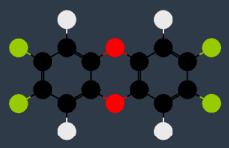

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Turn Up Trumps

Each card in the pack shows a list of numerical data about a greenhouse gas. If the highest is best, the number is shown in green. If the lowest is best, the number is shown in red.

All the cards are dealt among the players. There must be at least two players, and at least one card for each player. The starting player (the player sitting on the dealer's left) selects a category from his or her topmost card and reads out its value. Each other player then reads out the value of the same category from their cards. The best value wins the "trick", and the winner takes all the cards of the trick and places them at the bottom of his or her pile. The winner then looks at their new topmost card, and chooses the category for the next round.

In the event of a draw, the cards are placed in the centre and a new category is chosen from the next card by the same person as in the previous round. The winner of that round obtains all of the cards in the centre as well as the top card from each player.

Players are eliminated when they lose their last card, and the winner is the player who obtains the whole pack.

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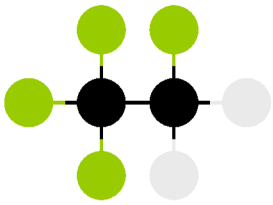
1,1,1,2-Tetrafluoroethane (HFC-134a)



CH_2FCF_3

Number of atoms	8
Number of bonds	7
Molar mass	102.03 g/mol
Lifetime in atmosphere	13.4 years
Global Warming Potential over 20 years	3,790
Global Warming Potential over 100 years	1,550
Estimated emissions in 2008	163 Gg
Atmospheric concentration in September 2013	74 ppt

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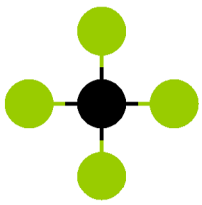
Tetrafluoromethane (PFC-14)



CF_4

Number of atoms	5
Number of bonds	4
Molar mass	88.0043 g/mol
Lifetime in atmosphere	50,000 years
Global Warming Potential over 20 years	4,950
Global Warming Potential over 100 years	7,350
Estimated emissions in 2008	11 Gg
Atmospheric concentration in September 2013	81 ppt

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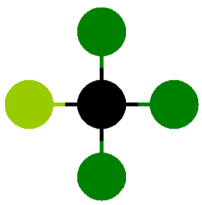
Trichlorofluoromethane (CFC-11)



CCl_3F

Number of atoms	5
Number of bonds	4
Molar mass	137.37 g/mol
Lifetime in atmosphere	45 years
Global Warming Potential over 20 years	7,020
Global Warming Potential over 100 years	5,350
Estimated emissions in 2008	No data
Atmospheric concentration in September 2013	233 ppt

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Carbon dioxide

CO_2

Number of atoms	3
Number of bonds	4
Molar mass	44.01 g/mol
Lifetime in atmosphere	No single lifetime can be given
Global Warming Potential over 20 years	1
Global Warming Potential over 100 years	1
Estimated emissions in 2008	51,762,916 Gg
Atmospheric concentration in September 2013	393,510,000 ppt

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Nitrous oxide

N_2O

Number of atoms	3
Number of bonds	4
Molar mass	44.013 g/mol
Lifetime in atmosphere	121 years
Global Warming Potential over 20 years	268
Global Warming Potential over 100 years	298
Estimated emissions in 2008	10,700 Gg
Atmospheric concentration in September 2013	325,924 ppt

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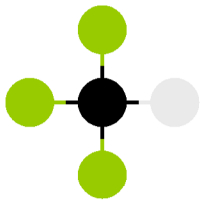
Fluoroform (HFC-23)



CHF_3

Number of atoms	5
Number of bonds	4
Molar mass	70.01 g/mol
Lifetime in atmosphere	222 years
Global Warming Potential over 20 years	11,005
Global Warming Potential over 100 years	13,856
Estimated emissions in 2008	18 Gg
Atmospheric concentration in September 2013	26 ppt

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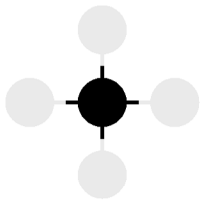
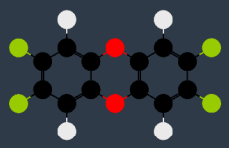
Methane



CH_4

Number of atoms	5
Number of bonds	4
Molar mass	16.04 g/mol
Lifetime in atmosphere	12.4 years
Global Warming Potential over 20 years	86
Global Warming Potential over 100 years	34
Estimated emissions in 2008	364,000 Gg
Atmospheric concentration in September 2013	1,814,345 ppt



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Data sources

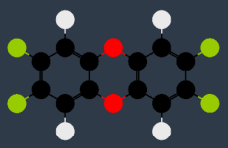
Molecule names, structures, molar masses:
Wikipedia... so comes with health warnings!

