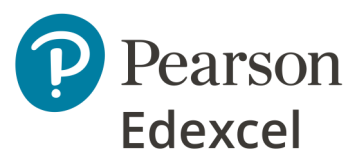
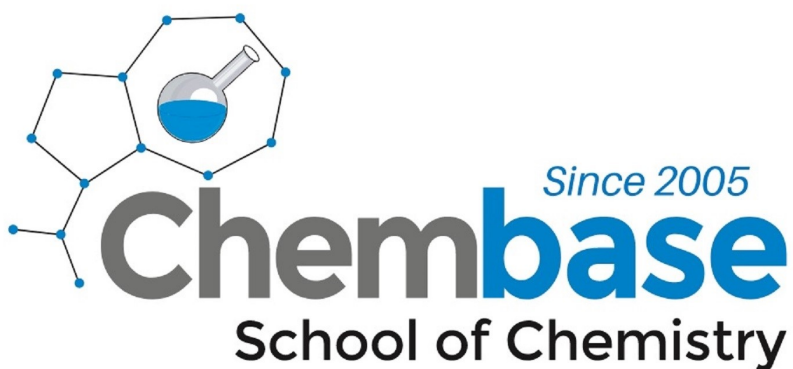


STUDY PACK : 1.1



1. Principles of Chemistry

Chemical Formulae



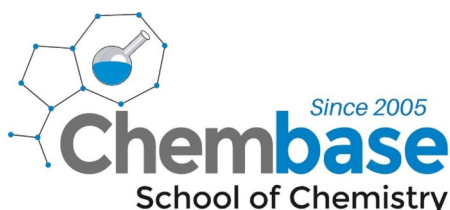
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Chemical Formulae

1. What is meant by the term Valency?

Valency of an element is equal to the number of positive or negative charge acquired by the atom by losing or gaining electrons

2. Write down the Rules of writing a Chemical formula?

a) Write down the symbols of the elements/ radicals given in the chemical name of the compound.

b) Write down the valencies of each element or radical under the corresponding symbol.

c) Cross them over as shown below

d) The valencies show the simplest combining ratio & may be cancelled down in order to simplify

e) If an element has more than one valency, the name of the compound will indicate the valency in capital roman numerals.

Eg: Copper (I) Oxide

Lead (IV) chloride

5. Explain why the valency of noble gasses is zero hence forming no compounds

Noble gases possess a completely filled outermost shell of electrons. Therefore, it will not lose or gain electrons, hence the valency is zero forming no bonds.

6. Assign the valency for the following Elements & Radicals:

ELEMENTS			RADICALS		
	Symbol	Valency		Symbol	Valency
Hydrogen	H		Hydroxide	OH	
Carbon	C		Nitrite	NO₂	
Nitrogen	N		Nitrate	NO₃	
Oxygen	O		Sulfite	SO₃	
Sodium	Na		Sulfate	SO₄	
Magnesium	Mg		Ammonium	NH₄	
Aluminium	Al		Carbonate	CO₃	
Silicon	Si		Hydrogen-carbonate (bicarbonate)	HCO₃	
Phosphorus	P		Hydrogen- Sulfite (bisulfite)	HSO₃	
Sulfur	S		Hydrogen- Sulfate (bisulfate)	HSO₄	
Chlorine	Cl		Phosphate	PO₄	
Potassium	K		Manganate (VII)	MnO₄	
Manganese	Mn		Chlorate (I)	ClO	
Iron	Fe		Chlorate (V)	ClO₃	
Cobalt	Co		Vanadate (V)	VO₃	
Copper	Cu		Chromate (VI)	CrO₄	
Zinc	Zn		Dichromate (VI)	Cr₂O₇	
Bromine	Br		Oxalate	C₂O₄	
Barium	Ba		Thiosulfate	S₂O₃	
Iodine	I		Tetrathionate	S₄O₆	
Lead	Pb		Peroxi di sulfate (per sulfate)	S₂O₈	
Mercury	Hg				
Silver	Ag				

