

APPENDIX 2

PROPERTIES OF COMMON SUBSTANCES

SUBSTANCES THAT ARE GASES AT 20°C								
Substance (chemical formula)	Description	Uses and characteristics	Hazards and precautions	Physical properties				Chemical properties
				MP (°C)	BP (°C)	ρ (g/mL at 20°C)	Solubility (g/L of water at 20°C)	
Ammonia (NH ₃)	- Colourless - Characteristic odour	- Manufacture of cleaning products and fertilizers - Refrigeration	- Highly toxic, irritating and corrosive - Can cause burns	-78	-33	0.000 75	531	- Produces white smoke in reaction with hydrochloric acid - Extinguishes flames - Colours litmus paper blue¹
Carbon dioxide (CO ₂)	- Colourless - Odourless - Nonexistent in liquid form	- Product of combustion - Soft drinks - Dry ice (in solid form)	Causes the greenhouse effect	-79 ²	n/a	0.001 98	1.6	- Extinguishes flames - Clouds limewater - Colours litmus paper red¹
Carbon monoxide (CO)	- Colourless - Odourless	By-product of incomplete combustion	- Lethal if inhaled - Flammable	-207	-192	0.001 25	0.26	Produces a bright blue flame
Chlorine (Cl ₂)	- Greenish yellow - Suffocating odour	- Disinfectant - Drinking water treatment - Bleaching agent	- Highly toxic - Irritant to the airways, eyes and skin	-102	-35	0.002 94	7.3	Reignites a glowing splint
Helium (He)	- Colourless - Odourless	- Balloon inflation - Cryogenics - Welding - Refrigeration	Usually non-toxic, but can cause asphyxia if inhaled in large amounts	-272	-269	0.000 18	0.0017	- Inert (does not react) - Extinguishes flames
Hydrochloric acid (HCl)	- Colourless - Sharp odour	- Metal cleaning - Rubber and cotton processing	- Highly toxic and corrosive - Can cause burns, coughing, etc.	-114	-85	0.001 64	420	- Produces white smoke in reaction with ammonia - Extinguishes flames - Colours litmus paper red¹

Hydrogen gas (H ₂)	- Colourless - Odourless	- Manufacture of certain substances (ammonia, hydrogenated vegetable oil, etc.) - Rocket fuel	- Explosive in the presence of a flame - Can cause asphyxia	-259	-253	0.000 09	0.002	Explodes in the presence of a burning splint
Hydrogen sulphide (H ₂ S)	- Colourless - Characteristic odour of rotten eggs	Protection of iron	- Toxic - Can damage the sense of smell - Flammable	-83	-60	0.001 54	4.13	- Colours lead acetate paper black - Explodes in the presence of a flame
Methane or natural gas (CH ₄)	- Colourless - Odourless	Fuel	Flammable	-183	-162	0.000 72	0.025	Explodes in the presence of a flame
Molecular nitrogen (N ₂)	- Colourless - Odourless	- Main component of air (78%) - Freezing of living cells (cryogenics)	Usually non-toxic, but can cause asphyxia if inhaled in large amounts	-210	-196	0.001 25	0.02	Extinguishes flames
Molecular oxygen (O ₂)	- Colourless - Odourless	- Component of air (21%) - Welding - Medicine	Maintains combustion	-218	-183	0.001 43	0.04	Reignites a glowing splint
Ozone (O ₃)	- Pale blue - Slight odour	- Protection of the Earth's inhabitants from UV rays at high altitude - Pollutant at low altitude	- Highly toxic if inhaled - Explosive	-193	-111	0.002 14	0.57	Reignites a glowing splint
Propane (C ₃ H ₈)	- Colourless - Odourless	Barbecue fuel	Flammable	-188	-42	0.001 83	0.119	Produces a blue flame

MP: melting point **BP: boiling point** **ρ: density** **n/a: not applicable**

1. This property becomes apparent when the substance is dissolved in water.
2. This temperature corresponds to the sublimation point.

