{ HF} \rightarrow 3 \text{ H}_2[\text{SiF}_6] + 4 \text{ NO}\uparrow + 8 \text{ H}_2\text{O}$
- 28      $\text{Cu} + 2 \text{ H}_2\text{SO}_4 \rightarrow \text{CuSO}_4 + \text{SO}_2\uparrow + 2 \text{ H}_2\text{O}$
- 29      $\text{SO}_2 + 2 \text{ Hg}_2\text{Cl}_2 + 4 \text{ HCl} \rightarrow 4 \text{ HgCl}_2 + \text{S} + 2 \text{ H}_2\text{O}$
- 30      $\text{SO}_2 + 2 \text{ CuCl}_2 + 2 \text{ H}_2\text{O} \rightarrow 2 \text{ CuCl} + \text{H}_2\text{SO}_4 + 2 \text{ HCl}$

- 31  $\text{SO}_2 + 2 \text{FeCl}_3 + 2 \text{H}_2\text{O} \rightarrow 2 \text{FeCl}_2 + \text{H}_2\text{SO}_4 + 2 \text{HCl}$
- 32  $\text{SO}_2 + \text{SnCl}_4 + 2 \text{H}_2\text{O} \rightarrow \text{SnCl}_2 + \text{H}_2\text{SO}_4 + 2 \text{HCl}$
- 33  $\text{SO}_2 + \text{Br}_2 + 2 \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_4 + 2 \text{HBr}$
- 34  $\text{SO}_2 + \text{I}_2 + 2\text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_4 + 2 \text{HI}$
- 35  $3 \text{SO}_2 + 2 \text{HNO}_3 + 2\text{H}_2\text{O} \rightarrow 3 \text{H}_2\text{SO}_4 + 2 \text{NO}\uparrow$
- 36  $3 \text{H}_2\text{S} + 8 \text{HNO}_3 \rightarrow 3 \text{H}_2\text{SO}_4 + 8 \text{NO}\uparrow + 4 \text{H}_2\text{O}$
- 37  $\text{S} + 3 \text{Br}_2 + 4 \text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_4 + 6 \text{HBr}$
- 38  $\text{P}_4 + 10 \text{Br}_2 + 4 \text{H}_2\text{O} \rightarrow 4 \text{H}_3\text{PO}_4 + 20 \text{HBr}$
- 39  $2 \text{KI} + 2 \text{H}_2\text{SO}_4 \rightarrow \text{K}_2\text{SO}_4 + \text{I}_2 + \text{SO}_2\uparrow + 2 \text{H}_2\text{O}$
- 40  $\text{I}_2 + 5 \text{Cl}_2 + 6 \text{H}_2\text{O} \rightarrow 2 \text{HIO}_3 + 10 \text{HCl}$
- 41  $3 \text{Cu} + 8 \text{HNO}_3 \rightarrow 3 \text{Cu}(\text{NO}_3)_2 + 2 \text{NO}\uparrow + 4 \text{H}_2\text{O}$
- 42  $8 \text{Al} + 30 \text{HNO}_3 \rightarrow 8 \text{Al}(\text{NO}_3)_3 + 3 \text{NH}_4\text{NO}_3 + 9 \text{H}_2\text{O}$
- 43  $2 \text{Al} + 6 \text{H}_2\text{SO}_4 \rightarrow \text{Al}_2\text{SO}_4 + 3 \text{SO}_2\uparrow + 6 \text{H}_2\text{O}$
- 44  $(\text{NH}_4)_2\text{Cr}_2\text{O}_7 \rightarrow \text{Cr}_2\text{O}_3 + \text{N}_2\uparrow + 4 \text{H}_2\text{O}$
- 45  $2 \text{Fe} + 6 \text{H}_2\text{SO}_4 \rightarrow \text{Fe}_2(\text{SO}_4)_3 + 3 \text{SO}_2\uparrow + 6 \text{H}_2\text{O}$