7. Write the formulae of the following, by showing the valencies of each element & Crossing them over:

Aluminium Oxide

Iron (II) Sulfate

Copper (I) Oxide

Lead (II) Nitrate

Ammonium Carbonate

Calcium Hydrogen Carbonate

Lead (IV) Oxide

Tin (II) Chloride

Iron (III) hydroxide

Ammonium Phosphate

Magnesium Chromate (VI)

Potassium Chlorate (V)

Aluminium Vanadate (V)

Sodium dichromate (VI)

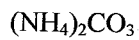
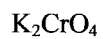
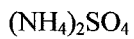
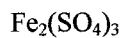
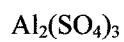
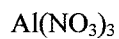
Calcium Oxalate

Zinc nitrate

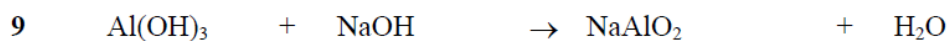
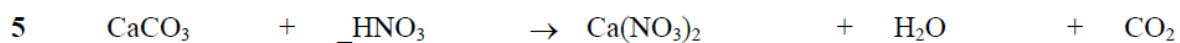
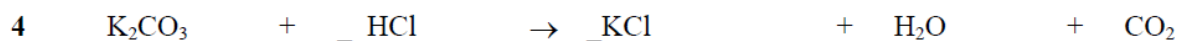
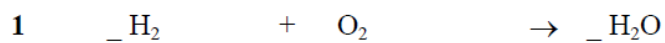
Sodium thiosulfate

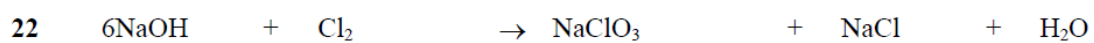
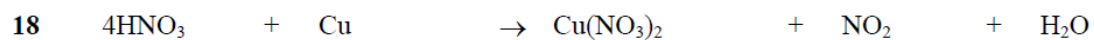
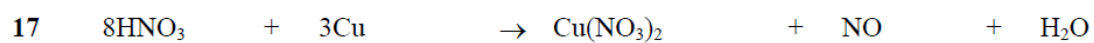
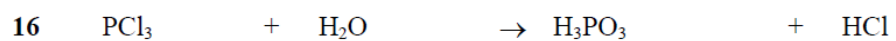
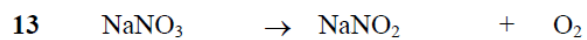
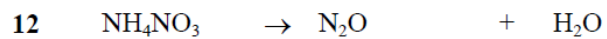
Sodium Chlorate (I)

Naming of Compounds



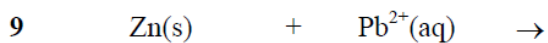
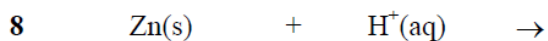
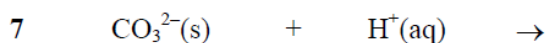
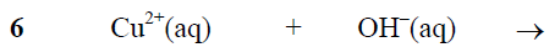
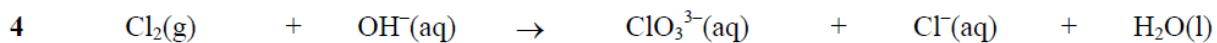
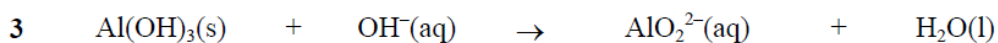
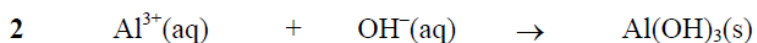
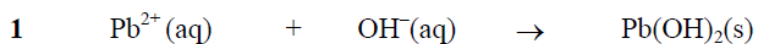
Balancing Equations





Ionic equations

In questions 1–5 you are required to balance the equations, in questions 6–10 you are required to complete the equation and then balance it. For questions 1–17 you are required to write the full, balanced ionic equation. Questions 18–20 involve more complex ions again you are just asked to balance the equation.