SUBSTANCES THAT ARE LIQUIDS AT 20°C

Substance (chemical formula)	Description	Uses and characteristics	Hazards and precautions	Physical properties					Chemical properties
				MP (°C)	BP (°C)	ρ (g/mL)	EC	Solubility in water	
Acetic acid (CH ₃ COOH)	- Colourless - Characteristic odour of vinegar	- Food (produces vinegar when diluted in water) - Antiseptic - Disinfectant	- Corrosive - Irritating fumes - Can cause burns	17	118	1.05	Yes	Yes	Colours litmus paper red
Ethanol or ethyl alcohol (C ₂ H ₆ O)	- Colourless - Characteristic odour	Product of sugar fermentation	- If ingested, can cause inebriation, nausea, vomiting - Hazardous to the eyes - Flammable	-114	78	0.79	No	Yes	Produces a pale blue flame
Ethylene glycol (HOCH ₂ CH ₂ OH)	- Colourless - Slightly sweet odour	- Antifreeze - Manufacture of vaccines	- Irritating fumes - Can cause vomiting and paralysis	-13	198	1.11	No	Yes	Flammable
Glycerin or glycerol (C ₃ H ₈ O ₃)	- Colourless - Odourless - Viscous - Sweet-tasting	- Lubricating agent in medicines and cosmetics - Bubbling liquid	Explosive under certain conditions	18	290	1.26	No	Yes	Explodes in the presence of some substances
Mercury (Hg)	- Silvery grey - Shiny	- Thermometers - Barometers - Mirrors - UV lamps	- Highly toxic - Can cause neurological disorders	-39	357	13.55	Yes	No	- Reacts with nitric acid (HNO₃) - Oxidizes to form a black solid
Methanol or methyl alcohol (CH ₃ OH)	- Colourless - Characteristic odour	- Antifreeze - Fuel - Solvent	- Toxic if ingested - Can be lethal - Dries the skin - Causes blindness - Flammable	-98	65	0.79	No	Yes	Produces a pale blue flame
Water (H ₂ O)	- Colourless - Odourless	- Basic necessity of life - Food - Solvent	None	0	100	1.00	No	n/a	- Colours cobalt chloride paper pink - Colours litmus paper purple

MP: melting point BP: boiling point ρ: density EC: electrical conductivity n/a: not applicable

SUBSTANCES THAT ARE SOLIDS AT 20°C

Substance (chemical formula)	Description	Uses and characteristics	Hazards and precautions	Physical properties					Chemical properties
				MP (°C)	BP (°C)	ρ (g/mL)	EC	Solubility (g/L of water at 20°C)	
Aluminum (Al)	- Grey-white - Odourless - Shiny - Malleable	- Outer wall coverings - Cans for preserving food - Automobiles	Toxic in large amounts	660	2467	2.7	Yes (good conductor)	0	Oxidizes to form a white solid
Barium chloride (BaCl ₂)	- White or colourless crystals - Odourless	- Fireworks - Manufacture of pigments	- Toxic if ingested - Avoid contact with skin	963	1560	3.90	Yes ¹	360	Produces a yellowish-green flame
Barium nitrate (Ba(NO ₃) ₂)	- White crystals - Odourless	- Fireworks - Ceramics manufacture - Green traffic lights	Highly toxic if inhaled or ingested	590	n/a ²	3.24	Yes ¹	87	Produces a yellowish-green flame
Calcium carbonate (CaCO ₃)	- White - Odourless	- Component of chalk - Component of marble	Produces a dust that irritates the eyes and airways	n/a ²	n/a	2.83	Yes ¹	0.0153	- Releases carbon dioxide in the presence of an acid - Colours litmus paper blue¹
Calcium chloride (CaCl ₂)	- White crystals - Odourless	- Food - Deicer for roads - Concrete hardener	Eye irritant	772	1935	2.15	Yes ¹	425	Produces an orange-red flame
Calcium hydroxide (Ca(OH) ₂)	- White - Odourless	Forms limewater when diluted in water	Avoid contact with eyes	n/a ²	n/a	2.24	Yes ¹	1.59	Colours litmus paper blue¹

MP: melting point **BP:** boiling point **ρ:** density **EC:** electrical conductivity **n/a:** not applicable

1. This property becomes apparent when the substance is dissolved in water.
2. Not applicable because this substance decomposes before reaching its melting or boiling point.

Substance (chemical formula)	Description	Uses and characteristics	Hazards and precautions	Physical properties					Chemical properties
				MP (°C)	BP (°C)	ρ (g/mL)	EC	Solubility (g/L of water at 20°C)	
Carbon (diamond) (C)	- Colourless crystals - Odourless	- Jewellery - Drilling	n/a	3547	4200	3.52	Yes (but poor conductor)	0	Oxidizes to form carbon dioxide
Carbon (graphite) (C)	- Grey-black - Odourless	- Good fuel - Essential element to life - Pencil leads - Steel	- If burned, produces a greenhouse gas - Irritating dust	3652	4200	2.09	Yes (but poor conductor)	0	Oxidizes to form carbon dioxide
Copper (Cu)	- Reddish brown - Odourless - Shiny	- Essential element to life, in small doses - Electrical wires - Pipes for plumbing - Coins	Dust that irritates the eyes and stomach	1083	2595	8.94	Yes (excellent conductor)	0	- Oxidizes to form a greenish or black solid - Produces a green flame
Copper oxide (CuO)	- Black powder - Odourless	- Green pigment - Fireworks	Toxic if ingested	1446	n/a ²	6.32	Yes ¹	0	- Reacts with certain metals - Produces a blue-green flame
Copper sulphate (CuSO ₄)	- Blue crystals - Odourless	- Fungicides - Bactericides - Pesticides - Dietary supplement for hogs	- Highly toxic - Avoid contact with skin	n/a ²	n/a	3.60	Yes ¹	220	Produces a blue-green flame
Glucose (C ₆ H ₁₂ O ₁₁)	- White - Slightly sweet odour - Sometimes sticky texture	- Product of photosynthesis by plants - Food	Dust that irritates the eyes	146	n/a ²	1.56	No	1000	Turns golden in colour when heated
Gold (Au)	- Golden - Odourless - Shiny - Malleable	- Jewellery - Coins - Electronic circuits	n/a	1064	2807	19.32	Yes (good conductor)	0	- Does not oxidize - Reacts with ammonia

