



Physics. *You work it out.*

[Home](#) [Gameboard](#) [Chemistry](#) [Inorganic](#) [Redox](#) [Balancing Redox Equations 1](#)

Balancing Redox Equations 1

Essential Pre-Uni Chemistry K3.1

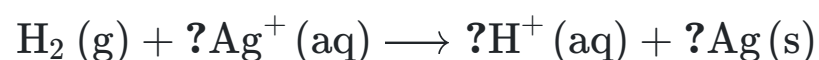
A Level



Balance the following redox equations.

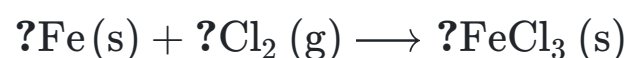
Use the lowest possible **integer** coefficients your answers.

Part A (a)



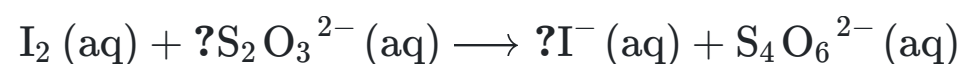
Please **click on and drag** the pre-loaded species to create a balanced chemical equation.

Part B (b)

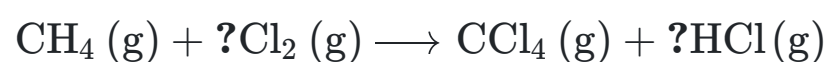


Please **click on and drag** the pre-loaded species to create a balanced chemical equation.

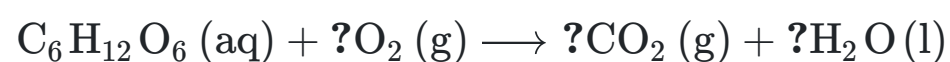
Part C (c)



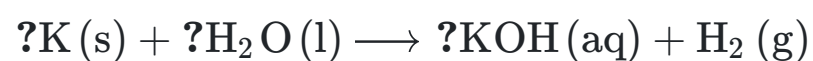
Please **click on and drag** the pre-loaded species to create a balanced chemical equation.

Part D (d)

Please **click on and drag** the pre-loaded species to create a balanced chemical equation.

Part E (e)

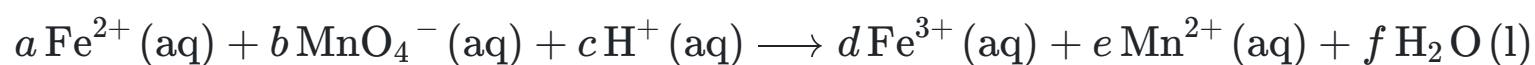
Please **click on and drag** the pre-loaded species to create a balanced chemical equation.

Part F (f)

Please **click on and drag** the pre-loaded species to create a balanced chemical equation.

Part G (g)

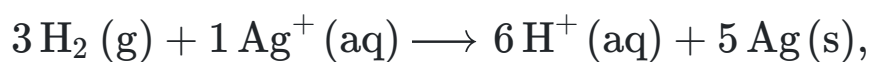
Please **click on and drag** the pre-loaded species to create a balanced chemical equation.

Part H (h)

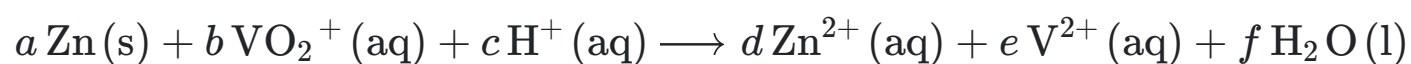
This chemical equation is too long to fit on your screen, so please balance the equation and give your answer as a string of numbers in the order of *abcdef*. For example, if the question is



and you think the answer is



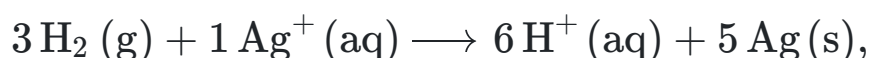
then input 3165.