- 46  $\text{Fe} + 4 \text{HNO}_3 \rightarrow \text{Fe}(\text{NO}_3)_3 + \text{NO}\uparrow + 2 \text{H}_2\text{O}$
- 47  $4 \text{Fe} + 10 \text{HNO}_3 \rightarrow 4 \text{Fe}(\text{NO}_3)_2 + \text{N}_2\text{O}\uparrow + 5 \text{H}_2\text{O}$
- 48  $\text{Mn} + 2 \text{H}_2\text{SO}_4 \rightarrow \text{MnSO}_4 + \text{SO}_2\uparrow + 2 \text{H}_2\text{O}$
- 49  $4 \text{Zn} + 10 \text{HNO}_3 \rightarrow 4 \text{Zn}(\text{NO}_3)_2 + \text{N}_2\text{O}\uparrow + 5 \text{H}_2\text{O}$
- 50  $3 \text{Zn} + 8 \text{HNO}_3 \rightarrow 3 \text{Zn}(\text{NO}_3)_2 + 2 \text{NO}\uparrow + 4 \text{H}_2\text{O}$
- 51  $\text{Zn} + 2 \text{H}_2\text{SO}_4 \rightarrow \text{ZnSO}_4 + \text{SO}_2\uparrow + \text{H}_2\text{O}$
- 52  $3 \text{Co} + 8 \text{HNO}_3 \rightarrow 3 \text{Co}(\text{NO}_3)_2 + 2 \text{NO}\uparrow + 4 \text{H}_2\text{O}$
- 53  $3 \text{Ni} + 8 \text{HNO}_3 \rightarrow 3 \text{Ni}(\text{NO}_3)_2 + 2 \text{NO}\uparrow + 4 \text{H}_2\text{O}$
- 54  $2 \text{KMnO}_4 + 16 \text{HCl} \rightarrow 2 \text{KCl} + 2 \text{MnCl}_2 + 8 \text{H}_2\text{O} + 5 \text{Cl}_2\uparrow$
- 55  $\text{K}_2\text{Cr}_2\text{O}_7 + 14 \text{HCl} \rightarrow 2 \text{KCl} + 2 \text{CrCl}_3 + 7 \text{H}_2\text{O} + 3 \text{Cl}_2\uparrow$
- 56  $6 \text{NaOH} + 3 \text{Cl}_2 \rightarrow \text{NaClO}_3 + 5 \text{NaCl} + 3 \text{H}_2\text{O}$
- 57  $2 \text{NaOH} + \text{Cl}_2 \rightarrow \text{NaClO} + \text{NaCl} + \text{H}_2\text{O}$
- 58  $\text{Au} + 3 \text{HNO}_3 + 4 \text{HCl} \rightarrow \text{H}[\text{AuCl}_4] + 3 \text{NO}_2 + 3 \text{H}_2\text{O}$
- 59  $\text{Pt} + 4 \text{HNO}_3 + 6 \text{HCl} \rightarrow \text{H}_2[\text{PtCl}_6] + 4 \text{NO}_2\uparrow + 4 \text{H}_2\text{O}$
- 60  $2 \text{KOH} + \text{I}_2 \rightarrow \text{KIO} + \text{KI} + \text{H}_2\text{O}$
- 61  $3 \text{NO}_2 + \text{H}_2\text{O} \rightarrow 2 \text{HNO}_3 + \text{NO}\uparrow$
- 62  $3 \text{KNO}_2 + \text{H}_2\text{SO}_4 \rightarrow \text{KNO}_3 + \text{K}_2\text{SO}_4 + 2 \text{NO}\uparrow + \text{H}_2\text{O}$
- 63  $3 \text{NaClO} \rightarrow \text{NaClO}_3 + 2 \text{NaCl}$
- 64  $2 \text{H}_2\text{MnO}_4 \rightarrow 2 \text{HMnO}_4 + \text{MnO}_2 + 2 \text{H}_2\text{O}$