-
- 11** Write an ionic equation for the reaction of magnesium with sulphuric acid.
-
- 12** Write an ionic equation for the reaction of sodium carbonate solution with nitric acid.
-
- 13** Write an ionic equation for the reaction of copper oxide with hydrochloric acid.
-
- 14** Write an ionic equation for the reaction of barium chloride solution with sodium sulphate solution.
-
- 15** Write an ionic equation for the reaction of silver nitrate solution with potassium chloride solution.
-
- 16** Write an ionic equation for the reaction of zinc with silver nitrate solution.
-
- 17** Write ionic equations for the reactions of sodium hydroxide and potassium hydroxide with hydrochloric acid.
-
- 18** Write ionic equations for the reactions of sodium hydroxide and potassium hydroxide with nitric acid.
-
- 19** Write ionic equations for the reactions of sodium hydroxide and potassium hydroxide with sulphuric acid.
-
- 20** What do you notice about the answers to questions 17, 18 and 19?
-

Steps for writing ionic equations.

- Step 1 : Write the correct formulae of the reactants & the products.
Step II : Balance the equation.
Step III : Write the state symbols, aqueous (aq), liquid (l), gaseous (g), solid (s), vapour (v)
Step IV : Separate ONLY the (aq) molecules into their respective ions.
Step V : Cancel the common ions. (spectator ions)

Rules for solubility of salts

1. All nitrate salts are soluble.
2. All salts of Na^+ , K^+ & NH_4^+ are soluble.
3. Most Chloride salts are soluble. Exceptions : AgCl , PbCl_2
4. Most sulfate salts are soluble. Exceptions : BaSO_4 , PbSO_4 , CaSO_4
5. Most of hydroxide salts are slightly soluble. Important soluble hydroxides are : NaOH , KOH , & Ca(OH)_2
6. Most carbonate salts are insoluble. Except for Na^+ , K^+ & NH_4^+