Part I (i)

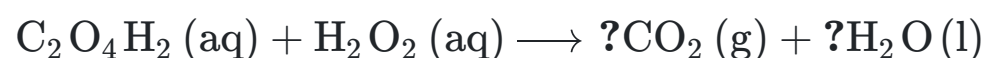
This chemical equation is too long to fit on your screen, so please balance the equation and give your answer as a string of numbers in the order of *abcdef*. For example, if the question is



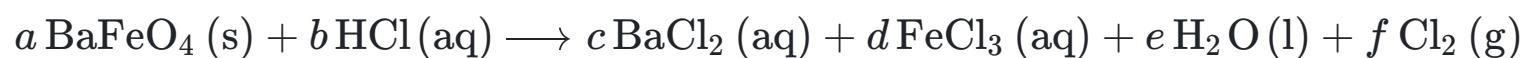
and you think the answer is



then input 3165.

Part J (j)

Please **click on and drag** the pre-loaded species to create a balanced chemical equation.

Part K (k)

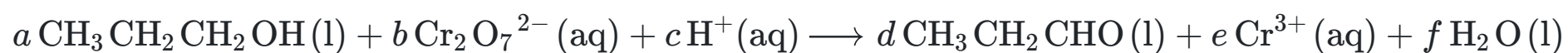
This chemical equation is too long to fit on your screen, so please balance the equation and give your answer as a string of numbers in the order of *abcdef*. For example, if the question is



and you think the answer is



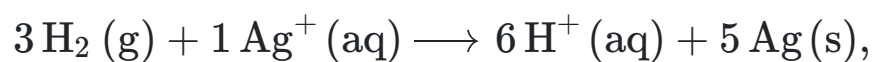
then input 3165.

Part L (l)

This chemical equation is too long to fit on your screen, so please balance the equation and give your answer as a string of numbers in the order of *abcdef*. For example, if the question is



and you think the answer is



then input 3165.



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[Home](#) [Gameboard](#) [Chemistry](#) [Inorganic](#) [Redox](#) [Balancing Redox Equations 2](#)

Balancing Redox Equations 2

Essential Pre-Uni Chemistry K3.2

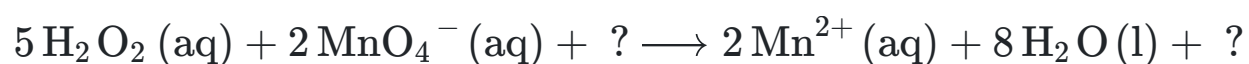
A Level



Complete the balanced equations to show the reactions between the following pairs of substances in acidic aqueous conditions (no fractions).

Part A Manganate(VII) and hydrogen peroxide

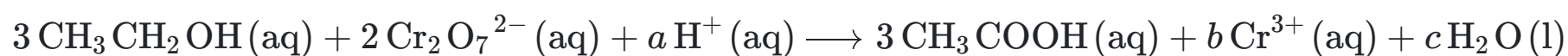
Please **click on and drag** the pre-loaded species to create a balanced chemical equation.



Part B Scandium and ethanoic acid

Please **click on and drag** the pre-loaded species to create a balanced chemical equation.



Part C Ethanol and boiling dichromate(VI)

This chemical equation is too long to fit on your screen, so please balance the equation and give your answer as a string of numbers in the order of abc . For example, if the question is



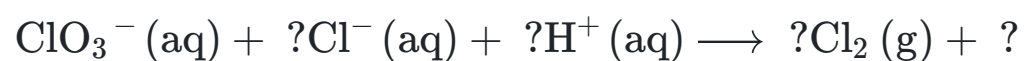
and you think the answer is



then input 315.

Part D Chlorate(V) and chloride

Please **click on and drag** the pre-loaded species to create a balanced chemical equation.



