CHEMISTRY

BOOKS - NTA MOCK TESTS

CHEMICAL KINETICS TEST -1

Multiple Choice Questions

1. For a hypothetical reaction $A \rightarrow B$ then activation energy for forward and backward reactions are 19 kJ/mol and 9 kJ /mol respectively. The heat of reaction is

A. $9kJmol^{-1}$

B. $19kJmol^{-1}$

C. $+10kJmol^{-1}$

D. $28kJmol^{-1}$

Answer: C

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2. The rate law for reaction between the substances A and B is given by Rate $= k[A]^n[B]^m$ On doubling the concentration of A and having the

concentration of B, the ratio of the new rate of the earlier rate of reaction will be

A. $m + n$

B. $n - m$

C. $2^{(n-m)}$

D. 2^{m+n}

Answer: C

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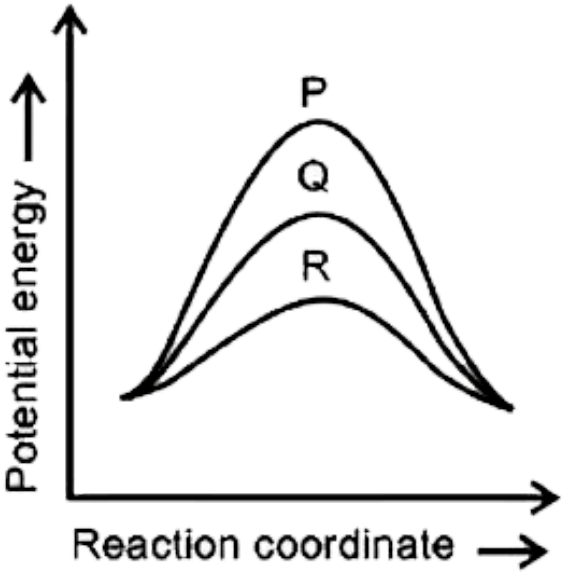
3. If a homogeneous catalytic reaction can take place through three alternative paths as depicated below, the catalytic efficiency of P , Q, R representing the relative case would be,



A. $P > Q > R$

B. $Q > P > R$

C. $P > R > Q$

D. $R > Q > P$

Answer: D

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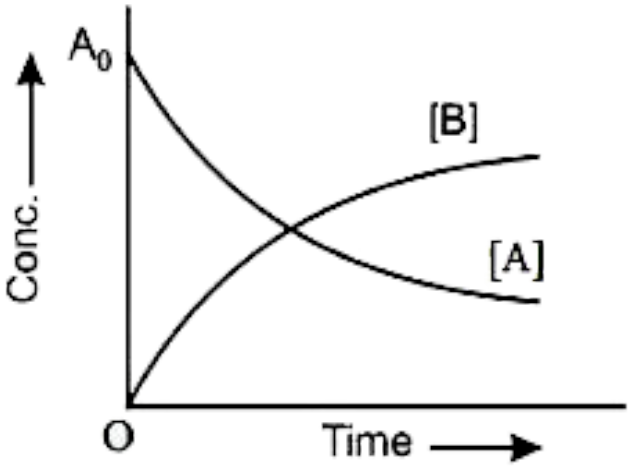
4. At the point of intersection of the two curves shown, calculate the concentration of B in the first

order reaction $A \rightarrow nB$.



A. $\frac{nA_0}{2}$

B. $\frac{A_0}{n-1}$

C. $\frac{nA_0}{n+1}$

D. $\left(\frac{n-1}{n=1}\right)A_0$

Answer: C

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5. Benzene diazonium chlride in aqueous solution decomposes as :

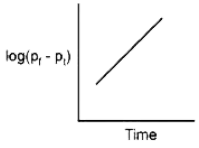
$$C_6H_5 - N = N^+Cl^-_{(aq)} + H_2O_{(aq)}$$

$$\rightarrow C_6H_5OH_{(aq)} + N_{2(g)} + HCl_{(aq)}$$

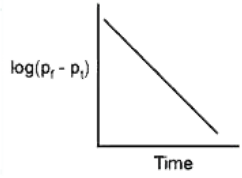
The reaction follows first order kinetics. If p is the pressure of N_2 at constant volume and temperture corresponding to time t and pf that after completion of the reaction , then which of the following graphs conforms to the kinetics of the reaction ?

A.

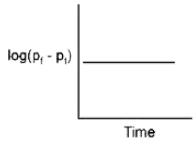
B.



C.



D.



Answer: C

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6. For the reaction mechanism of the reaction.