- 65  $\text{NaOH} + 3 \text{Br}_2 \rightarrow \text{NaBrO}_3 + 5 \text{NaBr} + 3 \text{H}_2\text{O}$
- 66  $\text{PbS} + 8 \text{HNO}_3 \rightarrow \text{PbSO}_4 + 8 \text{NO}_2\uparrow + 4 \text{H}_2\text{O}$
- 67  $\text{K}_2\text{S} + \text{NaClO} + \text{H}_2\text{SO}_4 \rightarrow \text{K}_2\text{SO}_4 + \text{NaCl} + \text{S} + \text{H}_2\text{O}$
- 68  $5 \text{NaBr} + \text{NaBrO}_3 + 3 \text{H}_2\text{SO}_4 \rightarrow 3 \text{Na}_2\text{SO}_4 + 3 \text{Br}_2 + 3 \text{H}_2\text{O}$
- 69  $2 \text{K}_2\text{CrO}_4 + 6 \text{KBr} + 8 \text{H}_2\text{SO}_4 \rightarrow 5 \text{K}_2\text{SO}_4 + \text{Cr}_2(\text{SO}_4)_3 + 3 \text{Br}_2 + 8 \text{H}_2\text{O}$
- 70  $\text{K}_2\text{Cr}_2\text{O}_7 + 3 \text{SnCl}_2 + 7 \text{H}_2\text{SO}_4 \rightarrow 3 \text{Sn}(\text{SO}_4)_2 + 2 \text{CrCl}_3 + \text{K}_2\text{SO}_4 + 7 \text{H}_2\text{O}$
- 71  $2 \text{KMnO}_4 + \text{Na}_2\text{SO}_3 + 2 \text{KOH} \rightarrow 2 \text{K}_2\text{MnO}_4 + \text{Na}_2\text{SO}_4 + \text{H}_2\text{O}$
- 72  $2 \text{KMnO}_4 + \text{H}_2\text{O}_2 + 2 \text{KOH} \rightarrow 2 \text{K}_2\text{MnO}_4 + 2 \text{H}_2\text{O} + \text{O}_2\uparrow$
- 73  $2 \text{NaCrO}_2 + 3 \text{Br}_2 + 8 \text{NaOH} \rightarrow 2 \text{Na}_2\text{CrO}_4 + 6 \text{NaBr} + 4 \text{H}_2\text{O}$
- 74  $\text{As}_2\text{S}_8 + 28 \text{HNO}_3 \rightarrow 2 \text{H}_3\text{AsO}_4 + 3 \text{H}_2\text{SO}_4 + 28 \text{NO}_2\uparrow + 8 \text{H}_2\text{O}$
- 75  $2 \text{KMnO}_4 + 5 \text{Na}_2\text{C}_2\text{O}_4 + 8 \text{H}_2\text{SO}_4 \rightarrow 5 \text{Na}^+ + \text{K}_2\text{SO}_4 + 2 \text{MnSO}_4 + 8 \text{H}_2\text{O} + 10 \text{CO}_2\uparrow$
- 76  $\text{Cr}_2(\text{SO}_4)_3 + 3 \text{NaNO}_3 + 5 \text{Na}_2\text{CO}_3 \rightarrow 2 \text{Na}_2\text{CrO}_4 + 3 \text{NaNO}_2 + 3 \text{Na}_2\text{SO}_4 + 5 \text{CO}_2\uparrow$
- 77  $\text{Cr}_2(\text{SO}_4)_3 + \text{KClO}_3 + 5 \text{Na}_2\text{CO}_3 \rightarrow 2 \text{Na}_2\text{CrO}_4 + \text{KCl} + 3 \text{Na}_2\text{SO}_4 + 5 \text{CO}_2\uparrow$
- 78  $6 \text{FeSO}_4 + 2 \text{HNO}_3 + 3 \text{H}_2\text{SO}_4 \rightarrow 3 \text{Fe}_2(\text{SO}_4)_3 + 2 \text{NO}\uparrow + 4 \text{H}_2\text{O}$
- 79  $\text{MnSO}_4 + 2 \text{Na}_2\text{CO}_3 + 2 \text{KNO}_3 \rightarrow \text{Na}_2\text{MnO}_4 + 2 \text{KNO}_2 + \text{Na}_2\text{SO}_4 + 2 \text{CO}_2\uparrow$
