Particles Questions for A-level Physics

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BASIC

1. Which particle mediates the electromagnetic force?

2. What is the charge of a down quark?

3. What is the relative mass of a neutron compared to a proton?

4. What is the definition of a fundamental particle (sometimes called an elementary particle)?

5. How many types of quarks are there?

6. What combination of quarks forms a proton?

7. Which type of fundamental particle is the electron?

8. What is the name given to the force that holds quarks together inside protons and neutrons?

INTERMEDIATE

9. What are baryons and how do they differ from mesons?

10. Which interaction is responsible for beta decay?

11. State the conservation laws that apply to particle interactions.

12. What is the difference between a hadron and a lepton?

13. Name two mesons and the quarks that make them up.

14. Explain what is meant by quark confinement.

15. What property is conserved in all fundamental interactions, including weak interactions, even when some symmetries are violated?

ADVANCED

16. What are neutrinos, and why are they difficult to detect?

17. How does the mass-energy equivalence principle ($E=mc^2$) relate to particle physics experiments in accelerators?

18. What are gauge bosons, and what role do they play in the Standard Model?

PARTICLE INTERACTIONS

19. Is the following interaction allowed according to conservation laws? $\pi^+ \rightarrow \mu^+ + \nu_\mu$

20. Determine whether the following decay is allowed: $n \rightarrow p + e^- + \bar{\nu}_e$

21. Is the following process possible? $\Sigma^+ \rightarrow p + \pi^-$

22. Can this interaction occur? $K^0 \rightarrow \pi^+ + e^- + \bar{\nu}_e$

23. Check whether the following interaction is possible: $p + \bar{p} \rightarrow \gamma + \gamma$

24. Can the following reaction occur according to conservation laws? $n \rightarrow p + e^-$

25. Is the following interaction possible based on conservation laws? $\nu_\mu + n \rightarrow p + \mu^-$

26. Is the following process possible? $\Sigma^- \rightarrow n + e^- + \bar{\nu}_e$

27. Can this interaction occur? $K^+ \rightarrow \pi^0 + \pi^+$

28. Check whether the following interaction is possible: $\mu^+ \rightarrow e^+ + \nu_e + \nu_\mu$

29. Can the following reaction occur according to conservation laws? $p + p \rightarrow p + n + \pi^+$

30. Is the following interaction possible based on conservation laws? $p + p \rightarrow p + n + e^+ + e^-$