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[Home](#) [Gameboard](#) [Chemistry](#) [Inorganic](#) [Redox](#) [Balancing Redox Equations 3](#)

Balancing Redox Equations 3

Essential Pre-Uni Chemistry K3.3

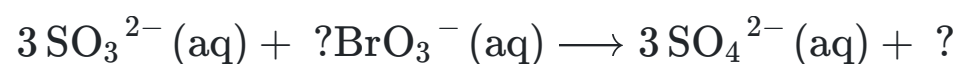
A Level



Complete the balanced equations to show the reactions between the following pairs of substances in alkaline aqueous conditions (no fractions).

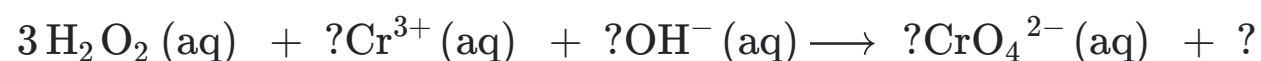
Part A Sulfite and bromate(V)

sulfite and bromate(V)



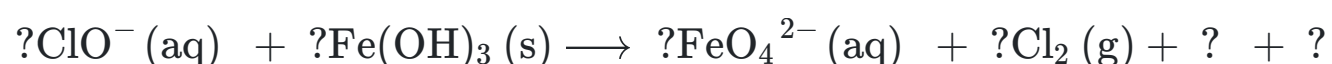
Part B Hydrogen peroxide and chromium(III)

hydrogen peroxide and chromium(III)



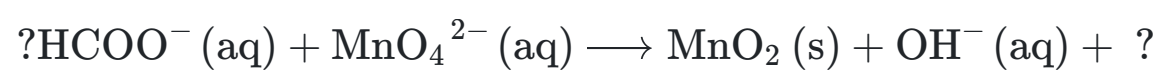
Part C Chlorate(I) and iron(III)

chlorate(I) and iron(III)



Part D Manganate(VI) and methanoate

manganate(VI) and methanoate



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Oxidation of Thiosulfate

A Level

An aqueous solution contains 1 mol of $\text{S}_2\text{O}_3^{2-}$ ions and this reduces 4 mol of Cl_2 molecules to Cl^- ions. What is the sulfur-containing product of this reaction?

- ☐ SO_3^{2-}
- ☐ $\text{S}_4\text{O}_6^{2-}$
- ☐ SO_2
- ☐ SO_4^{2-}
- ☐ S

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[Home](#) [Gameboard](#) [Chemistry](#) [Inorganic](#) [Redox](#) [Disproportionation 1](#)

Disproportionation 1

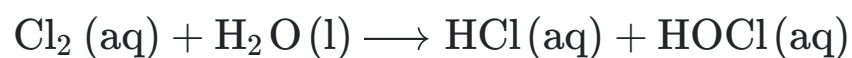
Essential Pre-Uni Chemistry K4.1

A Level



The following are all examples of disproportionation reactions.

Part A (a)



State the symbol of the element that is disproportionated in the reaction.

State the element's oxidation state when it first appears in the chemical equation.

State the element's oxidation state the second time it appears in the chemical equation.

State the element's oxidation state the third time it appears in the chemical equation.

Part B **(b)**



State the symbol of the element that is disproportionated in the reaction.

State the element's oxidation state when it first appears in the chemical equation.

State the element's oxidation state the second time it appears in the chemical equation.

State the element's oxidation state the third time it appears in the chemical equation.

Part C (c)



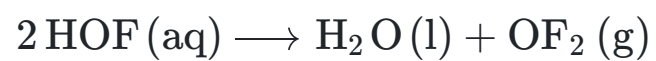
State the symbol of the element that is disproportionated in the reaction.

State the element's oxidation state when it first appears in the chemical equation.

State the element's oxidation state the second time it appears in the chemical equation.

State the element's oxidation state the third time it appears in the chemical equation.

Part D (d)



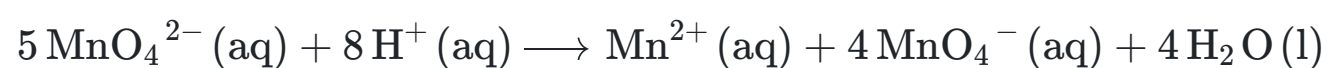
State the symbol of the element that is disproportionated in the reaction.