Iodine (I ₂)	- Black-purple crystals - Acrid odour	- Essential element to life, in small doses - Antiseptic - Halogen lamps - Pharmaceutical products	Releases toxic vapours	114	184	4.93	No	0.29	Reacts in the presence of starch
Iron (Fe)	- Grey-white - Odourless - Shiny	- Essential element to life - Steel - Construction - Automobiles - Magnetic tape - Vitamin supplements	Irritating dust	1535	3000	7.86	Yes (good conductor)	0	Oxidizes to form a reddish-brown solid
Lead (Pb)	- Bluish grey - Odourless - Highly malleable - Shiny	- Protection from radiation - Batteries	- Highly toxic if ingested - Causes neurological disorders	327	1740	11.34	Yes (good conductor)	0	Oxidizes to form a black solid
Lithium chloride (LiCl)	- White powder - Odourless	- Fireworks - Refrigeration - Antidepressants	Can cause kidney problems in the long term	605	1360	2.07	Yes ¹	454	Produces a bright red flame
Lithium nitrate (LiNO ₃)	- White powder - Odourless	Fireworks	- Toxic if ingested - Avoid contact with skin	255	n/a ²	2.38	Yes ¹	430	Produces a bright red flame
Magnesium (Mg)	- Grey-white - Odourless - Shiny	- Essential element to life, in small doses - Computer casings - Pharmaceutical products	Flammable in small pieces	650	1100	1.74	Yes (good conductor)	0	- Oxidizes to form a white solid - Produces a very intense white flame
Nickel (Ni)	- Grey-white - Odourless - Shiny	- Coins - Stainless steel - Television screens	- Can cause lung cancer, in high doses - Can irritate the skin	1455	2730	8.90	Yes (good conductor)	0	Oxidizes slightly to form a green solid

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Substance (chemical formula)	Description	Uses and characteristics	Hazards and precautions	Physical properties					Chemical properties
				MP (°C)	BP (°C)	ρ (g/mL)	EC	Solubility (g/L of water at 20°C)	
Nickel chloride (NiCl ₂)	- Green crystals - Odourless	- Ink - Gas masks	- Irritant - Avoid contact with skin	1001	n/a	3.55	Yes ¹	642	- Colours litmus paper red¹ - Produces a green flame
Para- dichloro- benzene (C ₆ H ₄ Cl ₂)	- Colourless or white crystals - Characteristic odour	- Insecticides - Mothballs	Fumes that irritate the skin, throat and eyes	54	174	1.46	No	0.08	Reacts with aluminum
Potassium chloride (KCl)	- White crystals - Odourless	- Photography - Batteries	Toxic if ingested	774	1411	1.99	Yes ¹	344	Produces a purple flame
Potassium nitrate (KNO ₃)	- White crystals - Odourless	Fertilizers	- Toxic if ingested - Do not pour down drains	334	n/a ²	2.11	Yes ¹	357	Produces a purple flame
Silver (Ag)	- Silvery white - Odourless - Shiny - Malleable	- Jewellery - Photography - Electrical components	Moderately toxic if ingested	961	2212	10.40	Yes (excellent conductor)	0	- Oxidizes to form a black solid - Produces a silvery-white flame
Sodium chloride (table salt) (NaCl)	- White cubic crystals - Odourless	- Food - Deicer for roads	Can cause high blood pressure	801	1413	2.17	Yes ¹	357	Produces an orange-yellow flame
Sodium hydroxide (NaOH)	- White crystals - Odourless	Manufacture of plastics, detergents, soaps, etc.	- Avoid contact with skin - Corrosive	318	1390	2.13	Yes ¹	1111	Colours litmus paper blue¹
Strontium chloride (SrCl ₂)	- White crystals - Odourless	Fireworks	- Toxic if ingested - Avoid contact with skin	875	1250	3.05	Yes ¹	538	Produces a red flame

