

1. electron diffraction	occurs as a consequence of the wave nature of electrons; electrons exhibit diffraction when they pass through a crystal lattice	16. paddle wheels	discharge tubes used to show that cathode rays carry energy and momentum
2. electron guns	devices that produce a narrow beam of electrons in a cathode ray tube by thermionic emission, which consists of a filament, a cathode and two open-cylinder anodes	17. photocells	cells in which the electrons initiating an electric current are produced by the photoelectric effect
3. electron-hole pairs	occur at temperatures above 0 K when some electrons gain sufficient energy to escape from their bonds and exist as free electrons, which leaves a hole behind; the electron and hole form an electron-hole pair	18. photoelectric effect	the emission of electrons by materials when subjected to electromagnetic radiation of appropriate frequency; Einstein explained the photoelectric effect and showed the particle nature of light
4. electron sea model	describes the circumstances by which in a metal, positive ions in the lattice are surrounded by a moving 'sea' of electrons	19. photon	a quantum (bundle) of energy
5. energy bands	represent where the electron energies of large number of electrons in matter are spread over bands; the highest occupied energy band is the valence band; above the valence band is the conduction band; between these bands is the forbidden energy gap	20. Planck, Max	a German scientist credited with discovering quantum theory when investigating black body radiation; he found he could only get agreement between experiment and theory by postulating that light came in photons or quanta or bundles of energy
6. extrinsic conduction	electrical conduction in doped semiconductors		
7. filament	a thin wire with high electrical resistance; when current passes through it, it gets hot		
8. fluorescent screen	the screen of a cathode ray tube whose surface is coated with a material that fluoresces to emit light when struck with electrons; it is used to form an image of an electrical signal		
9. germanium	a group IV element, which was originally used in semiconductor devices but now superseded by silicon as the preferred choice		
10. Hertz, Heinrich	a German physicist who demonstrated the existence of electromagnetic waves after James Clerk Maxwell had predicted them; he also discovered the photoelectric effect but failed to investigate it further		
11. holes	represent the absence of an electron in an energy level; formed when a group IV element (e.g. silicon) is doped with a group III element		
12. maglev train	uses magnetic levitation for propulsion		
13. maltese cross	an evacuated tube with a metal cross in it; used to show that cathode rays travel in straight lines		
14. meissner effect	the exclusion of a magnetic field by a superconductor		
15. n-type	semiconductor material has electrons as the majority carriers and holes as the minority carriers; doped with group V atoms		