

## Subatomic Particles Practice\

- The particles in a nucleus are held together primarily by the
  - strong force**
  - gravitational force
  - electrostatic force
  - magnetic force
- Base your answer to the following question on the table below, which shows data about various subatomic particles.

Subatomic Particle Table

| Symbol     | Name       | Quark Content           | Electric Charge | Mass (GeV/c <sup>2</sup> ) |
|------------|------------|-------------------------|-----------------|----------------------------|
| p          | proton     | uud                     | +1              | 0.938                      |
| $\bar{p}$  | antiproton | $\bar{u}\bar{u}\bar{d}$ | -1              | 0.938                      |
| n          | neutron    | udd                     | 0               | 0.940                      |
| $\lambda$  | lambda     | uds                     | 0               | 1.116                      |
| $\Omega^-$ | omega      | sss                     | -1              | 1.672                      |

Which particle listed on the table has the opposite charge of, and is more massive than, a proton?

- antiproton
  - neutron
  - lambda
  - omega**
- What is the total number of quarks in a helium nucleus consisting of 2 protons and 2 neutrons?
    - 16
    - 12**
    - 8
    - 4
  - A top quark has an approximate charge of
    - $-1.07 \times 10^{-19} \text{ C}$
    - $-2.40 \times 10^{-19} \text{ C}$
    - $+1.07 \times 10^{-19} \text{ C}$**
    - $+2.40 \times 10^{-19} \text{ C}$
  - According to the Standard Model of Particle Physics, a meson is composed of
    - a quark and a muon neutrino
    - a quark and an antiquark**
    - three quarks
    - a lepton and an antilepton
  - What are the sign and charge, in coulombs, of an antiproton?
  - Protons and neutrons are examples of
    - positrons
    - baryons**
    - mesons
    - quarks

- Compared to the mass and charge of a proton, an antiproton has
  - the same mass and the same charge
  - greater mass and the same charge
  - the same mass and the opposite charge**
  - greater mass and the opposite charge
- The composition of a meson with a charge of  $-1$  elementary charge could be
  - $s\bar{c}$
  - $dss$
  - $u\bar{b}$
  - $\bar{u}\bar{c}\bar{d}$**
- A particle that is composed of two up quarks and one down quark is a
  - meson
  - neutron
  - proton**
  - positron
- A particle unaffected by an electric field could have a quark composition of
  - $css$
  - $bbb$
  - $udc$
  - $uud$
- Which combination of quarks could produce a neutral baryon?
  - $cdt$
  - $cts$
  - $cdb$**
  - $cd u$
- Which combination of quarks would produce a neutral baryon?
  - $uud$
  - $udd$**
  - $\bar{u}\bar{u}\bar{d}$
  - $\bar{u}\bar{d}\bar{d}$
- A baryon may have a charge of
  - $-1/3 e$
  - $0 e$**
  - $+2/3 e$
  - $+4/3 e$
- Which of the following has the same charge as a neutron ( $udd$ )?
  - proton ( $uud$ )
  - sigma ( $\Sigma$ ) ( $uus$ )
  - xi ( $\Xi$ ) ( $uss$ )**
  - omega ( $\Omega$ ) ( $sss$ )
- What is the charge on an anti-down quark?
  - $+\frac{1}{3} e$**
  - $+\frac{2}{3} e$
  - $-\frac{1}{3} e$
  - $-\frac{2}{3} e$
- One variety of delta ( $\Delta$ ) particle has a charge of  $+2 e$ . What is a possible quark configuration for it?
  - $uuu$**
  - $uud$
  - $udd$
  - $ddd$
- The strong force is the force of
  - repulsion between protons
  - attraction between protons and electrons
  - repulsion between nucleons
  - attraction between nucleons**

**Answer Key**  
**ModernPhysNotes**

1. **A**

2. **D**

3. **B**

4. **C**

5. **B**

6.  $-1.6 \times 10^{-19} \text{ C}$

7. **B**

8. **C**

9. **A**

10. **C**

11. **A**

12. **C**

13. **B**

14. **B**

15. **C**

16. **A**

17. **A**

18. **D**

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