

TOPIC 5A: Skills 33-37 Review

Electrostatics Practice Quiz

136. How many excess electrons are present on an object that has a charge of -3.2C ? (1pt)

$$q = -3.2\text{C} \times \frac{1e}{1.6 \times 10^{-19}\text{C}} = 2 \times 10^{19}e$$

"Coulombs divide to e"
"Coulombs denominator to e" C/e

137. A metal dome with 3.2×10^8 extra electrons is brought into contact with an identical dome with no charge. What will be the charge in coulomb's of each dome after they are brought into contact? (1 pt)

$$q_1 = 3.2 \times 10^8 e \quad \bar{q} = \frac{q_1 + q_2}{2} = \frac{3.2 \times 10^8 e + 0}{2} = 1.6 \times 10^8 e \text{ each}$$

$$q_2 = 0$$

EMC elementary charge multiply into C

$$1.6 \times 10^8 e \times \frac{1.6 \times 10^{-19}\text{C}}{1e} = 2.56 \times 10^{-11}\text{C} \text{ each}$$

138. An object with a charge of $+2\mu\text{C}$ and a second object with a charge of -3nC are separated by a distance of $1.5 \times 10^{-4}\text{m}$. What is the electrostatic force acting between the objects? (2pts)

Known /Unknown

Equation with substitution and units

Solution

$$\begin{aligned} q_1 &= +2\mu\text{C} = 2 \times 10^{-6}\text{C} \\ q_2 &= -3\text{nC} = -3 \times 10^{-9}\text{C} \\ r &= 1.5 \times 10^{-4}\text{m} \\ F_e &=? \end{aligned}$$

$$F_e = \frac{k q_1 q_2}{r^2} = \frac{(8.99 \times 10^9 \text{N}\cdot\text{m}^2/\text{C}^2)(2 \times 10^{-6}\text{C})(-3 \times 10^{-9}\text{C})}{(1.5 \times 10^{-4}\text{m})^2}$$

$$F_e = 2397\text{N}$$

139. A pie plate with a charge of 0.5C is placed in an electric field of 2N/C caused by a Van de Graaf generator. What is the electrostatic force acting on the plate? (2 pts)

Known /Unknown

Equation with substitution and units

Solution

$$\begin{aligned} q &= .5\text{C} \\ E &= 2\text{N/C} \\ F_e &=? \end{aligned}$$

$$F_e = E q = (2\text{N/C})(.5\text{C})$$

$$= 1\text{N}$$

1N



140. 30J of electrical energy are used to move 5C of charge in a battery. What is the potential difference in the battery? (2pts)

Known / Unknown

$$W = 30J$$

$$q = 5C$$

$$V = ?$$

Equation with substitution and units

$$V = \frac{W}{q} = \frac{30J}{5C} = 6J$$

Solution

$$6J$$

141. In recharging a battery 2500 electrons are moved through a potential difference of 3V. What is the energy stored in the battery? Give your answer in both joules and electron volts and show any necessary conversions. (3pts)

$$q = 2500e$$

$$V = 3V$$

$$W = ?$$

$$W = qV$$

$$= (2500e)(3V) = 7500eV$$

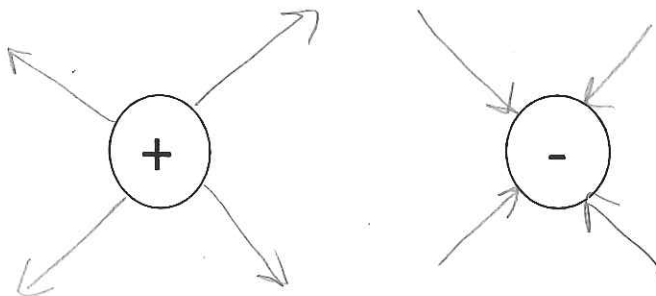
$$\text{or } = (2500e \times \frac{1.6 \times 10^{-19}C}{1e})(3V) = 1.2 \times 10^{-15}J$$

$$\text{or } 7500eV \times \frac{1.6 \times 10^{-19}J}{1eV} = 1.2 \times 10^{-15}J$$

142. Circle the charges that are possible on an object (more than one correct answer is possible)

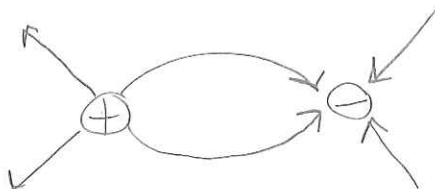
- (a) $3 \times 10^{-15}C$ $1.875 \times 10^{14}e$
- (b) $3.2 \times 10^{-19}C$ $2e$
- c. $3.2 \times 10^{-20}C$ less than minimum charge
- (d) $4.0 \times 10^{-5}C$ $2.5 \times 10^{14}e$
- e. $4.0 \times 10^{-19}C$ $2.5e$ can't have a partial elementary charge

143. Draw at least 4 electric field lines around each of these two charges (2pts)



as
separate
charges

If they
are
interacting
charges



144. Which of the following statements would be true about gravitational and electrostatic force between the two charges shown above *opposite*

- a. $F_g > F_e$, both forces would be repulsive
- b. $F_g < F_e$, both force are attractive
- c. $F_g = F_e$, both forces are attractive
- d. $F_g < F_e$, F_g causes attraction and F_e causes repulsion

145. For each of the following variables (F_e , E , W , q , V) circle the all the appropriate units of measurement in the row

F_e	<input checked="" type="radio"/> a. N	b. J	c. C	d. e
$E = \frac{F_e}{q}$	a. N	<input checked="" type="radio"/> b. N/C	c. J	d. C
$W = Vq$	<input checked="" type="radio"/> a. J	b. J/C	<input checked="" type="radio"/> c. Nm	<input checked="" type="radio"/> d. eV
Q	<input checked="" type="radio"/> a. C	b. eV	<input checked="" type="radio"/> c. e	d. N
$V = \frac{W}{q}$	a. J	<input checked="" type="radio"/> b. J/C	<input checked="" type="radio"/> c. V	d. eV