- 80  $3 \text{CoS} + 6 \text{HCl} + \text{KClO}_3 \rightarrow 3 \text{CoCl}_2 + \text{KCl} + 3 \text{Si} + 3 \text{H}_2\text{O}$
- 81  $3 \text{NiS} + 6 \text{HCl} + 2 \text{HNO}_3 \rightarrow 3 \text{NiCl}_2 + 2 \text{NO}\uparrow + 3 \text{Si} + 4 \text{H}_2\text{O}$
- 82  $3 \text{Cu}_2\text{S} + 16 \text{HNO}_3 \rightarrow 6 \text{Cu}(\text{NO}_3)_2 + 4 \text{NO}\uparrow + 3 \text{Si} + 8 \text{H}_2\text{O}$
- 83  $3 \text{As}_4 + 20 \text{HNO}_3 + 8 \text{H}_2\text{O} \rightarrow 12 \text{H}_3\text{AsO}_4 + 20 \text{NO}\uparrow$
- 84  $\text{As}_4 + 10 \text{KNO}_3 + 6 \text{Na}_2\text{CO}_3 \rightarrow 4 \text{Na}_3\text{AsO}_4 + 10 \text{KNO}_2 + 6 \text{CO}_2\uparrow$
- 85  $\text{As}_2\text{O}_3 + 6 \text{Zn} + 6 \text{H}_2\text{SO}_4 \rightarrow 2 \text{AsH}_3\uparrow + 6 \text{ZnSO}_4 + 3 \text{H}_2\text{O}$
- 86  $2 \text{Cu}^{2+} + 2 \text{I}^- \rightarrow 2 \text{Cu}^+ + \text{I}_2$
- 87  $\text{Sn}^{2+} + 2 \text{Fe}^{3+} \rightarrow \text{Sn}^{4+} + 2 \text{Fe}^{2+}$
- 88  $2 \text{Fe}^{3+} + 2 \text{I}^- \rightarrow 2 \text{Fe}^{2+} + \text{I}_2$
- 89  $2 \text{Fe}^{2+} + \text{Br}_2 \rightarrow 2 \text{Fe}^{3+} + 2 \text{Br}^-$
- 90  $\text{AsO}_4^{3-} + 2 \text{I}^- + 2 \text{H}^+ \rightarrow \text{AsO}_3^{3-} + \text{I}_2 + \text{H}_2\text{O}$
- 91  $2 \text{Fe}^{2+} + \text{ClO}^- + 2 \text{H}^+ \rightarrow 2 \text{Fe}^{3+} + \text{Cl}^- + \text{H}_2\text{O}$
- 92  $\text{AsO}_4^{3-} + \text{S}^{2-} + 2 \text{H}^+ \rightarrow \text{AsO}_3^{3-} + \text{S} + \text{H}_2\text{O}$
- 93  $\text{AsO}_3^{3-} + 3 \text{Zn} + 9 \text{H}^+ \rightarrow \text{AsH}_3\uparrow + 3 \text{Zn}^{2+} + 3 \text{H}_2\text{O}$
- 94  $\text{SO}_4^{2-} + 4 \text{Zn} + 8 \text{H}^+ \rightarrow \text{S}^{2-} + 4 \text{Zn}^{2+} + 4 \text{H}_2\text{O}$
- 95  $\text{NO}_3^- + 3 \text{Fe}^{2+} + 4 \text{H}^+ \rightarrow 3 \text{Fe}^{3+} + \text{NO}\uparrow + 2 \text{H}_2\text{O}$
- 96  $\text{Cu} + 2 \text{NO}_3^- + 4 \text{H}^+ \rightarrow \text{Cu}^{2+} + 2 \text{NO}_2\uparrow + 2 \text{H}_2\text{O}$
- 97  $\text{Cr}_2\text{O}_7^{2-} + 6 \text{Fe}^{2+} + 14 \text{H}^+ \rightarrow 2 \text{Cr}^{3+} + 6 \text{Fe}^{3+} + 7 \text{H}_2\text{O}$
- 98  $\text{Pb}_3\text{O}_4 + 2 \text{Fe}^{2+} + 8 \text{H}^+ \rightarrow 3 \text{Pb}^{2+} + 2 \text{Fe}^{3+} + 4 \text{H}_2\text{O}$

