Exam

Name________________________________

1) Nitrogen dioxide decomposes to nitric oxide and oxygen via the reaction: 1) _______

$$2NO_2 \rightarrow 2NO + O_2$$

In a particular experiment at 300°C, $[NO_2]$ drops from 0.0100 to 0.00650 M in 100 s. The rate of appearance of O_2 for this period is _________ M/s.

A) 3.5×10^{-5} B) 3.5×10^{-3} C) 1.8×10^{-5} D) 7.0×10^{-3} E) 7.0×10^{-5}

2) The instantaneous rate of a reaction can be determined from the graph of molarity versus time at any point on the graph. 2) _______

3) The overall reaction order is the sum of the orders of each reactant in the rate law. 3) _______

4) Units of the rate constant of a reaction are independent of the overall reaction order. 4) _______

5) The concentration of reactants or products at any time during the reaction can be calculated from the integrated rate law. 5) _______

6) The rate of a second order reaction can depend on the concentrations of more than one reactant . 6) _______

7) The half life for a first order rate law depends on the starting concentration. 7) _______

8) The rate limiting step in a reaction is the slowest step in the reaction sequence. 8) _______

9) Heterogeneous catalysts have different phases from reactants. 9) _______

10) Rates of reaction can be positive or negative. 10) _______

11) Which substance in the reaction below either appears or disappears the fastest? 11) _______

$$4NH_3 + 7O_2 \rightarrow 4NO_2 + 6H_2O$$

A) NH_3
B) NO_2
C) H_2O
D) O_2
E) The rates of appearance/disappearance are the same for all of these.

A flask is charged with 0.124 mol of A *and allowed to react to form* B *according to the reaction* A(g) → B(g). *The following data are obtained for* [A] *as the reaction proceeds:*

Time (s)	1	10	20	30	40
Moles of A	0.124	0.110	0.088	0.073	0.054

12) How many moles of B are present at 30 s? 12) ______

A) 0.15 B) 0.073 C) 1.7×10^{-3} D) 2.4×10^{-3} E) 0.051

13) A reaction was found to be second order in carbon monoxide concentration. The rate of the reaction _________ if the [CO] is doubled, with everything else kept the same. 13) ______

A) is reduced by a factor of 2.
B) triples
C) remains unchanged
D) increases by a factor of 4
E) doubles

14) If the rate law for the reaction 14) ______

$$2A + 3B \rightarrow \text{products}$$

is first order in A and second order in B, then the rate law is rate = ___________.

A) $k[A]^2[B]^3$ B) $k[A][B]$ C) $k[A][B]^2$ D) $k[A]^2[B]^2$ E) $k[A]^2[B]$

15) A reaction was found to be third order in A. Increasing the concentration of A by a factor of 3 will cause the reaction rate to _________. 15) ______

A) increase by a factor of 9
B) decrease by a factor of the cube root of 3
C) increase by a factor of 27
D) remain constant
E) triple

16) A reaction was found to be zero order in A. Increasing the concentration of A by a factor of 3 will cause the reaction rate to _________. 16) ______

A) triple
B) decrease by a factor of the cube root of 3
C) remain constant
D) increase by a factor of 9
E) increase by a factor of 27

17) The following reaction occurs in aqueous solution: 17) ______

$NH_4^+ (aq) + NO_2^- \rightarrow N_2 (g) + 2H_2O (l)$

The data below is obtained at 25°C.

$[NH_4^+]$ (M)	$[NO_2^-]$ (M)	Initial rate (M/s)
0.0100	0.200	3.2×10^{-3}
0.0200	0.200	6.4×10^{-3}

The order of the reaction in NH_4^+ is __________.

A) +2 B) +1 C) 0 D) -1 E) -2

18) The reaction below is first order in $[H_2O_2]$: 18) ______

$2H_2O_2 (l) \rightarrow 2H_2O (l) + O_2 (g)$

A solution originally at 0.600 M H_2O_2 is found to be 0.075 M after 54 min. The half-life for this reaction is __________ min.

A) 6.8 B) 54 C) 28 D) 18 E) 14

The data in the table below were obtained for the reaction:

A + B → P

Experiment Number	[A] (M)	[B] (M)	Initial Rate (M/s)
1	0.273	0.763	2.83
2	0.273	1.526	2.83
3	0.819	0.763	25.47

19) The magnitude of the rate constant is __________. 19) ______

A) 38.0 B) 0.278 C) 42.0 D) 2.21 E) 13.2

20) The half-life of a first-order reaction __________. 20) ______

A) is constant
B) can be calculated from the reaction rate constant
C) does not depend on the initial reactant concentration
D) is the time necessary for the reactant concentration to drop to half its original value
E) All of the above are correct.