

Physics AS / A2 Revision – “Cue Cards” and “Just a Minute”

This is a complete set of resources covering the whole AQA course, organised for two types of revision.

(1) **“Cue Cards”**. Each unit is broken down into key knowledge and concepts, formulas, definitions and so on, which are grouped and tabulated. The table can be printed and cut into cards, and the student can write the answers on the back of each card. The student can then revise by going through the cards, and giving the answers to each of the bullet points, and checking with the answer on the back. This can be done verbally – so no writing needed.

(2) **“Just a Minute”**. The student can practise talking for “Just a Minute” on each of the key concepts in the table, without hesitation, repetition or deviation. It can be just verbal, with graphs and diagrams sketched in the air, or with a pencil and rough paper.

Both revision activities will be much more effective and enjoyable if done with a friend, who does not need to know any physics at all.

There are phrases, usually in “quotes”, that relate to memory aids I used in the Physics course. For example, “Roll over Beethoven”, is not only the old Chuck Berry and Beatles song, it is also a memory aid for the electrical resistivity formula. And the John Travolta Rule is from his posing in his white suit, with one arm up and one arm down, in the film “Saturday Night Fever”. This becomes the kinaesthetic memory aid for the way a semiconductor's resistance goes down as the temperature goes up – yes, teacher and students would compete in the classroom for the most realistic pose. “Bil” and “Bev” refer to the formulas for the forces on wires and free electrons in magnetic fields.

I hope you find this guide useful.

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May 2024

10.5 DC Circuits Unit 1 • power formula - 3 versions • resistors - series (1 formula), parallel (2 formulas) • potential divider - diagram of a light sensor (1 formula) • Kirchhoff's laws - Junction and Loop	10.4 Electricity - (a) Unit 1 • drift velocity - formula (1) • real cells - diagram - 1 formula + explanation - cells in series - graph terminal pd vs current • semiconductors...ldr....thermistor...diode - symbols....V/I.....behaviour
10.6 Information Unit 1 • analogue and digital • decimal and binary • data sampling • remote sensing • power transmission through cables	10. 4 Electricity - (b) Unit 1 • charge carriers - 3 states of matter • current - def. + 1 formula • voltage - def + 1 formula • superconductivity • resistivity - definition + formula (1)

10.1 Scalars and Vectors Unit 1 • scalars and vectors • adding vectors • components of vectors • moments • torque	10.2 Kinematics (a) Unit 1 • the 3 graphs for motion with constant acceleration • the 4 equations of motion • projectiles in a gravity field • non-uniform accelerated motion - v/t and s/t graphs...areas and slopes
10.3 Energy Unit 1 • energy conservation • energy resources and electricity generation • PE and KE	10.2 Kinematics (b) Unit 1 • Friction and motion.... terminal velocity... v/t and a/t graphs • motion with fixed power output • Newton's Law II • oscillating systems....period, damping

Physics AS / A2 Revision - "Cue Cards" and "Just a Minute"

Unit 1 - Electricity

"Just a Minute" - can you talk for 1 minute on these topics? Draw diagrams to help you explain.

Binary	Digital and Analogue	"Roll over Beethoven"	"Lost Volts"
Potential Dividers	A Light Sensor	Conducting Solutions	Current
"Times over Plus"	Transition Temperature	Drift velocity	Voltage
Remote Sensing	Semiconductors	John Travolta's rule	Emf and Potential Difference

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Unit 1 - other stuff

"Just a Minute" - can you talk for 1 minute on these topics? Draw diagrams to help you explain.

Moment	Resolution	Equations of Motion	Projectiles
s/t graphs	v/t graphs	Terminal velocity	Oscillators
Damping	Data-logging	Free Fall	Energy resources
Conservation of energy	Stretched spring	Data transmission	Energy losses in cables

11.1 Basic Waves (a) Unit 2

- T and L waves.... examples...diagrams
- polarisation - diagram
- wave equation - formula (1)

11.1 Basic Waves (b) Unit 2

- reflection, refraction and absorption - diagrams, with wave fronts
- phase
- measuring wave velocity - 3 ways

diagram &
formulas !!

11.2 Diffraction & Interference (a) Unit 2

- double gap
- diffraction grating
- Constructive and Destructive Interference.... path difference
- Phase and coherence

diagram &
formulas !!

11.2 Diffraction & Interference (b) Unit 2

- single gap
- loudspeakers and aerials
- the eye and resolution

diagram &
formulas !!