Answers

The Periodic Table of Elements

	1	2	3	4	5	6	7	0 (8)																																																																																																																																																																																																																																																																														
	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> 1.0 H hydrogen 1 </div>																																																																																																																																																																																																																																																																																					
	<div style="border: 1px solid black; padding: 2px; display: inline-block;"> relative atomic mass atomic symbol name atomic (proton) number </div>																																																																																																																																																																																																																																																																																					
(1)	6.9 Li lithium 3	9.0 Be beryllium 4	(2)	23.0 Na sodium 11	24.3 Mg magnesium 12	(3)	47.9 Ti titanium 22	50.9 V vanadium 23	54.9 Mn manganese 25	58.9 Co cobalt 27	59.0 Cr chromium 24	(4)	45.0 Sc scandium 21	40.1 Ca calcium 20	55.8 Fe iron 26	58.7 Ni nickel 28	63.5 Cu copper 29	65.4 Zn zinc 30	(5)	85.5 Rb rubidium 37	87.6 Sr strontium 38	91.2 Zr zirconium 40	92.9 Nb niobium 41	95.9 Mo molybdenum 42	101.1 Ru ruthenium 44	102.9 Rh rhodium 45	106.4 Pd palladium 46	112.4 Cd cadmium 48	(6)	132.9 Cs caesium 55	137.3 Ba barium 56	178.5 Hf hafnium 72	180.9 Ta tantalum 73	183.8 W tungsten 74	186.2 Re rhenium 75	190.2 Os osmium 76	192.2 Ir iridium 77	195.1 Pt platinum 78	200.6 Hg mercury 80	(7)	132.9 Fr francium 87	[223] Ra radium 88	[227] Ac* actinium 89	[261] Rf rutherfordium 104	[262] Db dubnium 105	[266] Sg seaborgium 106	[264] Bh bohrium 107	[277] Hs hassium 108	[268] Mt meitnerium 109	[271] Ds darmstadtium 110	[272] Rg roentgenium 111	(8)	132.9 Fr francium 87	[223] Ra radium 88	[227] Ac* actinium 89	[261] Rf rutherfordium 104	[262] Db dubnium 105	[266] Sg seaborgium 106	[264] Bh bohrium 107	[277] Hs hassium 108	[268] Mt meitnerium 109	[271] Ds darmstadtium 110	[272] Rg roentgenium 111	(9)	132.9 Fr francium 87	[223] Ra radium 88	[227] Ac* actinium 89	[261] Rf rutherfordium 104	[262] Db dubnium 105	[266] Sg seaborgium 106	[264] Bh bohrium 107	[277] Hs hassium 108	[268] Mt meitnerium 109	[271] Ds darmstadtium 110	[272] Rg roentgenium 111	(10)	132.9 Fr francium 87	[223] Ra radium 88	[227] Ac* actinium 89	[261] Rf rutherfordium 104	[262] Db dubnium 105	[266] Sg seaborgium 106	[264] Bh bohrium 107	[277] Hs hassium 108	[268] Mt meitnerium 109	[271] Ds darmstadtium 110	[272] Rg roentgenium 111	(11)	132.9 Fr francium 87	[223] Ra radium 88	[227] Ac* actinium 89	[261] Rf rutherfordium 104	[262] Db dubnium 105	[266] Sg seaborgium 106	[264] Bh bohrium 107	[277] Hs hassium 108	[268] Mt meitnerium 109	[271] Ds darmstadtium 110	[272] Rg roentgenium 111	(12)	132.9 Fr francium 87	[223] Ra radium 88	[227] Ac* actinium 89	[261] Rf rutherfordium 104	[262] Db dubnium 105	[266] Sg seaborgium 106	[264] Bh bohrium 107	[277] Hs hassium 108	[268] Mt meitnerium 109	[271] Ds darmstadtium 110	[272] Rg roentgenium 111	(13)	10.8 B boron 5	27.0 Al aluminium 13	12.0 C carbon 6	14.0 N nitrogen 7	16.0 O oxygen 8	19.0 F fluorine 9	20.2 Ne neon 10	(14)	10.8 B boron 5	27.0 Al aluminium 13	28.1 Si silicon 14	31.0 P phosphorus 15	32.1 S sulfur 16	35.5 Cl chlorine 17	39.9 Ar argon 18	(15)	10.8 B boron 5	