Worksheet: Units for Particle Rest Masses

Q1:

Particle	Electron	Muon	Tauon
Mass	511 keV/c^2	106 MeV/c^2	1.78 GeV/c^2

The table shows the masses of the three charged leptons. What is the most massive lepton–antilepton pair that could be produced via pair production from a 150 MeV photon?

A An electron–positron pair

B A tauon–antitauon pair

C A muon–antimuon pair

Q2: What is 4.99×10^{-32} kg in keV/c^2? Give your answer to 3 significant figures.

A 4.99 keV/c^2

B 0.0359 keV/c^2

C 28.0 keV/c^2

D 79.0 keV/c^2

E 89.7 keV/c^2

Q3: A muon has a mass of 106 MeV/c^2. What is the mass of a muon in kilograms? Give your answer to 3 significant figures.

A 1.69×10^{-32} kg

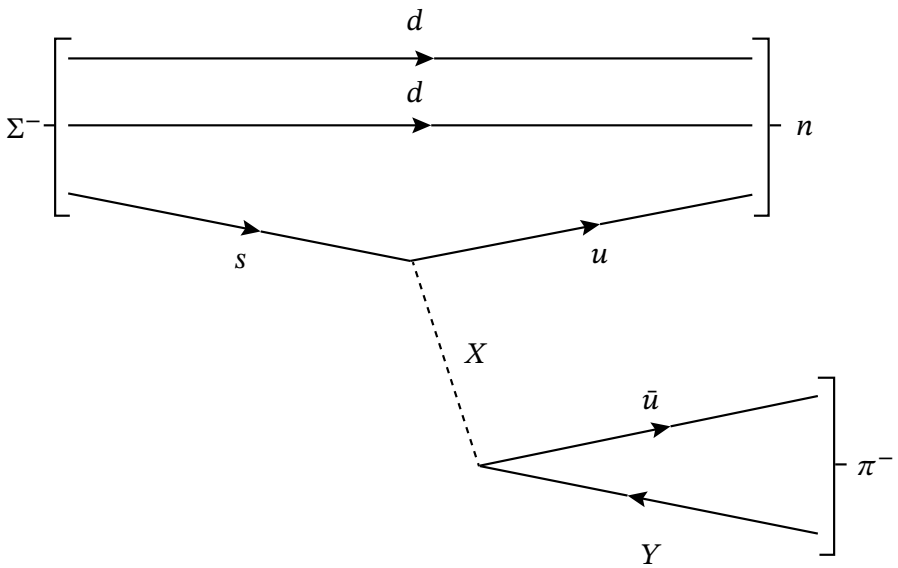
B 1.89×10^{-28} kg

C 6.32×10^{-28} kg

D 1.89×10^{-29} kg

E 1.69×10^{-29} kg

Q4: The Feynman diagram shows a sigma baryon decaying into a neutron and a pion.



What particle is represented by X in the diagram?

A W^+

B d

C W^-

D $\bar{s}$

E $\bar{d}$

What particle is represented by Y in the diagram?

A W^-

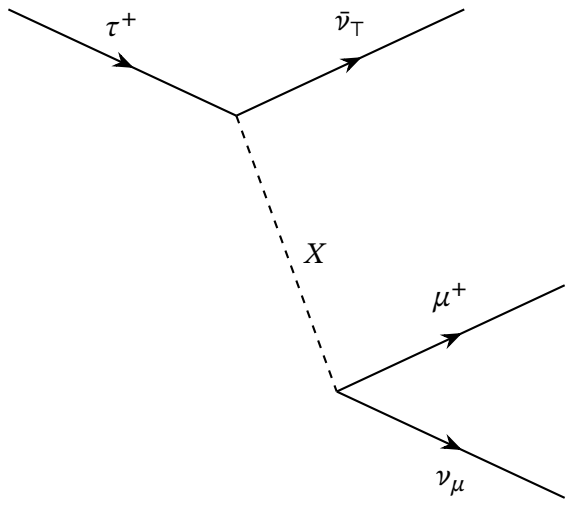
B $\bar{s}$

C d

D W^+

E $\bar{d}$

Q5: The Feynman diagram shows an antitauon decaying into an antimuon.
What particle is represented by X in the diagram?



