Sample study material:

Physics:

motion	-time graph			• Instantaneous velocity = draw tangent line at a point and work out gradient.
Kinematics / motion	Acceleration	a = (v - u) / t	acceleration = change in velocity / time	The most common unit for acceleration is m s^{-2}.
Kinematics / motion	Velocity-time graph	–	Finding acceleration and displacement	• Average acceleration = connect two points on graph and work out gradient. • Instantaneous acceleration = draw tangent line at a point and work out gradient. • Displacement = area under curve. Treat area below the time-axis as negative displacement.
Force	Force	F = ma	Newton's 2nd law says that net force = mass × acceleration	The unit for force is the Newton (N). Forces that contribute to the resultant force often include external driving force, drag, friction, tension, reaction force, weight, and spring force.
Force	Spring constant	F = kx	Force = spring constant × extension	This is called Hooke's law. Here we are assuming that the spring hasn't exceeded its limit of proportionality.
Force	Force-extension graph	–	Force-extension graph	• Gradient = spring constant (k), unit = N m^{-1}. • Point where graph starts to curve = limit of proportionality (material may still be elastic but won't obey Hooke's law when deformed) • Limit of elasticity = the point beyond which material is permanently deformed and won't return to its original shape even if force removed • Area under graph (= $\frac{1}{2}kx^2$, not needed for exam) = spring elastic energy stored
Force	Weight	W = mg	Weight = mass × gravitation field strength	For objects near the Earth's surface, g = 10 m s^{-2}.
Force	Momentum	p = mv	Momentum = mass × velocity	
Force	Impulse	Impulse = $F\Delta t$ = mv - mu	Impulse = change in momentum	Be aware of appropriately assigning negative signs during situations where there is a change in direction e.g. rebounding.
Force	Impact force	$F = \frac{(mv - mu)}{\Delta t}$	Impact force = impulse / time	
Force	Conservation of momentum	$m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2$	Total momentum before an event e.g. collision = total momentum afterwards.	If the collision is inelastic and the two objects are joined, then the equation becomes $m_1u_1 + m_2u_2 = (m_1 + m_2)v$ where v is the common velocity after the collision.

Chemistry

Test for gases and simple molecular substances	hydrogen	place burning splint into gas	A small explosion leads to a pop sound	Squeaky pop sound	$2H_2 + O_2 \rightarrow 2H_2O$
	oxygen	place glowing splint into gas	more oxygen will sustain the combustion of the splint material (cellulose or lignin)	glowing splint relights	more oxygen will sustain the combustion of the splint material (cellulose or lignin)
	carbon dioxide	bubble through lime water	carbon dioxide reacts with lime water, which is aqueous calcium hydroxide, to produce the insoluble calcium carbonate	lime water turns milky	$Ca(OH)_2(aq) + CO_2(g) \rightarrow CaCO_3(s) + H_2O(l)$
	sulphur dioxide	bubble through acidified potassium manganate(VII) solution	sulphur dioxide dissolves in water to form sulphurous acid, which dissociates into the sulphite ion.	potassium manganate(VII) solution turns from deep purple to colorless	The reaction between sulphur dioxide and water is $SO_2 + H_2O \rightarrow H_2SO_3$. For those who are interested, the ionic equation for this reaction is $5SO_3^{2-} + 2MnO_4^- + 6H^+ \rightarrow 5SO_4^{2-} + 2Mn^{2+} + 3H_2O$
	chlorine	Hold damp blue litmus paper against the gas and look for color changes	For your reference, HCl accounts for most of the acidity while HOCl accounts for the bleaching activity as it oxidizes dyes	damp blue litmus paper turns red and then colorless	For your reference only, the equation is $Cl_2(g) + H_2O(l) \leftrightarrow HCl(aq) + HOCl(aq)$.
	presence of water	add anhydrous copper sulphate	Anhydrous copper sulphate is white while hydrated copper sulphate is blue	white powder turns blue	$CuSO_4(s) + 5H_2O \rightarrow CuSO_4 \bullet 5H_2O(s)$
	purity of water	boiling point	Pure water boils at exactly 100°C	should be exactly 100°C	$H_2O(l) \leftrightarrow H_2O(g)$