11.2 Diffraction & Interference (c) Unit 2

- 2 parallel reflectors
- Inverse square law
- Intensity and amplitude



11.2 Diffraction & Interference (d) Unit 2

- **Standing Waves**... basics....diagram
-in strings...fundamental and harmonics.... factors affecting the fundamental
-in pipes.....open one end... open both ends... fundamental and harmonics
- measuring the speed of sound

11.3 Spectra (a) Unit 2

- Types of spectra
- The EM spectrum - the 7 radiations, frequencies, wave lengths and photon energies...rough figures

11.3 Spectra (b) Unit 2

- **Doppler effect** (Nee-Nah!)... basics.... formula
- redshift..... example
- Hubble's Law.... formula (1)
- Big Bang

"Just a Minute" - can you talk for 1 minute on these topics? Draw diagrams to help you explain.

Path Difference	Inverse Square Law	Polarisation	Reflection and Refraction
Single Gap Diffraction	Double Gap Diffraction	Diffraction Grating	Path Difference
Constructive and Destructive Interference	Parallel Reflectors	EM Spectrum	Standing Waves
Fundamental and Harmonics	Doppler Effect	Red Shift	"Big Bang"

Background Radiation	Anti-neutrino	Ionising radiation	Alpha, Beta and Gamma radiation
Half Life	Decay equation	Nucleon and Proton numbers	Alpha particle scattering
Antiparticles	Leptons	Hadrons	Quarks
Bandwidth	Sampling rate	Modulation	Information transmission

13.6 Capacitors (1 of 2) Unit 4 - basics...diagram....definition of 1 Farad....formula (1) - physical construction....factors affecting capacitance...formula (1) - energy stored - formula (3 versions)	13.2 SHM Unit 4 - basics...diagram...examples....formulas (4?) - simple pendulum....mass/spring...formulas (2) - energy and amplitude - forced vibrations....resonance,...examples....graph
13.6 Capacitors (2 of 2) Unit 4 - combinations - series and parallel...formulas (2) - discharge..... graphs.....half life..... formulas (2) meaning of slope of Q/t..... area under I/t graphs	13.1 Circular Motion Unit 4 - basics...diagram....centripetal acceleration - formulas (2 versions) - angular distance velocity.... links to linear $d=v \times t$ - centripetal force.....diagrams

13.4 Kinetic Theory (1 of 2) Unit 4 • Brownian motion...internal energy...random distribution • ideal gas equation... (1 formula)...3 relationships - PV, PT, VT...explain with particle model • Thermodynamic temp. scale...absolute zero	13.5 Heating and Working (1 of 2) Unit 4 • First Law... $\Delta U = Q + W$...heating and working change the internal energy of a gas.... •adiabatic, isothermal, const. Vol. changes for gases • $Q = mc\Delta\theta$....solids and flowing fluids (gases and liquids)... $Q = ml$.
13.4 Kinetic Theory (2 of 2) Unit 4 • Molar mass and Avogadro constant • Maxwell's formula....$pV = \frac{1}{3} Nm\langle c^2 \rangle$ • Gas internal energy... $T / K \propto$ av kinetic energy...energy of 1 molecule is $3kT/2$.	13.5 Heating and Working (2 of 2) Unit 4 • Work done by moving forces...$W = Fs$... $W =$ area under F/s graph... $P = Fv$ • Work done on/by gas = $p\Delta V$....area under pV graph • Young modulus... $E = \text{stress}/\text{strain}$... stress = F/A... strain=$\Delta l/l$.... graphs for metals and rubber

13.7 Momentum (1 of 2) Unit 4 • definition - formula and units (1) • conservation in collisions • elastic and inelastic...examples....energy and momentum...especially nuclear particles	13.7 Momentum (2 of 2) Unit 4 • impulse....formula (1)...examples...changing force...short times • force / time graphs....area
13.8 Quantum Physics (a) Unit 4 • wave/particle theory... exp. evidence for particle and wave behaviour from EM waves and electrons • de Broglie wavelength.. (1 formula)...probability $\propto \text{amplitude}^2$ • photo-electric effect...photon energy...work function (2 formulas)	13.8 Quantum Physics (b) Unit 4 • atomic energy levels and line spectra... (1 formula) • lasers... how they work.... population inversion ...metastable state

Work done by a Force....and at an angle to the force direction	Radians, Angular velocity, and linear velocity	Centripetal Acceleration and forces	The 2 Key features of SHM
The 3 graphs of SHM	The simple pendulum and measuring "g"	SHM - acceleration and displacement	SHM - the energies...and link between energy and amplitude.
SHM - mass/spring system and an atom in a crystal	SHM - and damping	Forced oscillations and Resonance	Momentum - and tennis
Momentum - and elastic collisions and atomic nuclei	Momentum - and rockets and explosions	Momentum - and inelastic car crashes and skids	Momentum - and impulse...and force/time graphs