$2NO(g) + 2H_2(g) \rightarrow N_2(g) + 2H_2O(g).$

Step l	$2NO$	$\overset{k_1}{\Longleftrightarrow}$	$N_2O_2:$	$K_{eq}(\text{fast})$
Step ll	$N_2O_2 + H_2$	$\overset{k_2}{\longrightarrow}$	$N_2O + H_2O$	(slow)
Step lll	$N_2O + H_2$	$\overset{K_3}{\longrightarrow}$	$N_2 + H_2O$	(fast)

Expresson of rate of reaction is

(Take $k_{eq} \times k_2 = k$)

A. $k'N_2O_2[H_2]$

B. $k'N_2O[H_2]$

C. $k'N_2O[H_2]$

D. $k'N_2O_2$

Answer: A

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7. The half-life of two samples of same compound is 0.1 s and 0.4 s. Their initial concentration is 200 M and 50 M respectively. What is the order of reaction ?

A. 0

B. 2

C. 1

D. 4

Answer: B

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8. $2N_2O_5 \Leftrightarrow 4NO_2 + O_2$

For the reaction above, which of the following is not the correct rate of reaction ?

A. $\frac{-d[N_2O_5]}{dt} = 2\frac{d[O_2]}{dt}$

B. $\frac{-2d[N_2O_5]}{dt} = \frac{d[NO_2]}{dt}$

C. $\frac{d[NO_2]}{dt} = 4\frac{d[O_2]}{dt}$

D. $\frac{-d[N_2O_5]}{dt} = \frac{d[NO_2]}{dt} = 4\frac{d[O_2]}{dt}$

Answer: D

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9. Rate of reacton depens upon

A. temperature

B. catalyst

C. concentration

D. All of these

Answer: D

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10. For the two gaseous reactions following data is given,

$A \rightarrow B, k_1 = 10^{10} e^{-20,000/T}$

$C \rightarrow D, k_2 = 10^{12} e^{-24,606/T}$

The temperature at which k_1 becomes equal to k_2 is ,

A. 400 K

B. 1000 K

C. 800 K

D. 1500 K

Answer: B

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11. The rate law for the chemical reaction

$2NO_2Cl \rightarrow 2NO_2 + Cl_2$

Rate $= k[NO_2Cl]$ is The rate determining step is

A. $2NO_2Cl \rightarrow 2NO_2 + 2Cl$

B. $NO_2 + Cl_2 \rightarrow NO_2Cl + Cl$

C. $NO_2Cl + Cl \rightarrow NO_2 + Cl_2$

D. $NO_2Cl \rightarrow NO_2 + Cl$

Answer: D

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12. Observe the following reaction,

$2A + B \rightarrow C$

The rate of formation of C is $2.2 \times 10^{-3} molL^{-1}\mathrm{mtextn}^{-1}$, then rate of disappearance of A is

A. $2.2 \times 10^{-3}\mathrm{mol\ L}^{-1}\mathrm{min}^{-1}$

B. $1.1 \times 10^{-3}\mathrm{mol\ L}^{-1}\mathrm{min}^{-1}$

C. $4.4 \times 10^{-3}\mathrm{mol\ L}^{-1}\mathrm{min}^{-1}$

D. $5.5 \times 10^{-3} \mathrm{mol\ L^{-1} min^{-1}}$

Answer: C

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13. For a reaction $\frac{1}{2}A \rightarrow 2B$, the rate of disappearance of 'A' is related to the rate of appearance of 'B' by the expression-

A. $-\frac{d[A]}{dt} = \frac{1}{2}\frac{d[B]}{dt}$

B. $-\frac{d[A]}{dt} = \frac{1}{4}\frac{d[B]}{dt}$

C. $-\frac{d[A]}{dt} = \frac{d[B]}{dt}$

D. $-\frac{d[A]}{dt} = 4\frac{d[B]}{dt}$

Answer: B

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14. 1 g of $_{79}Au^{198}\left(t_{1/2} = 65h\right)$ give stable marcury by $\beta -$ emission. What amount of mercury will left after 260 h ?

A. $0.9375g$

B. $0.3758g$

C. $0.7586g$

D. $0.9000g$

Answer: A

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15. If the instantaneous rate of appearance of $NO_2(g)$ is $0.0400M/s$ at same moment of time, what is the reate of disappearence of $N_2O_5(g)$ in M/s?

$$\left[N_2O_5(g) \rightarrow 2NO_2(g) + \frac{1}{2}O_2(g)\right].$$

A. 0.02

B. 0.01

C. 0.04

D. 0.08

Answer: A

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16. For the reaction ,

$2NO(g) + 2H_2(g) \rightarrow N_2(g)$

$+2H_2O(g)$

The rate expression can be written in the following ways,

$\frac{d[N_2]}{dt} = k_1[NO][H_2], \frac{d[H_2O]}{dt} = k_2[NO][H_2]$

The relationship between k_1, k_2, k_3, k_4 is ,

A. $k_2 = k_1 = k_3 = k_4$

B. $k_2 = 2k_1 = k_3 = k_4$

C. $k_2 = 2k_3 = k_1 = k_4$

D. $k_2 = k_1 = k_3 = 2k_4$

Answer: B

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17. The reaction

$2NO_2 + F_2 \rightarrow 2N_2F,$ occurs in the following steps given below,

$NO_2 + F_2 \xrightarrow{\text{slow}} NO_2F + F$

$NO_2 + F \xrightarrow{\text{fast}} NO_2F$

Thus rate expression of the above reaction can be written as,

A. $r = K[NO_2]^2[F_2]$

B. $r = K[NO_2]$

C. $r = K[NO_2][F_2]$

D. $r = K[F_2]$

Answer: C

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18. By what factor does the rate of reaction increases when the temperature is increased from $30^\circ C$ to $60^\circ C$?

