Answer on Question#61318 – Chemistry – General chemistry

Answer: Timothy has 1 gallon of 6% bleach, assume 94% is water. Timothy decides to dilute the bleach separately. Timothy pours 10mL+0.1, 9mL+0.1, 8mL+0.1, 7mL+0.1, 6mL+0.1, and 1mL+0.1, of the bleach into 6 different containers and then fills the difference to 10mL with water. The density of the bleach is 1.11 g/cm3, and the 10mL is measured in a graduated cylinder. Calculate the new concentration, in moles per decimeter cubed, of the bleach in each container.

Solution:

The chemical formula of bleach is NaClO. M(NaClO) = 74.5 g/mol

1 gallon = 378.412 dm^3 = 378412 cm^3

m(bleach) = 378412 cm^3 · 1.11 g/ml = 420037.32 g

m(NaClO without water) = 420037.32 g · 0.06 = 25202.24 g

n(NaClO) = $\frac{25202.24\ g}{74.5\ g/mol}$ = 338.29 mol;

C_0(NaClO) = $\frac{338.29\ mol}{378.412\ dm^3}$ = 0.894 mol/ dm^3;

$C_{new} = \frac{C_0 V_0}{V_{new}}$; Error(%) = $\frac{0.1}{V_0}$ ·100%;

Error(mol/dm^3) = $\frac{\text{Error}(\%)\cdot \text{Cnew}}{100}$

№	V_o,ml	C_{new}, mol/dm^3	Error, %	Error, mol/dm^3
1	10	$\frac{0.894 \cdot 10}{10} = 0.894$	$\frac{0.1}{10} \cdot 100 = 1$	$\frac{1 \cdot 0.894}{100} = 0.009$
2	9	$\frac{0.894 \cdot 9}{10} = 0.805$	$\frac{0.1}{9} \cdot 100 = 1.11$	$\frac{1 \cdot 0.805}{100} = 0.008$
3	8	$\frac{0.894 \cdot 8}{10} = 0.715$	$\frac{0.1}{8} \cdot 100 = 1.25$	$\frac{1 \cdot 0.715}{100} = 0.007$
4	7	$\frac{0.894 \cdot 7}{10} = 0.626$	$\frac{0.1}{7} \cdot 100 = 1.43$	$\frac{1 \cdot 0.626}{100} = 0.006$
5	6	$\frac{0.894 \cdot 6}{10} = 0.536$	$\frac{0.1}{6} \cdot 100 = 1.67$	$\frac{1 \cdot 0.536}{100} = 0.005$
6	1	$\frac{0.894 \cdot 1}{10} = 0.089$	$\frac{0.1}{1} \cdot 100 = 10$	$\frac{1 \cdot 0.089}{100} = 0.001$

Answer:

№	C_{new}, mol/dm^3
1	0.894 ± 0.009
2	0.805 ± 0.008
3	0.715 ± 0.007
4	0.626 ± 0.006
5	0.536 ± 0.005
6	0.089 ± 0.001