Formulae, Lifetimes, Global Warming Potentials:
IPCC Working Group I contribution to Fifth Assessment Report
http://www.climatechange2013.org/report/full-report/

Emissions:
EC-JRC/PBL Emission Database for Global Atmospheric Research (EDGAR), release version 4.0, 2009.
http://edgar.jrc.ec.europe.eu

Concentrations:
Advanced Global Atmospheric Gases Experiment (AGAGE)
https://agage.mit.edu/data/use-agage-data

Carbon dioxide concentrations:
NOAA Earth System Research Laboratory
http://www.esrl.noaa.gov/gmd/ccgg/trends/



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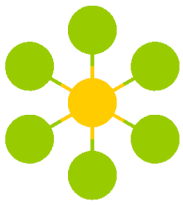
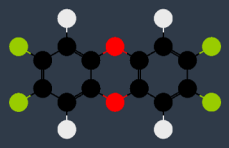
Sulphur hexafluoride



SF_6

Number of atoms	7
Number of bonds	6
Molar mass	146.06 g/mol
Lifetime in atmosphere	3,200 years
Global Warming Potential over 20 years	17,783
Global Warming Potential over 100 years	26,087
Estimated emissions in 2008	6 Gg
Atmospheric concentration in September 2013	8 ppt



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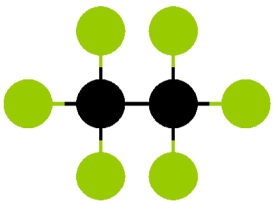
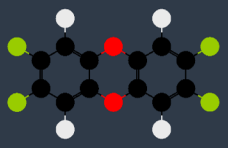
Hexafluoroethane (PFC-116)



C_2F_6

Number of atoms	8
Number of bonds	7
Molar mass	138.01 g/mol
Lifetime in atmosphere	10,000 years
Global Warming Potential over 20 years	8,344
Global Warming Potential over 100 years	12,340
Estimated emissions in 2008	2 Gg
Atmospheric concentration in September 2013	4 ppt



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Water vapour

H_2O

Number of atoms	3
Number of bonds	2
Molar mass	18.01528 g/mol
Lifetime in atmosphere	n/a
Global Warming Potential over 20 years	n/a
Global Warming Potential over 100 years	n/a
Estimated emissions in 2008	n/a
Atmospheric concentration in September 2013	n/a

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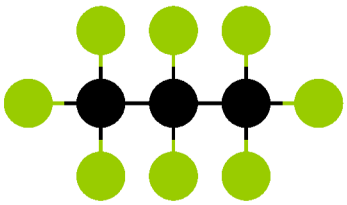
Octafluoropropane (PFC-218)

C_3F_8



Number of atoms	11
Number of bonds	10
Molar mass	188.02 g/mol
Lifetime in atmosphere	2,600 years
Global Warming Potential over 20 years	6,752
Global Warming Potential over 100 years	9,878
Estimated emissions in 2008	0.4 Gg
Atmospheric concentration in September 2013	0.6 ppt

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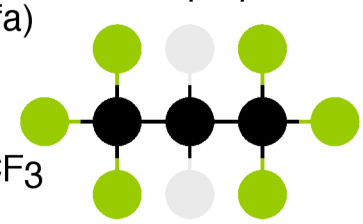
1,1,1,3,3,3-Hexafluoropropane (HFC-236fa)

$CF_3CH_2CF_3$



Number of atoms	11
Number of bonds	10
Molar mass	152.04 g/mol
Lifetime in atmosphere	242 years
Global Warming Potential over 20 years	7,054
Global Warming Potential over 100 years	8,998
Estimated emissions in 2008	0.2 Gg
Atmospheric concentration in September 2013	0.1 ppt