A W^+

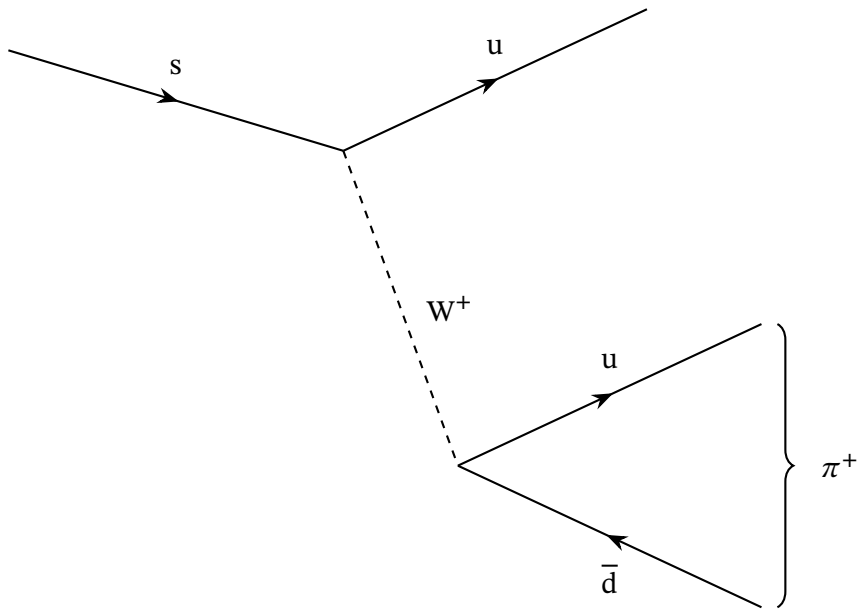
B g

C γ

D μ^+

E W^-

Q6: Is the interaction shown in the Feynman diagram possible? If not, why not?



A No, because it doesn't conserve the baryon number

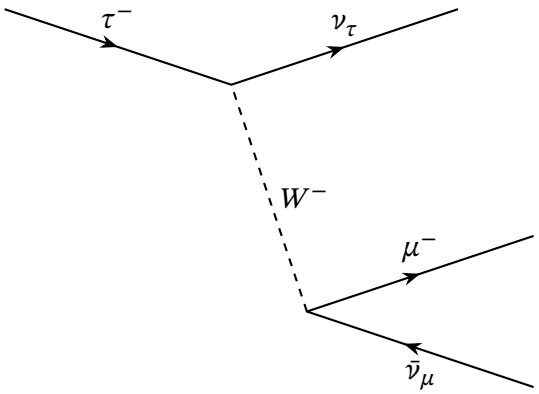
B Yes

C No, because it doesn't conserve strangeness

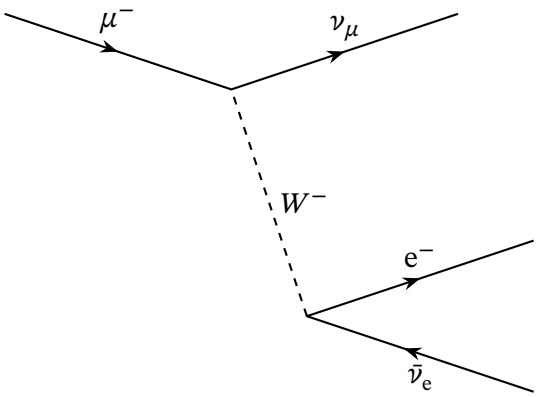
D No, because a W boson cannot decay into a pion

E No, because it doesn't conserve electric charge

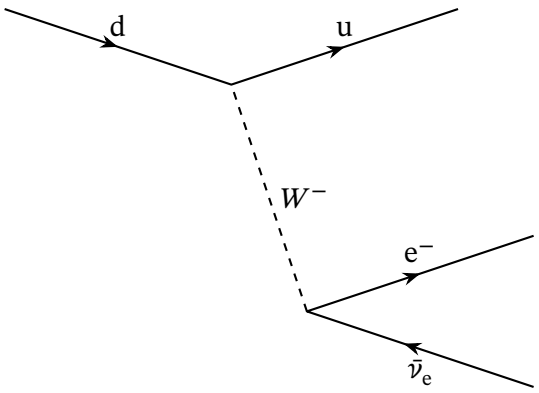
Q7: Which of the following Feynman diagrams shows the interaction $\tau^- \longrightarrow \mu^- + \overline{\nu}_\mu + \nu_\tau$?



A



B



C