Counting energy dispersal

General Chemistry, CH102 Spring 2011

1. Here is a representation of 4 quanta of energy, q, distributed among 3 molecules: **q|q|qq**. How many ways (**different or not**) can the **4 units** of energy end up with 1 in the first molecule, 1 in the second molecule, and 2 in the third molecule?

0% 1. 1
0% 2. 4
0% 3. q! = 4! = 4·3·2·1 = 24

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2. Here is a representation of 4 quanta of energy, q, distributed among 3 molecules: **q|q|qq**. Let d = 2 be the number of “dividers” separating the molecules m = 3 molecules . How many ways (**different or not**) can the **two dividers**, |, be assigned to achieve the arrangement **q|q|qq**?

0% 1. 1
0% 2. d! = 2! = 2·1 = 2
0% 3. m! = 3! = 3·2·1 = 6

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3. One possible representation of 4 units of energy, q, distributed among m = 3 molecules is **q|q|qq**. Let d = m – 1 = 2 be the number of “dividers” separating the m = 3 molecules . How many **total** arrangements of the q + d = 6 objects are possible, ignoring that q and | are different?

0% 1. q + m= 7
0% 2. q·d = 4·2 = 8
0% 3. (q + d)! = 6! = 6·5·4·3·2·1 = 720
0% 4. (q + m)! = 7! = 7·6·5·4·3·2·1 = 5040

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4. How many ways (**different or not**) can the particular arrangement **q|q|qq** of four quanta among three molecules be made?

0% 1. q!·m! = 4!·3! = 144
0% 2. q!·d! = 4!·2! = 48
0% 3. (q + d)! = 6! = 6·5·4·3·2·1 = 720
0% 4. (q + m)! = 7! = 7·6·5·4·3·2·1 = 5040

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5. Two **different** arrangements of q = 4 quanta among m = 3 molecules are **q|q|qq** and **qqq||q**. Which relation is true about the number of **total** number of **different** ways, W_e(q, m), that q quanta can be distributed among m molecules?

0% 1. W_e(q, m) = q!·m!
0% 2. W_e(q, m) = q!·d! = q!·(m – 1)!
0% 3. W_e(q, m)·q!·d! = (q + d)!
0% 4. W_e(q, m)·q!·m! = (q + m)!

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6. $W_e(q, m) = (q + d)!/(q!\cdot d!) = (q + m - 1)!/(q!\cdot(m - 1)!)$ is the number of **different** ways that q quanta can be distributed among m molecules. How many **different** ways can **2 quanta** be distributed among **3 molecules**?

0% 1. 3
0% 2. 6
0% 3. 10
0% 4. 20

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7. $W_e(q, m) = (q + d)!/(q!\cdot d!) = (q + m - 1)!/(q!\cdot(m - 1)!)$ is the number of **different** ways that q quanta can be distributed among m molecules. How many **different** ways can **3 quanta** be distributed among **3 molecules**?

0% 1. 3
0% 2. 6
0% 3. 10
0% 4. 20

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