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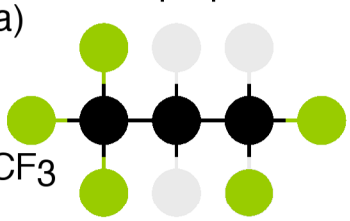
1,1,1,3,3-Pentafluoropropane (HFC-245fa)

$CHF_2CH_2CF_3$



Number of atoms	11
Number of bonds	10
Molar mass	134.05 g/mol
Lifetime in atmosphere	7.7 years
Global Warming Potential over 20 years	2,992
Global Warming Potential over 100 years	1,032
Estimated emissions in 2008	4 Gg
Atmospheric concentration in September 2013	1.6 ppt

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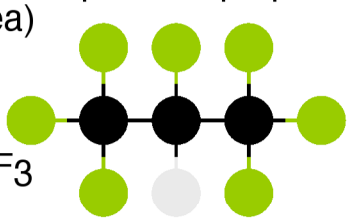
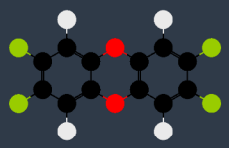
1,1,1,2,3,3,3-Heptafluoropropane (HFC-227ea)

CF_3CHFCF_3



Number of atoms	11
Number of bonds	10
Molar mass	170.03 g/mol
Lifetime in atmosphere	38.9 years
Global Warming Potential over 20 years	5,454
Global Warming Potential over 100 years	3,860
Estimated emissions in 2008	7 Gg
Atmospheric concentration in September 2013	0.8 ppt



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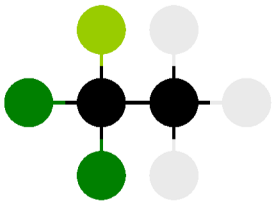
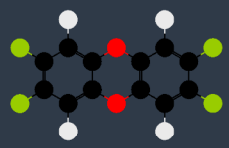
1,1-Dichloro-1-fluoroethane (HCFC-141b)



CH_3CCl_2F

Number of atoms	8
Number of bonds	7
Molar mass	116.94 g/mol
Lifetime in atmosphere	9.2 years
Global Warming Potential over 20 years	2,608
Global Warming Potential over 100 years	938
Estimated emissions in 2008	0.8 Gg
Atmospheric concentration in September 2013	23 ppt



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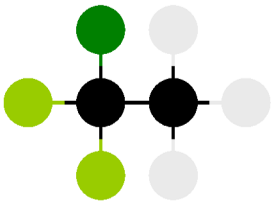
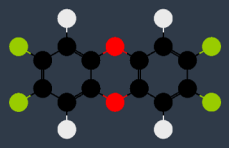
1-Chloro-1,1-difluoroethane (HCFC-142b)



CH_3CClF_2

Number of atoms	8
Number of bonds	7
Molar mass	100.49 g/mol
Lifetime in atmosphere	17.2 years
Global Warming Potential over 20 years	5,125
Global Warming Potential over 100 years	2,345
Estimated emissions in 2008	6 Gg
Atmospheric concentration in September 2013	22 ppt



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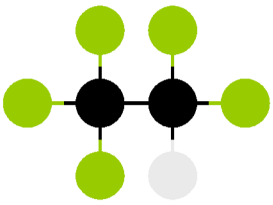
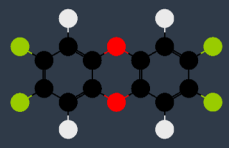
Pentafluoroethane (HFC-125)



CHF_2CF_3

Number of atoms	8
Number of bonds	7
Molar mass	120.02 g/mol
Lifetime in atmosphere	28.2 years
Global Warming Potential over 20 years	6,207
Global Warming Potential over 100 years	3,691
Estimated emissions in 2008	30 Gg
Atmospheric concentration in September 2013	13 ppt



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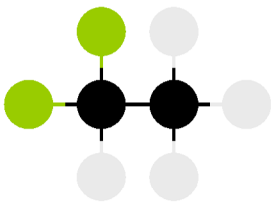
1,1-Difluoroethane (HFC-152a)



CH_3CHF_2

Number of atoms	8
Number of bonds	7
Molar mass	66.05 g/mol
Lifetime in atmosphere	1.5 years
Global Warming Potential over 20 years	524
Global Warming Potential over 100 years	167
Estimated emissions in 2008	28 Gg
Atmospheric concentration in September 2013	6.4 ppt