- 99  $2 \text{NO}_2^- + 2 \text{I}^- + 4 \text{H}^+ \rightarrow \text{I}_2 + 2 \text{NO}\uparrow + 2 \text{H}_2\text{O}$
- 100  $\text{Pb}_3\text{O}_4 + 2 \text{Cl}^- + 8 \text{H}^+ \rightarrow 3 \text{Pb}^{2+} + \text{Cl}_2\uparrow + 4 \text{H}_2\text{O}$
- 101  $\text{AsO}_3^{3-} + \text{I}_2 + 2 \text{OH}^- \rightarrow \text{AsO}_4^{3-} + 2 \text{I}^- + \text{H}_2\text{O}$
- 102  $\text{S}_2\text{O}_3^{2-} + 4 \text{Cl}_2 + 10 \text{OH}^- \rightarrow 2 \text{SO}_4^{2-} + 8 \text{Cl}^- + 5 \text{H}_2\text{O}$
- 103  $\text{SO}_3^{2-} + \text{I}_2 + 2 \text{OH}^- \rightarrow \text{SO}_4^{2-} + 2 \text{I}^- + \text{H}_2\text{O}$
- 104  $2 \text{Cr}^{3+} + 3 \text{Cl}_2 + 16 \text{OH}^- \rightarrow 2 \text{CrO}_4^{2-} + 6 \text{Cl}^- + 8 \text{H}_2\text{O}$
- 105  $2 \text{Ag}^+ + \text{SO}_3^{2-} + 2 \text{OH}^- \rightarrow 2 \text{Ag} + \text{SO}_4^{2-} + \text{H}_2\text{O}$
- 106  $\text{HPO}_3^{2-} + \text{Br}_2 + 3 \text{OH}^- \rightarrow \text{PO}_4^{3-} + 2 \text{Br}^- + 2 \text{H}_2\text{O}$
- 107  $\text{N}_2\text{H}_4 + 2 \text{I}_2 + 4 \text{OH}^- \rightarrow 4 \text{I}^- + \text{N}_2 + 4 \text{H}_2\text{O}$
- 108  $\text{AsO}_3^{3-} + 2 \text{Ag}^+ + 2 \text{OH}^- \rightarrow \text{AsO}_4^{3-} + 2 \text{Ag} + \text{H}_2\text{O}$
- 109  $2 \text{Au}^{3+} + \text{AsH}_3 + 9 \text{OH}^- \rightarrow \text{AsO}_3^{3-} + 2 \text{Au} + 6 \text{H}_2\text{O}$
- 110  $2 \text{Mn}^{2+} + 5 \text{BiO}_3^- + 14 \text{H}^+ \rightarrow 2 \text{MnO}_4^- + 5 \text{Bi}^{3+} + 7 \text{H}_2\text{O}$
- 111  $2 \text{MnO}_4^- + 5 \text{H}_2\text{O}_2 + 6 \text{H}^+ \rightarrow 2 \text{Mn}^{2+} + 5 \text{O}_2\uparrow + 8 \text{H}_2\text{O}$
- 112  $\text{AsO}_4^{3-} + \text{SO}_3^{2-} + 6 \text{H}^+ \rightarrow \text{As}^{3+} + \text{SO}_4^{2-} + 3 \text{H}_2\text{O}$
- 113  $2 \text{AsO}_3^{3-} + 2 \text{NO}_3^- + 2 \text{H}^+ \rightarrow 2 \text{AsO}_4^{3-} + \text{N}_2\text{O}_3 + \text{H}_2\text{O}$
- 114  $2 \text{MnO}_4^- + 5 \text{NO}_2^- + 6 \text{H}^+ \rightarrow 2 \text{Mn}^{2+} + 5 \text{NO}_3^- + 3 \text{H}_2\text{O}$
- 115  $2 \text{MnO}_4^- + 3 \text{Mn}^{2+} + 4 \text{OH}^- \rightarrow 5 \text{MnO}_2\downarrow + 2 \text{H}_2\text{O}$