Internal kinetic energy	Ideal Gas Equation	Absolute Zero	Avogadro Constant
Zeroth Law	Average energy of a molecule	The First Law	Isothermal changes
Constant Volume changes	Adiabatic changes	Specific and Latent Heat	Work done by an expanding gas
Molar specific heat	Elastic stored energy	Young Modulus	Rate of working

Capacitance	Capacitors in Series and Parallel	Energy stored in a Capacitor	Physical factors in Capacitance
Capacitor discharge	Capacitor discharge graphs	Time constant	Photon energy
Photoelectric effect	Line spectra	Atomic energy levels	lasers
Wave/Particle behaviour	de Broglie waves	Electron Probability	Electron Diffraction

14.2 Magnetic Fields - Motor effect (a) Unit 5 • magnetic flux and flux density...formula (1) • force on a wire....formula (1) • motor...current balance...diagrams of each	14.2 Magnetic Fields - EM induction (a) Unit 5 • Faraday's law....formula + explaining all symbols...and the - sign • Emil Lenz's law....explanation and examples of use • simple ac alternator (single coil)...diagram...how it works...ac output... factors affecting peak output and ac frequency
14.2 Magnetic Fields - Motor effect (b) Unit 5 • force on a moving charge....formula (1) • Flemings LH Rule for wire and charge • balanced electric and magnetic forces	14.2 Magnetic Fields - EM induction (b) Unit 5 • transformers....diagram....explanation of working ...energy losses (2 + 2).... • formulas.... turns ratio....power input / output for 100% efficient... • ...use in power transmission... voltage drop + energy losses from cables • eddy currents...in transformers... use in damping oscillations

14.4 Particles and detectors (a) Unit 5 • electron tube (gun)...accelerating charged particles with electric field....PE --> KE.... equation • charged particles in "crossed" electric & magnetic fields	14.4 Particles & Detectors-radioactive decay Unit 5 • builds on Unit 2 and Unit 4...relates to capacitors • activity $\propto$ no. of nuclei...formula (1) • formulas for exponential decay & half life (2)...graphs • meaning & units of decay constant λ
14.4 Particles and detectors (b) Unit 5 • particle accelerators...cyclotron...diagram...how it works..... synchrotron...compare with cyclotron ...relativistic increase in mass with speed • de Broglie wavelengths of particles • bubble chambers...working out charge and momentum from particle tracks	14.3 Nuclear Energy Unit 5 • $E = mc^2$ applies to all energy changes and mass loss • building big particles by colliding small fast particles • nuclear binding energy... graph • basic fission reactors • 14.1... Strong force...short range... between Quarks and Hadrons... exceeds Grav/Elec fields... holds nucleus together.

14.1 Fields - Gravity (a) Unit 5 • $g = F/m$.... N/kg... always attraction • Forces between point masses....big G • gravitational field strength • orbital periods and speeds of satellites • geosynchronous orbits	14.1 Fields - Electric (a) Unit 5 • $E = F/Q$..... N/C... attract or repel • Forces between point charges...permittivity • electric field strength - for a point charge • electric field strength for a uniform field
14.1 Fields - Gravity (b) Unit 5 • Energy conservation.... PE to KE... or heat • diagrams... force lines and equipotentials • Force-distance graphs and potential energy... • ... calculating PE changes • Absolute Potential • Universe Open, critical or closed?	14.1 Fields - Electric (b) Unit 5 • Energy conservation... VQ • diagrams... force lines and equipotentials • Force-distance graphs and potential energy.. • ... calculating PE changes • Absolute Potential

Flux density	"Bil and Bev"	Fleming's LH Rule	Michael Faraday's Law
Emil Lenz's Law	"Robots in Disguise"	Eddy Currents	Electron gun
"Crossed fields"	Cyclotron	de Broglie wavelength	Exponential radioactive decay
Radioactive decay constant	Half life and Decay constant	Fission reactors	Nuclear binding energy

Velocity selector	Cloud and Bubble chambers	strong nuclear force	electron charge/mass ratio
Potential energy in a field	Inverse square law for gravity	"N/kg"	Geosynchronous satellites
Energy conservation in fields	Closed Universe ?	"N/C"	Point charge electric field strength
Uniform Electric field strength	"VQ"	Equipotentials and Field lines	Absolute Potential