Year 12 Physics Revision Table

Topics 6-8

Topic 6: The Motion of Charged Particles in Electric Fields

Expectation From SACE Subject Outline *Note: these can be asked in converse*	***Summary of things I know about this*** (for formulae, for example, this could be: what the symbols mean, what the units of each variable is, and some possible rearrangements)	***Example question(s) to practice until I can do under test conditions without help*** There are likely to be some in the textbook too; also take note of questions you'd like examples of from the teacher
Solve problems involving the use of $W = q\Delta V$.		Assignment Q1 (b) Test Q1 (a)
Convert energy from joules into electron volts and vice versa.		Assignment Q1 (c) Test Q1 (b)
Derive the expression $E = \Delta V / d$ for the magnitude of the electric field (away from the edges) between two oppositely charged parallel plates a distance d apart, where ΔV is the potential difference between the plates.		Assignment Q1 (d) Test Q1 (c)
Solve problems involving the use of $E = \Delta V / d$.		Assignment Q1 (a), Q4 (a) Test Q1 (d)
Describe the motion of a charged particle in a uniform electric field.		
Perform calculations involving the movement of charged particles parallel or antiparallel to a uniform electric field.		
Compare the motion of a projectile in the absence of air resistance with the motion of a charged particle in a uniform electric field.		Assignment Q2 Test Q2

Calculate the time of flight and deflection of a charged particle that enters a uniform electric field at right angles to the field.		Assignment Q3 Test Q3
Describe how hydrogen atoms are given a negative charge or a positive charge in an ion source of a cyclotron.		
Describe the following parts of a cyclotron: • semicircular metal containers (‘dees’) • evacuated outer container.		Assignment Q5 (b)
Explain why there is no electric field inside the dees.		Assignment Q5 (a)
Describe how an electric field between the dees can transfer energy to an ion passing between them.		
Describe how ions could be accelerated to high energies if they could be made to move in a circular path inside the dees so that they repeatedly moved across the electric field, the direction of which was reversing every half-revolution.		Assignment Q5 (c)
Calculate the energy transferred to an ion each time it passes between the dees.		Assignment Q5 (d)
Explain why the cyclotron must be evacuated.		

Topic 7: Magnetic Fields

Expectation	***Summary of things I know about this***	***Example question(s) to practice until I can do under test conditions***
Sketch the magnetic field lines produced by an electric current flowing in a straight conductor, a loop, and a solenoid.		Assignment Q1 Test Q1
Using a right-hand rule, relate the directions of the force, magnetic field, and conventional current.		Assignment Q2 Test Q2
Use the unit for $\vec{B}$, tesla (T), equivalent to $\mathrm{NA^{-1}m^{-1}}$. Solve problems involving the use of $F = I\Delta l B \sin\theta$.		Assignment Q3 Test Q2
Describe the following components of a moving-coil loudspeaker: a cone, a magnet structure, a voice coil, and a supporting frame. Explain the action of a moving-coil loudspeaker.		Assignment Q4 Test Q3

Topic 8: The Motion of Charged Particles in Magnetic Fields

Expectation	***Summary of things I know about this***	***Example question(s) to practice until I can do under test conditions***
Demonstrate an understanding that the magnetic force depends on both the magnitude and the direction of the velocity of the particle.		Assignment Q2
Solve problems involving the use of $F = qvB\sin\theta$.		Assignment Q1 Test Q5 (a)
Determine the direction of the force on a charged particle moving at any angle θ to a uniform magnetic field.		Assignment Q2
Explain how the velocity-dependence of the magnetic force on a charged particle causes the particle to move with uniform circular motion when it enters a uniform magnetic field at right angles.		Assignment Q5 (b) Test Q5 (c)
Derive $r = mv/qB$ for the radius r of the circular path of an ion of charge q and mass m that is moving with speed v at right angles to a uniform magnetic field of magnitude B.		Assignment Q3 (a) Test Q4 (a)
Solve problems involving the use of $r = mv/qB$.		Assignment Q5 (c)
Describe the nature and direction of the magnetic field needed to deflect ions into a circular path in the dees of a cyclotron.		Assignment Q3 (d)

Derive the expression $T = 2\pi m/qB$ for the period T of the circular motion of an ion, and hence show that the period is independent of the speed of the ion.		Assignment Q3 (b) Test Q4 (b) and (c)
Using the relationships $K = ½mv^2$ and $r = mv/qB$, derive the expression $K = q^2B^2r^2/2m$ for the kinetic energy K of the ions emerging at radius r from a cyclotron.		Assignment Q5 (d) Test Q5 (d)
Use this expression to show that K is independent of the potential difference across the dees and, for given ions, depends only on the magnetic field and the radius of the cyclotron.		
Solve problems involving the use of $T = 2\pi m/qB$ and $K = q^2B^2r^2/2m$.		Assignment Q5 (e) and (f) Test Q5 (e)