

CLASS 10

Physics & Chemistry — Complete Formula Handbook

Contents

PHYSICS

1. Light — Reflection and Refraction
2. The Human Eye and the Colourful World
3. Electricity
4. Magnetic Effects of Electric Current
5. Sources of Energy

CHEMISTRY

1. Chemical Reactions and Equations
2. Acids, Bases and Salts
3. Metals and Non-metals
4. Carbon and its Compounds
5. Periodic Classification of Elements

PHYSICS

Light — Reflection and Refraction

Mirror formula	$1/v + 1/u = 1/f$
Magnification (mirror)	$m = -v/u = h'/h$
Focal length (mirror)	$f = R / 2$
Refractive index	$n = \text{Speed of light in vacuum} / \text{Speed of light in medium} = c/v$
Snell's law	$n_1 \sin \theta_1 = n_2 \sin \theta_2$
Lens formula	$1/v - 1/u = 1/f$
Magnification (lens)	$m = v/u = h'/h$
Power of a lens	$P = 1/f$ (f in metres); Unit: Dioptre (D)
Combination of lenses	$P = P_1 + P_2 + \dots$

The Human Eye and the Colourful World

Near point (normal eye)	25 cm
Far point (normal eye)	Infinity
Angle of prism relation	$A = r_1 + r_2$
Angle of deviation	$\delta = (i + e) - A$

Electricity

Ohm's law	$V = IR$
Resistance (from resistivity)	$R = \rho L / A$
Resistors in series	$R = R_1 + R_2 + R_3 + \dots$
Resistors in parallel	$1/R = 1/R_1 + 1/R_2 + 1/R_3 + \dots$
Electric current	$I = Q / t$
Electric power	$P = VI = I^2R = V^2/R$
Electrical energy	$E = P \times t$
Commercial unit of energy	1 unit = 1 kWh = 3.6×10^6 J
Heating effect (Joule's law)	$H = I^2Rt$

Magnetic Effects of Electric Current

Right-hand thumb rule	Direction of magnetic field around a current-carrying conductor
-----------------------	---

Force on a current-carrying conductor	$F = BIL \sin \theta$
Fleming's left-hand rule	Direction of force on current-carrying conductor in magnetic field
Fleming's right-hand rule	Direction of induced current (generator effect)

Sources of Energy

Efficiency	$\text{Efficiency} = (\text{Useful energy output} / \text{Total energy input}) \times 100\%$
------------	--

CHEMISTRY

Chemical Reactions and Equations

Combination reaction	$A + B \rightarrow AB$
Decomposition reaction	$AB \rightarrow A + B$
Displacement reaction	$A + BC \rightarrow AC + B$
Double displacement reaction	$AB + CD \rightarrow AD + CB$
Oxidation	Gain of oxygen / Loss of hydrogen / Loss of electrons
Reduction	Loss of oxygen / Gain of hydrogen / Gain of electrons

Acids, Bases and Salts

Acid + Metal	$\text{Acid} + \text{Metal} \rightarrow \text{Salt} + \text{H}_2 \text{ (gas)}$
Acid + Metal carbonate	$\text{Acid} + \text{Metal carbonate} \rightarrow \text{Salt} + \text{CO}_2 + \text{H}_2\text{O}$
Neutralisation	$\text{Acid} + \text{Base} \rightarrow \text{Salt} + \text{Water}$
pH scale	pH < 7: Acidic, pH = 7: Neutral, pH > 7: Basic (range 0–14)
Washing soda formula	$\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$
Baking soda formula	NaHCO_3
Bleaching powder formula	CaOCl_2
Plaster of Paris formula	$\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$
Water of crystallisation (gypsum)	$\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$

Metals and Non-metals

Reactivity series (decreasing order)	$\text{K} > \text{Na} > \text{Ca} > \text{Mg} > \text{Al} > \text{Zn} > \text{Fe} > \text{Pb} > \text{H} > \text{Cu} > \text{Ag} > \text{Au}$
Metal + Oxygen	$\text{Metal} + \text{O}_2 \rightarrow \text{Metal oxide}$
Metal + Water	$\text{Metal} + \text{Water} \rightarrow \text{Metal hydroxide/oxide} + \text{H}_2$
Metal + Dilute acid	$\text{Metal} + \text{Dilute acid} \rightarrow \text{Salt} + \text{H}_2$
Thermite reaction	$\text{Fe}_2\text{O}_3 + 2\text{Al} \rightarrow 2\text{Fe} + \text{Al}_2\text{O}_3 + \text{Heat}$
Ionic compound formation	Metal loses electrons (cation), Non-metal gains electrons (anion)

Carbon and its Compounds

General formula (alkanes)	$\text{C}_n\text{H}_{2n+2}$
General formula (alkenes)	C_nH_{2n}

General formula (alkynes)	C_nH_{2n-2}
Combustion of hydrocarbon	$C_xH_y + O_2 \rightarrow CO_2 + H_2O + \text{Heat}$
Esterification	Alcohol + Acid $\xrightarrow{\text{(conc. } H_2SO_4)}$ Ester + Water
Saponification	Ester + NaOH $\rightarrow$ Soap (salt) + Alcohol
Oxidation of alcohol	Alcohol $\xrightarrow{\text{(alkaline } KMnO_4)}$ Carboxylic acid
Functional groups	–OH (alcohol), –CHO (aldehyde), –COOH (acid), –CO– (ketone)

Periodic Classification of Elements

Modern periodic law	Properties of elements are a periodic function of their atomic number
Group / Period	18 Groups (vertical columns), 7 Periods (horizontal rows)
Trend across a period	Atomic size decreases, metallic character decreases, valence electrons increase
Trend down a group	Atomic size increases, metallic character increases