1. Two negative charges are placed near each other. They will:

   ☐ do nothing

   ☐ attract

   ☐ repel

   ☐ combine into a positive charge

2. In ordinary charging, which particles actually move between objects?

   ☐ protons

   ☐ electrons

   ☐ whole atoms

   ☐ neutrons

3. A 2 C charge sits in a field of 5 $\frac{\text{N}}{\text{C}}$. What force does it feel, in N?

   _____ N

4. Two +1 C charges are 2 m apart ($k = 9 \times 10^9$). What is their potential energy, in J? (Give the coefficient of 10^9.)

   _____ $\times 10^9$ J

5. A +2 C charge moves slowly to a point 6 V higher in potential. How much external work is required, in J?

   _____ J

6. A 2 F capacitor is charged to 3 V. How much charge does it store, in C?

   _____ C

7. A 2 C charge accelerates from rest through 9 V. How much kinetic energy does it gain, in J?

   _____ J

8. Electric charge is measured in _____.

   _____

9. A positively charged object has:

   ☐ lost protons

   ☐ lost electrons

   ☐ gained neutrons

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10. The electric field at a point is defined as:

    ☐ charge times distance

    ☐ force per unit charge

    ☐ charge per unit force

    ☐ force times charge

1. **repel**

   Like charges repel – two negatives push apart.

2. **electrons**

   Electrons transfer; protons stay locked in the nuclei.

3. **10 N**

   $F = qE = 2 \times 5 = 10$ N.

4. **4.5×10^{9} J**

   $U = kq_1q_2/r = 9 \times 10^9/2 = 4.5 \times 10^9$ J.

5. **12 J**

   For slow motion, $W_{\text{ext}} = \Delta U = q\Delta V = 2 \times 6 = 12$ J. Electric work is -12 J.

6. **6 C**

   $Q = CV = 2 \times 3 = 6$ C.

7. **18 J**

   The positive charge accelerates through a potential drop: $\Delta V = -9$ V, so $\Delta K = -q\Delta V = -(2)(-9) = 18$ J.

8. **coulombs**

   Charge is measured in coulombs (C).

9. **lost electrons**

   A positive object has lost electrons, leaving more protons than electrons.

10. **force per unit charge**

    $E = F/q$ – the force a unit positive charge would feel.

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