

# Worksheet: Neutrinos



**Q1:** Which of the four fundamental forces are the three different types of neutrino—the electron neutrino, the mu neutrino, and the tau neutrino—affected by?

- A The weak nuclear force and the strong nuclear force
- B The weak nuclear force and gravity
- C The electric force and the magnetic force
- D The strong nuclear force and gravity
- E The electromagnetic force and the nuclear force

**Q2:** List the following particles in order from least mass to greatest mass:

- ▶ neutron
- ▶ neutrino
- ▶ proton
- ▶ alpha Particle
- ▶ electron

- A Electron, neutrino, proton, neutron, alpha particle
- B Electron, neutrino, neutron, alpha particle, proton
- C Neutrino, electron, proton, neutron, alpha particle
- D Neutrino, electron, neutron, alpha particle, proton
- E Alpha particle, neutrino, electron, proton, neutron

**Q3:** Which of the following is the correct symbol for an electron neutrino?

- A  $\nu_{\mu}$
- B  $\nu_{\epsilon}$
- C  $\nu_E$
- D  $\nu_T$
- E  $\nu_e$

**Q4:** List the following particles in order from the greatest to the least mass:

- ▶ positron
- ▶ neutron
- ▶ helium nucleus
- ▶ photon
- ▶ neutrino

- A Positron, helium nucleus, neutron, photon, neutrino
- B Helium nucleus, neutron, positron, neutrino, photon
- C Helium nucleus, neutron, positron, photon, neutrino
- D Neutron, positron, neutrino, photon, helium nucleus
- E Positron, neutron, photon, neutrino, helium nucleus

**Q5:** Which two of the following particles have the same mass?

- ▶ photon
- ▶ neutrino
- ▶ electron
- ▶ proton
- ▶ muon
- ▶ positron

- A Proton and electron
- B Electron and neutrino
- C Neutrino and photon
- D Photon and muon
- E Electron and positron

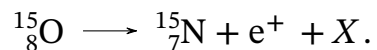
**Q6:** What is the relative charge of a neutrino?

- A -2
- B 0
- C +2
- D +1
- E -1



Question Video

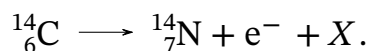
**Q7:** The following nuclear equation shows oxygen-15 undergoing beta decay to nitrogen-15,



What particle does  $X$  represent?

- A A mu antineutrino
- B A positron
- C A mu neutrino
- D An electron neutrino
- E An electron antineutrino

**Q8:** The following nuclear equation shows carbon-14 undergoing beta decay to nitrogen-14,



What particle does  $X$  represent?

- A An electron neutrino
- B A positron
- C A mu neutrino
- D An electron antineutrino
- E A mu antineutrino

**Q9:** Which of the following is the antiparticle of  $\bar{\nu}_\tau$ ?

- A  $\nu_\mu$
- B  $\tau^+$
- C  $\nu_e$
- D  $\tau^-$
- E  $\nu_\tau$

**Q10:** Which of the following is the antiparticle of  $\nu_e$ ?

- A  $e^-$
- B  $\bar{\nu}_e$
- C  $e^+$
- D  $\bar{\nu}_\mu$
- E  $\bar{\nu}_\tau$

**Q11:** Which of the following symbols does **not** represent a real antineutrino?

- A  $\bar{\nu}_\mu$
- B  $\nu_\tau$
- C  $\bar{\nu}_e$
- D  $\bar{\nu}_\tau$

**Q12:** Which of the following is the correct symbol for a  $\tau$  antineutrino?

A  $\bar{\nu}_t$

B  $\nu_\tau$

C  $\bar{\nu}_T$

D  $\nu_t$

E  $\bar{\nu}_\tau$

**Q13:** Which of the following is the correct symbol for a  $\mu$  antineutrino?

A  $\bar{\nu}_\mu$

B  $\bar{\nu}_m$

C  $\nu_p$

D  $\bar{\nu}_e$

E  $\nu_\mu$

**Q14:** Which of the following is the correct symbol for an electron antineutrino?

- A  $\bar{\nu}_e$
- B  $\bar{\nu}_\mu$
- C  $\nu_e$
- D  $\bar{\nu}_\epsilon$
- E  $\nu_E$

**Q15:** Which of the following symbols does **not** represent a real neutrino?

- A  $\nu_\tau$
- B  $\nu_\mu$
- C  $\nu_\epsilon$
- D  $\nu_e$

**Q16:** Which of the following is the correct symbol for a  $\tau$  neutrino?

- A  $\nu_t$
- B  $\nu_T$
- C  $\nu_e$
- D  $\nu_\tau$
- E  $\nu_\mu$

**Q17:** Which of the following is the correct symbol for a  $\mu$  neutrino?

A  $\nu_m$

B  $\nu_u$

C  $\nu_\tau$

D  $\nu_\mu$

E  $\nu_e$