Marks 4

- The table below gives the concentrations of C_2H_4O as a function of time at 690 K for the following reaction:

$$C_2H_4O(g) \rightarrow CH_4(g) + CO(g)$$

$[C_2H_4O]$ (M)	time (mins)
0.0860	0
0.0465	50
0.0355	72
0.0274	93
0.0174	130

The reaction is first order with respect to C_2H_4O.

Use the above data to determine the rate constant and the half-life of the reaction.

$k =$	$t_{½} =$

How long does it take for 75% of the C_2H_4O to react?

	Answer:

- Sevoflurane is an anaesthetic with a half-life in the brain of 2.3 minutes. How long does it take for the concentration of sevoflurane in brain tissue to drop from 0.025 mM to one hundredth of this value?

3

Answer:

Marks 4

- Phosgene is a toxic gas prepared by the reaction of carbon monoxide with chlorine.

$$CO(g) + Cl_2(g) \rightarrow COCl_2(g)$$

The following data were obtained in a kinetics study of its formation at 150 °C.

Experiment	Initial [CO] (mol L^{-1})	Initial [Cl_2] (mol L^{-1})	Initial rate (mol L^{-1} s^{-1})
1	1.00	0.100	1.29×10^{-3}
2	0.100	0.100	1.33×10^{-4}
3	0.100	1.00	1.30×10^{-3}
4	0.100	0.0100	1.32×10^{-5}

Write the rate law for the formation of phosgene at 150 °C.

Calculate the value of the rate constant at 150 °C.

Answer:

Calculate the rate of appearance of phosgene when [CO] = [Cl_2] = 1.3 M.

Answer:

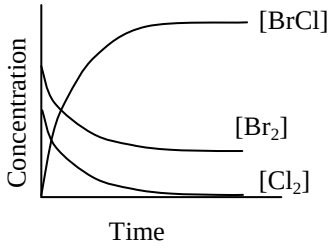
Marks 4

- In the reaction of Cl_2 with Br_2 in CCl_4 solution, BrCl forms according to the equation:

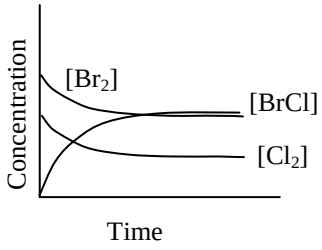
$$Br_2 + Cl_2 \rightarrow 2BrCl \qquad K_c = 2$$

With initial concentrations of $[Br_2] = 0.6$ M, $[Cl_2] = 0.4$ M and $[BrCl] = 0.0$ M, which of the following concentration versus time graphs represents this reaction? Explain why you rejected each of the other three graphs.

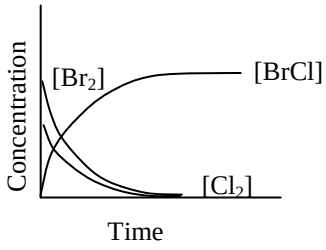
(a)



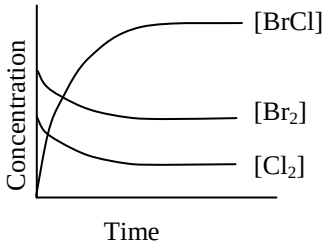
(b)



(c)



(d)



- The radioactive isotope ^{99m}Tc has a half life of 6.0 hours. How much time after production of the ^{99m}Tc isotope do radiologists have to examine a patient if at least 25 % of the original activity is required to get useful exposures?

Marks 2

Answer:

• Briefly explain the two factors necessary for a collision between two molecules to result in a reaction.	**Marks 3**

Briefly describe the relationship between the rate of a reaction and the activation energy for the reaction.

- The radioactive isotope ^{99m}Tc has a half life of 6.0 hours. How much time after production of the ^{99m}Tc isotope do radiologists have to examine a patient if at least 35 % of the original activity is required to get useful exposures?

Marks 2

Answer: