19. Match the nuclear processes given in column I with the appropriate option(s) in column II

Column I	Column II
(A) Nuclear fusion	(P) Absorption of thermal neutrons by $^{235}_{92}U$
(B) Fission in a nuclear reactor	(Q) $^{60}_{27}Co$ Nucleus
(C) β −decay	(R) Energy production in stars via hydrogen conversion to helium
(D) γ − emission	(S) Heavy water
	(T) Neutrino emission

Answer: (A) Nuclear fusion: Sun radiates energy because of nuclear fusion where 4 atoms of hydrogen converted to Helium and difference of mass emitted in the form of energy.
A →R

(B) Fission in a nuclear reactor: Fissionable isotope of $^{235}_{92}U$ require fast neutrons. Heavy water (deuterium oxide D_2O) is used in nuclear reactor as its coolant and moderator. It helps to sustain and control neutron during fission reaction
B→P, S

(C) β −decay: Cobalt-60 ($^{60}_{27}Co$) is an unstable isotope of cobalt that decays by beta decay to the stable isotope nickel-60 ($^{28}_{60}Ni$). During this decay, one of the neutrons in the cobalt-60 nucleus decays to a proton by emitting an electron (e−) and an electron antineutrino (ve). This changes the cobalt-60 nucleus into a nickel-60 nucleus. The resulting nickel nucleus, however, is in an excited state and promptly decays to its ground state by emitting two gamma rays (γ). Hence the overall nuclear equation of the reaction is:
C→Q, T

(D) γ − emission: Source of γ − emission radio isotopes, astronomical process such as energy production in stars via hydrogen conversion to helium. Gamma-ray bursts are created in the mergers of double neutron star binaries and black hole neutron star binaries at cosmological distances. Some bursts may also be produced through neutrino-antineutrino annihilation into electrons and positrons

D→Q, R, T