Reaction Order and Rate Law Expression Worksheet

Given the following equations and experimental data, write the correct

a. Rate Law Expression
b. Reaction Order
c. Determine k, the Specific Rate Constant (including units)

1. $A_2 + B_2 \rightarrow 2\ AB$

Exp #	$[A_2]$	$[B_2]$	Rate (mole dm^{-3} s^{-1})
1	0.001	0.001	0.01
2	0.001	0.002	0.02
3	0.001	0.003	0.03
4	0.001	0.004	0.04
5	0.002	0.004	0.16
6	0.003	0.004	0.36

a. Rate = $k[A]^2[B]$

b. Third order

c. $k = 1.0 \times 10^7\ dm^6\ mol^{-2}\ s^{-1}$

2. $C + D \rightarrow E$

Exp #	[C]	[D]	Rate (mole dm^{-3} s^{-1})
1	0.1	0.01	0.02
2	0.1	0.02	0.04
3	0.1	0.03	0.06
4	0.1	0.04	0.08
5	0.2	0.04	0.08
6	0.3	0.04	0.08

a. Rate = $k[D]$

b. First order

c. $k = 2\ s^{-1}$

3. $F + G \rightarrow H$

Exp #	[F]	[G]	Rate (mole dm^{-3} s^{-1})
1	0.01	0.4	0.02
2	0.02	0.4	0.04
3	0.03	0.4	0.06
4	0.1	0.2	5
5	0.1	0.4	10
6	0.1	0.6	15

a. Rate = k[F][G]

b. Second Order

c. $k = 5\ dm^3\ mol^{-1}\ s^{-1}$

4. $C + D \rightarrow E$

Exp #	[C]	[D]	Rate (mole dm^{-3} s^{-1})
1	0.1	0.01	0.02
2	0.1	0.02	0.08
3	0.1	0.03	0.18
4	0.1	0.04	0.32
5	0.2	0.04	1.28
6	0.3	0.04	2.88

a. $Rate = k[C]^2[D]^2$

b. Fourth order

c. $k = 2 \times 10^4\ dm^9\ mol^{-3}\ s^{-1}$

5. $F + G \rightarrow H$

Exp #	[F]	[G]	Rate (mole dm^{-3} s^{-1})
1	0.01	0.4	0.02
2	0.02	0.4	0.16
3	0.03	0.4	0.54
4	0.1	0.2	5
5	0.1	0.4	20
6	0.1	0.6	45

a. $Rate = k[F]^3[G]^2$

b. Fifth order

c. $k = 1.25 \times 10^5\ dm^{12}\ mol^{-4}\ s^{-1}$