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科目：普通化學 (154-172)

Problems : 70%

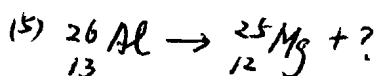
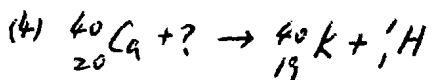
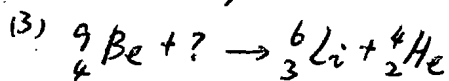
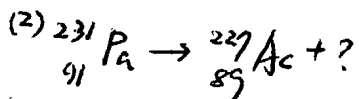
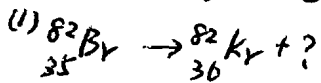
- The rate equation for decomposition of  $N_2O_5$  is  $\text{Rate} = k[N_2O_5]$ . The value of  $k$  is  $6.7 \times 10^{-5} s^{-1}$ . Calculate the half-life time of  $N_2O_5$ . 10%
- The activation energy  $E_a$  for a reaction is  $260 kJ/mol$ . At  $800K$ , the rate constant  $k = 0.0315 s^{-1}$ . Determine the value  $k$  at  $850K$ . 10%
- A reaction has rate equation,  $\text{Rate} = k[A]^2$ , How will the rate change if the concentration of  $A$  is doubled? If the concentration of  $A$  is halved? 10%
- You dissolve  $15.0g$  of sucrose,  $C_{12}H_{22}O_{11}$ , in a cup of  $225g$  water. What is the freezing point of the solution?  $K_f$  of  $H_2O$  is  $-1.86$ . 10%
- Calculate the osmotic pressure of a  $0.0120M$  solution of  $NaCl$  in water at  $0^\circ C$ . Assume the van't Hoff  $i$  factor is  $1.94$  for this solution. 10%
- You burn  $0.1523g$  of an unknown compound  $C_xH_yO_z$  and isolate  $0.3718g$  of  $CO_2$  and  $0.1522g$  of  $H_2O$ . What's the empirical formula of the compound? If molecular weight is  $72.17/mol$ , what's the molecular formula?  $C=12.0, O=16.0, H=1.0$  10%
- Data for reaction  $CO(g) + NO_2(g) \rightarrow CO_2(g) + NO(g)$  are given in the table below. 10%

Experiment	$[CO]$ in $M$	$[NO_2]$ in $M$	rate in $M/h$
1	$5.0 \times 10^{-4}$	$0.36 \times 10^{-4}$	$3.4 \times 10^{-8}$
2	$5.0 \times 10^{-4}$	$0.18 \times 10^{-4}$	$1.7 \times 10^{-8}$
3	$1.0 \times 10^{-3}$	$0.36 \times 10^{-4}$	$6.8 \times 10^{-8}$

What is the rate constant for the reaction?

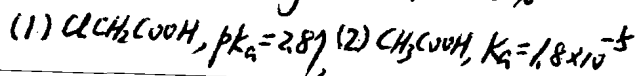
B. Questions : 30%

1. Complete the following equations. 5%

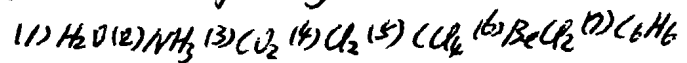


2. Indicate two types of catalysis. 5%

3. Which is the stronger acid? 5%

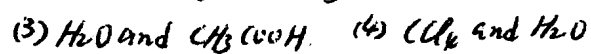
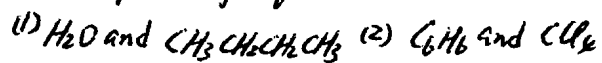


4. Consider the following molecules : 5%



Which compounds are not polar?

5. Which pairs of liquids will be miscible? 5%



b. Define acid and base according to Arrhenius and Brønsted-Lowry theory. 5%