

1

a) $Q = n \cdot e$

$$Q = 5 \cdot 10^{14} \cdot 1,6 \cdot 10^{-19}$$

$$Q = 8 \cdot 10^{-5} \text{ C}$$

b) $F = \frac{9 \cdot 10^9 \cdot 8 \cdot 10^{-5} \cdot 8 \cdot 10^{-5}}{(8 \cdot 10^{-2})^2}$

$$F = \frac{9 \cdot 10^9 \cdot 10^{-10}}{10^{-4}} = 9 \cdot 10^{-1+4}$$

$$F = 9 \cdot 10^3 \text{ N}$$

2) $F = P = 9 \cdot 10^{-1} \text{ N}$

$$9 \cdot 10^{-1} = \frac{9 \cdot 10^9 \cdot 8 \cdot 10^{-6} \cdot 2 \cdot 10^{-6}}{d^2}$$

$$d^2 = \frac{16 \cdot 10^{-3}}{10^{-1}} = 16 \cdot 10^{-3+1}$$

$$d^2 = 16 \cdot 10^{-2}$$

$$d = \sqrt{16 \cdot 10^{-2}} \quad d = 4 \cdot 10^{-1} \text{ m}$$

$$d = 0,4 \text{ m} \quad \text{ou} \quad d = 40 \text{ cm}$$

3

(A) (B) (C)
Q 0 0

1^o (A)(B) = (A) (B)
 $\frac{Q+0}{2} = \frac{Q}{2} \quad \frac{Q}{2}$

2^o (A)(C) = (A) (B)
 $\frac{Q+0}{2} = \frac{Q}{4} \quad \frac{Q}{4}$

3^o (B)(C) = (B) (C)
 $\frac{Q+Q}{2} = \frac{3Q}{8} \quad \frac{3Q}{8}$

e

4) $\frac{+12 + (-8)}{2} = \frac{4}{2}$

$$Q_1 = Q_2 = +2 \text{ C}$$

a

5

a) Positiva, pois perdeu elétrons

b) $Q = n \cdot e$

$$Q = 3 \cdot 10^{20} \cdot 1,6 \cdot 10^{-19}$$

$$Q = 4,8 \cdot 10 = 48 \text{ C}$$

$$Q = 48 \text{ C}$$

6) I - F

II - V

III - V

d

7) $Q = n \cdot e$

$$6 \cdot 10^9 = n \cdot 1,6 \cdot 10^{-19}$$

$$n = \frac{6 \cdot 10^9}{1,6 \cdot 10^{-19}}$$

$$n = 3,75 \cdot 10^{10} \text{ elétrons}$$

8

a) $\sum Q_i = 4 + (-8) + 0$

$$\sum Q_i = -4 \text{ C}$$

b) $\sum Q_i = \sum Q_f$

$$-4 = 2 - 5,2 + Q_c'$$

$$Q_c' = -0,8 \text{ C}$$

c) $Q_c' = n \cdot e$

$$0,8 = n \cdot 1,6 \cdot 10^{-19}$$

$$n = \frac{0,8}{1,6 \cdot 10^{-19}} = 5 \cdot 10^{10} \text{ elétrons}$$

9

$$F = \frac{9 \cdot 10^9 \cdot 5 \cdot 10^{-5} \cdot 0,3 \cdot 10^{-6}}{(5 \cdot 10^{-2})^2}$$

$$F = \frac{9 \cdot 10^9 \cdot 8 \cdot 10^{-5} \cdot 0,3 \cdot 10^{-6}}{25 \cdot 10^{-4}}$$

$$F = \frac{2,7}{5} \cdot \frac{10^{-2}}{10^{-4}}$$

$$F = \frac{2,7}{5} \cdot 10^{-2+4}$$

$$F = \frac{2,70}{5} \Rightarrow F = 54 \text{ N}$$

10

$$a) F = 9 \cdot 10^9 \frac{10^{-7} \cdot 10^{-7}}{(10^{-1})^2}$$

$$F = \frac{9 \cdot 10^{-5}}{10^{-2}} \Rightarrow \boxed{F = 9 \cdot 10^{-3} \text{ N}}$$

$$b) F_{cp} = \frac{m \cdot v^2}{R}$$

$$9 \cdot 10^{-3} = \frac{1 \cdot 10^{-4} \cdot v^2}{10^{-1}}$$

$$v^2 = \frac{9 \cdot 10^{-4}}{1 \cdot 10^{-4}}$$

$$v = \sqrt{9}$$

$$\boxed{v = 3 \text{ m/s}}$$

12

e

13

- I - V
- II - F
- III - F
- IV - F

a

11

$$8 = \frac{9 \cdot 10^9 \cdot 2 \cdot 10^{-6} \cdot Q_2}{(6 \cdot 10^{-2})^2}$$

$$8 = \frac{9 \cdot 10^9 \cdot 2 \cdot 10^{-6} \cdot Q_2}{36 \cdot 10^{-4}}$$

$$16 = Q_2 \cdot 10^{3+4}$$

$$Q_2 = \frac{16}{10^7}$$

$$Q_2 = 16 \cdot 10^{-7}$$

$$Q = -1,6 \cdot 10^{-6} \text{ C}$$

ou

$$\boxed{Q = -1,6 \mu\text{C}}$$

14

$$\text{Contato: } Q_1 = Q_2 = \frac{16 + (-4)}{2}$$

$$Q_1 = Q_2 = 6 \mu\text{C}$$

$$F = \frac{9 \cdot 10^9 \cdot 6 \cdot 10^{-6} \cdot 6 \cdot 10^{-6}}{(3 \cdot 10^{-2})^2}$$

$$F = \frac{36 \cdot 10^{9-12}}{10^{-4}} \quad F = 36 \cdot 10^{3+4}$$

$$\boxed{F = 360 \text{ N}} \quad \text{d}$$

15

$$a) F_1 = F \cdot 2^2 \quad F_1 = 9 \cdot 10^{-3} \cdot 4$$

$$\boxed{F_1 = 36 \cdot 10^{-3} \text{ N}}$$

$$F_2 = \frac{F}{2^2} \quad F_2 = \frac{9 \cdot 10^{-3}}{4} \quad \boxed{F_2 = 2,25 \cdot 10^{-3} \text{ N}}$$

$$b) 9 \cdot 10^{-3} = \frac{9 \cdot 10^9 \cdot Q^2}{1}$$

$$Q^2 = \frac{10^{-3}}{10^9} \Rightarrow Q^2 = 10^{-12}$$

$$Q = \sqrt{10^{-12}} \quad Q = 1 \cdot 10^{-6} \text{ C}$$

$$\boxed{Q = 1 \mu\text{C}}$$