Match the following (more than one and non-unique matches are possible). Answer will be considered only if all matches are correct:

(a) K electron capture	(p) excess protons
(b) positron emission	(q) x-rays
(c) crystallography	(r) γ-rays
(d) electron-positron annihilation	(s) photons

## Answer/Solution

(a) K electron capture is a decay mode for those isotopes which have too many protons in their nuclei. It happens by the capture of a K-shell electron in the nucleus leading to formation of a positron and neutrino. Also, after K electron capture, the atom in its excited state emits X-rays due to electron transition from outer shell to inner shell. X-rays are made of photons. Thus, (a) matches with (p), (q) & (s).

(b) Positron emission is also another mode of decay in isotopes having too many protons in their nuclei. It is Beta plus decay in which a proton gets converted into neutron, positron and a neutrino. So, (b) matches with (p).

(c) In crystallography, X-rays are used to analyse the diffraction pattern of the crystal. X-rays are made of photons. So, (c) matches with (q) & (s).

(d) Electron-Positron annihilation occurs when an electron collides with a positron to create gamma ray photons. In fact, the conservation of linear momentum and total energy in the process forbids the emission of a single gamma ray but leads to emission of a large no. of gamma ray photons. So (d) matches with (r) and (s).

Hence correct match is: pqs,p,qs,rs.