27.0 Al aluminium 13	28.1 Si silicon 14	31.0 P phosphorus 15	32.1 S sulfur 16	35.5 Cl chlorine 17	39.9 Ar argon 18	40.1 Ca calcium 20	50.9 V vanadium 23	54.9 Mn manganese 25	58.9 Co cobalt 27	59.0 Cr chromium 24	63.5 Cu copper 29	65.4 Zn zinc 30	69.7 Ga gallium 31	72.6 Ge germanium 32	74.9 As arsenic 33	79.0 Se selenium 34	79.9 Br bromine 35	83.8 Kr krypton 36	(16)	10.8 B boron 5	27.0 Al aluminium 13	28.1 Si silicon 14	31.0 P phosphorus 15	32.1 S sulfur 16	35.5 Cl chlorine 17	39.9 Ar argon 18	40.1 Ca calcium 20	50.9 V vanadium 23	54.9 Mn manganese 25	58.9 Co cobalt 27	59.0 Cr chromium 24	63.5 Cu copper 29	65.4 Zn zinc 30	69.7 Ga gallium 31	72.6 Ge germanium 32	74.9 As arsenic 33	79.0 Se selenium 34	79.9 Br bromine 35	83.8 Kr krypton 36	85.5 Rb rubidium 37	87.6 Sr strontium 38	91.2 Zr zirconium 40	92.9 Nb niobium 41	95.9 Mo molybdenum 42	101.1 Ru ruthenium 44	102.9 Rh rhodium 45	106.4 Pd palladium 46	112.4 Cd cadmium 48	114.8 In indium 49	118.7 Sn tin 50	121.8 Sb antimony 51	126.9 Te tellurium 52	127.6 I iodine 53	131.3 Xe xenon 54	(17)	10.8 B boron 5	27.0 Al aluminium 13	28.1 Si silicon 14	31.0 P phosphorus 15	32.1 S sulfur 16	35.5 Cl chlorine 17	39.9 Ar argon 18	40.1 Ca calcium 20	50.9 V vanadium 23	54.9 Mn manganese 25	58.9 Co cobalt 27	59.0 Cr chromium 24	63.5 Cu copper 29	65.4 Zn zinc 30	69.7 Ga gallium 31	72.6 Ge germanium 32	74.9 As arsenic 33	79.0 Se selenium 34	79.9 Br bromine 35	83.8 Kr krypton 36	85.5 Rb rubidium 37	87.6 Sr strontium 38	91.2 Zr zirconium 40	92.9 Nb niobium 41	95.9 Mo molybdenum 42	101.1 Ru ruthenium 44	102.9 Rh rhodium 45	106.4 Pd palladium 46	112.4 Cd cadmium 48	114.8 In indium 49	118.7 Sn tin 50	121.8 Sb antimony 51	126.9 Te tellurium 52	127.6 I iodine 53	131.3 Xe xenon 54	132.9 Fr francium 87	[223] Ra radium 88	[227] Ac* actinium 89	[261] Rf rutherfordium 104	[262] Db dubnium 105	[266] Sg seaborgium 106	[264] Bh bohrium 107	[277] Hs hassium 108	[268] Mt meitnerium 109	[271] Ds darmstadtium 110	[272] Rg roentgenium 111	(18)	10.8 B boron 5	27.0 Al aluminium 13	28.1 Si silicon 14	31.0 P phosphorus 15	32.1 S sulfur 16	35.5 Cl chlorine 17	39.9 Ar argon 18	40.1 Ca calcium 20	50.9 V vanadium 23	54.9 Mn manganese 25	58.9 Co cobalt 27	59.0 Cr chromium 24	63.5 Cu copper 29	65.4 Zn zinc 30	69.7 Ga gallium 31	72.6 Ge germanium 32	74.9 As arsenic 33	79.0 Se selenium 34	79.9 Br bromine 35	83.8 Kr krypton 36	85.5 Rb rubidium 37	87.6 Sr strontium 38	91.2 Zr zirconium 40	92.9 Nb niobium 41	95.9 Mo molybdenum 42	101.1 Ru ruthenium 44	102.9 Rh rhodium 45	106.4 Pd palladium 46	112.4 Cd cadmium 48	114.8 In indium 49	118.7 Sn tin 50	121.8 Sb antimony 51	126.9 Te tellurium 52	127.6 I iodine 53	131.3 Xe xenon 54	132.9 Fr francium 87	[223] Ra radium 88	[227] Ac* actinium 89	[261] Rf rutherfordium 104	[262] Db dubnium 105	[266] Sg seaborgium 106	[264] Bh bohrium 107	[277] Hs hassium 108	[268] Mt meitnerium 109	[271] Ds darmstadtium 110	[272] Rg roentgenium 111

Elements with atomic numbers 112-116 have been reported but not fully authenticated

* Lanthanide series
* Actinide series

140 Ce cerium 58	141 Pr praseodymium 59	144 Nd neodymium 60	147 Pm promethium 61	150 Sm samarium 62	152 Eu europium 63	157 Gd gadolinium 64	159 Tb terbium 65	163 Dy dysprosium 66	165 Ho holmium 67	167 Er erbium 68	169 Tm thulium 69	173 Yb ytterbium 70	175 Lu lutetium 71
232 Th thorium 90	[231] Pa protactinium 91	238 U uranium 92	[237] Np neptunium 93	[242] Pu plutonium 94	[243] Am americium 95	[247] Cm curium 96	[245] Bk berkelium 97	[251] Cf californium 98	[254] Es einsteinium 99	[255] Fm fermium 100	[256] Md mendelevium 101	[254] No nobelium 102	[257] Lr lawrencium 103