A. 16

B. 8

C. 32

D. 64

Answer: B

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19. For reaction $A + 2B \rightarrow C + D$ rate law $R = k[A]^1[B]^2$. By what factor would the rate change if concentration of A is doubled & that of B is halved ?

A. 2

B. 4

C. 5

D. $1/2$

Answer: D

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20. For a gaseous reaction , following data is given:

$A \rightarrow B, k_1 = 10^{15} e^{-200/T}$

$C \rightarrow D, k_2 = 10^{14} e^{-100/T}$

The temperatuer at which $k_1 = k_2$ is :

A. 1000 K

B. 2000 K

C. $868.82K$

D. $434.2K$

Answer: D

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21. At 500 K, the half life period of a gaseous reactio at an initia pressrue of 80 kPa is 350 s. When the pressure is 40 kPa, the half life period id 175 s, the order of the reaction is :

A. zero

B. one

C. two

D. three

Answer: A

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22. For the zero order reaction, $A \rightarrow B + C$, initial concentration of A is 0.1 M If [A] = 0.08 M after 10 minutes, then it's half life and completion time are respectively

A. 10 min, 20 min

B. 25 min, 50 min

C. 2×10^{-3} min , 4×10^{-3} min

D. 250 min, 500 min

Answer: B

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23. A catalyst is a substance which

A. increases the equilibrium concentration of the product.

B. changes the equilibrium constant of the reaction.

C. shortens the time to reach equilibrium.

D. supplies energy to the reaction.

Answer: C

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24. The half-life period for catalytic decomposition of AB_3 at 50 mm of Hg is found to be 4 hrs and at 100 mm of Hg it is 2 hrs. The order of the reaction is :

A. 3

B. 1

C. 2

D. 0

Answer: C

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25. $99\ \%$ of a first order reaction was completed in 32 min. When will $99.9\ \%$ of the reaction complete ?

A. 24 min

B. 8 min

C. 4 min

D. 48 min

Answer: D

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26. The rate constant (K') of one reaction is double the rate constant (K'') of another reaction. Then the relationship between the corresponding activation energies of the two reactions $(E_a{}'$ and $E_a{}'')$ will be -

(Assume the pre-exponential factor & temperature to be same)

A. $E_a{}' > E_a{}''$

B. $E_a' = E_a''$

C. $E_a' < E_a''$

D. $E_a' < 4E_a''$

Answer: C

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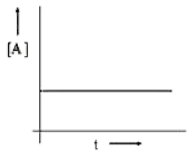
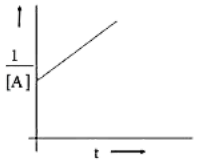
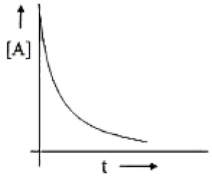
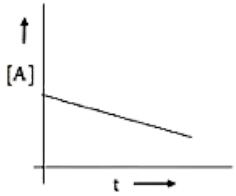
27. Which of the following curve represent zero order reaction of $A \rightarrow$ products ?

A. 

B. 

C. 

D. 

Answer: D

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28. When $\log_e$ k is plotted against $\frac{1}{T}$ using the Arrhenius equation a straight line is expected with

a slope equal to ,

A. $\frac{E_a}{R}$

B. $\frac{-E_a}{R}$

C. $-\frac{E_a}{2.303R}$

D. $-\frac{R}{E_a}$

Answer: B

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29. By 10 K increase in temperature, the rate of reaction becomes double. How many times the rate

of reaction will be if the temperature is increased from 303 K to 353 K ?

A. 32

B. 6

C. 8

D. 4

Answer: A

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30. Consider the following reaction in aquous solution.

$5Br^-(aq) + BrO_3^-(aq) + 6H^+(aq)$

$\rightarrow 3Br_1(aq) + 3H_2O(l)$

If the rate of appearance of Br_2 at a particular time during the reaction is 0.025M sec^{-1}, what is the rate of disppearance (in Msec^{-1}) of Br^- at that time ?

A. $0. - 25\text{M sec}^{-1}$

B. 0.042M sec^{-1}

C. 0.075M sec^{-1}

D. 0.125M sec^{-1}

Answer: B

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