State the element's oxidation state when it first appears in the chemical equation.

State the element's oxidation state the second time it appears in the chemical equation.

State the element's oxidation state the third time it appears in the chemical equation.

Part E (e)



State the symbol of the element that is disproportionated in the reaction.

State the element's oxidation state when it first appears in the chemical equation.

State the element's oxidation state the second time it appears in the chemical equation.

State the element's oxidation state the third time it appears in the chemical equation.

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[Home](#) [Gameboard](#) [Chemistry](#) [Inorganic](#) [Redox](#) [Disproportionation 2](#)

Disproportionation 2

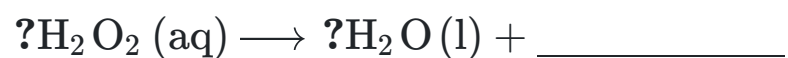
Essential Pre-Uni Chemistry K4.2

A Level



Complete and balance the following equations that represent disproportionation reactions.

Part A (a)

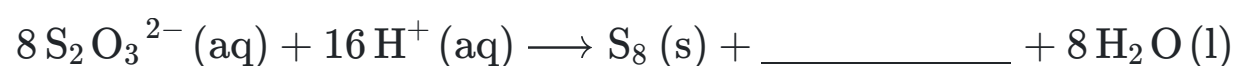


Part B (b)



Please **click on and drag** the pre-loaded species in the equation editor to create your chemical equation.

Part C (c)



Please **click on and drag** the pre-loaded species in the equation editor to create your chemical equation.

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[Home](#) [Gameboard](#) [Chemistry](#) [Inorganic](#) [Redox](#) [Iron in a Nail](#)

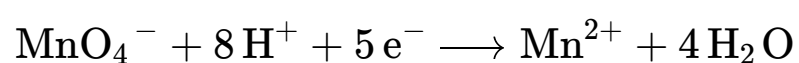
Iron in a Nail

A Level



A nail of mass 1.40 g was dissolved in an excess of dilute sulfuric acid to form 100 cm³ of solution. A 10 cm³ sample of this solution required 4.0×10^{-4} mol of manganate (VII) for complete oxidation.

In acidic solution:



By assuming that, in dissolving in sulfuric acid, the iron in the nail was converted entirely into Fe²⁺ (aq) and that manganate (VII) oxidises Fe²⁺ to Fe³⁺, calculate:

Part A Moles of Fe²⁺

The number of moles of Fe²⁺ produced from the nail.

Part B % of Fe

The percentage of iron in the nail.

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Sodium Nitrite

A Level

Nitrogen can be obtained in the laboratory by warming a mixture of ammonium chloride and sodium nitrite, NaNO_2 . Water is also produced and a solid is left.

Part A Ammonium chloride and sodium nitrite

Suggest an identity for the solid.

Part B Equation

Write a balanced equation for the reaction, including state symbols, balancing to obtain the lowest integer coefficients possible.

Part C Ammonium chloride and sodium nitrate

A similar reaction takes place when ammonium chloride is heated with sodium nitrate NaNO_3 but this time the only different product is an oxide of nitrogen. Suggest a formula for this oxide, and the oxidation state of nitrogen in it.

Formula:

Oxidation state:

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High Oxidation States

A Level

The maximum possible oxidation state of an element could occur if all the outermost electrons, the so-called valence electrons, were used in bonding. The maximum number of valence electrons is equal to the group number for Groups 1 to 11, and the group number minus 10 for elements from Groups 12 to 18. Note the maximum possible oxidation state is not always achievable; however, each of the following elements forms an oxide exhibiting the theoretical maximum oxidation state for that element. Give the formula for each oxide.

Part A **Xenon (Xe)****Part B** **Polonium (Po)****Part C** **Chlorine (Cl)****Part D** **Niobium (Nb)**

Part E **Osmium (Os)**

Part F **Yttrium (Y)**

Adapted with permission from the Cambridge Chemistry Challenge 2021, Question 2

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