- 116  $\text{Pb}^{2+} + \text{NO}_3^- + 2 \text{OH}^- \rightarrow \text{PbO}_2\downarrow + \text{NO}_2^- + \text{H}_2\text{O}$
- 117  $\text{S} + 2 \text{SO}_4^{2-} + 2 \text{OH}^- \rightarrow 3 \text{SO}_3^{2-} + \text{H}_2\text{O}$
- 118  $\text{S} + 2 \text{NO}_3^- \rightarrow \text{SO}_4^{2-} + 2 \text{NO}\uparrow$
- 119  $8 \text{MnO}_4^- + 5 \text{S}^{2-} + 24 \text{H}^+ \rightarrow 8 \text{Mn}^{2+} + 5 \text{SO}_4^{2-} + 12 \text{H}_2\text{O}$
- 120  $3 \text{I}_2 + 10 \text{NO}_3^- + 4 \text{H}^+ \rightarrow 6 \text{IO}_3^- + 10 \text{NO}\uparrow + 2 \text{H}_2\text{O}$
- 121  $2 \text{Au}^{3+} + 3 \text{H}_2\text{O}_2 + 6 \text{OH}^- \rightarrow 2 \text{Au} + 3 \text{O}_2\uparrow + 6 \text{H}_2\text{O}$
- 122  $\text{AuCl}_4 + 3 \text{Fe} \rightarrow \text{Au} + 3 \text{Fe}^{3+} + 4 \text{Cl}^-$
- 123  $2 \text{Fe}^{3+} + 2 \text{S}_2\text{O}_3^{2-} \rightarrow 2 \text{Fe}^{2+} + \text{S}_4\text{O}_6^{2-}$
- 124  $2 [\text{Fe}(\text{CN})_6]^{4-} + \text{I}_2 \rightarrow 2 [\text{Fe}(\text{CN})_6]^{3-} + 2 \text{I}^-$
- 125  $2 \text{MnO}_4^- + 5 \text{C}_2\text{O}_4^{2-} + 16 \text{H}^+ \rightarrow 2 \text{Mn}^{2+} + 10 \text{CO}_2\uparrow + 8 \text{H}_2\text{O}$
- 126  $\text{S}_2\text{O}_8^{2-} + 4 \text{ClO}^- + 2 \text{OH}^- \rightarrow 2 \text{SO}_4^{2-} + 4 \text{Cl}^- + \text{H}_2\text{O}$
- 127  $4 \text{Zn} + \text{NO}_3^- + 7 \text{OH}^- + 6 \text{H}_2\text{O} \rightarrow 4 [\text{Zn}(\text{OH})_4]^{2-} + \text{NH}_3\uparrow$
- 128  $8 \text{Al} + 3 \text{NO}_3^- + 5 \text{OH}^- + 18 \text{H}_2\text{O} \rightarrow 8 [\text{Al}(\text{OH})_4]^- + \text{NH}_3\uparrow$
- 129  $3 \text{P}_4 + 10 \text{IO}_3^- + 36 \text{OH}^- \rightarrow 12 \text{PO}_4^{3-} + 10 \text{I}^- + 18 \text{H}_2\text{O}$
- 130  $5 \text{P}_4 + 12 \text{IO}_3^- + 28 \text{OH}^- \rightarrow 20 \text{HPO}_3^{2-} + 6 \text{I}_2 + 4 \text{H}_2\text{O}$
- 131  $\text{FeS}_2 + 5 \text{NO}_3^- + 4 \text{H}^+ \rightarrow \text{Fe}^{3+} + 2 \text{SO}_4^{2-} + 5 \text{NO}\uparrow + 2 \text{H}_2\text{O}$
- 132  $\text{As}_2\text{S}_3 + 28 \text{NO}_3^- + 16 \text{H}^+ \rightarrow 2 \text{AsO}_4^{3-} + 3 \text{SO}_4^{2-} + 28 \text{NO}_2\uparrow + 8 \text{H}_2\text{O}$



\* Na podstawie: Marian Langner, **Reakcje utleniania-redukcji w nauczaniu chemii**, WSiP, 1988 r.