

Combined Science Equations to know Combined Science Equations to know

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| Biology Paper 1  𝑠𝑖𝑧𝑒 𝑜𝑓 𝑖𝑚𝑎𝑔𝑒  𝑚𝑎𝑔𝑛𝑖𝑓𝑖𝑐𝑎𝑡𝑖𝑜𝑛 =  𝑠𝑖𝑧𝑒 𝑜𝑓 𝑟𝑒𝑎𝑙 𝑜𝑏𝑗𝑒𝑐𝑡  𝑐ℎ𝑎𝑛𝑔𝑒  𝑝𝑒𝑟𝑐𝑒𝑛𝑡𝑎𝑔𝑒 𝑐ℎ𝑎𝑛𝑔𝑒 = 𝑥 100  𝑖𝑛𝑖𝑡𝑖𝑎𝑙  𝑐ℎ𝑎𝑛𝑔𝑒  𝑟𝑎𝑡𝑒 =  𝑡𝑖𝑚𝑒 |
| Chemistry Paper 1  𝑀𝑎𝑠𝑠 = 𝐹𝑜𝑟𝑚𝑢𝑙𝑎 𝑚𝑎𝑠𝑠 𝑥 𝑁𝑢𝑚𝑏𝑒𝑟 𝑜𝑓 𝑚𝑜𝑙𝑒𝑠  𝑚𝑜𝑙𝑒𝑠  𝐶𝑜𝑛𝑐𝑒𝑛𝑡𝑟𝑎𝑡𝑖𝑜𝑛 =  𝑣𝑜𝑙𝑢𝑚𝑒 (𝑑𝑚3)  𝑒𝑛𝑒𝑟𝑔𝑦 𝑡𝑟𝑎𝑛𝑠𝑓𝑒𝑟𝑟𝑒𝑑 (∆𝐻)  = 𝑆𝑢𝑚 𝑜𝑓 𝑟𝑒𝑎𝑐𝑡𝑎𝑛𝑡𝑠 𝑏𝑜𝑛𝑑 𝑒𝑛𝑒𝑟𝑔𝑖𝑒𝑠  − 𝑠𝑢𝑚 𝑜𝑓 𝑝𝑟𝑜𝑑𝑢𝑐𝑡𝑠 𝑏𝑜𝑛𝑑 𝑒𝑛𝑒𝑟𝑔𝑖𝑒𝑠 |
| *Physics Paper 1*  𝑘𝑖𝑛𝑒𝑡𝑖𝑐 𝑒𝑛𝑒𝑟𝑔𝑦 = 0.5 × 𝑚𝑎𝑠𝑠 × (𝑠𝑝𝑒𝑒𝑑)2  𝑔𝑟𝑎𝑣𝑖𝑡𝑎𝑡𝑖𝑜𝑛𝑎𝑙 𝑝𝑜𝑡𝑒𝑛𝑡𝑖𝑎𝑙 𝑒𝑛𝑒𝑟𝑔𝑦  = 𝑚𝑎𝑠𝑠 × 𝑔𝑟𝑎𝑣𝑖𝑡𝑎𝑡𝑖𝑜𝑛𝑎𝑙 𝑓𝑖𝑒𝑙𝑑 𝑠𝑡𝑟𝑒𝑛𝑔𝑡ℎ × ℎ𝑒𝑖𝑔ℎ𝑡  𝑒𝑛𝑒𝑟𝑔𝑦 𝑡𝑟𝑎𝑛𝑠𝑓𝑒𝑟𝑟𝑒𝑑  𝑝𝑜𝑤𝑒𝑟 =  𝑡𝑖𝑚𝑒  𝑤𝑜𝑟𝑘 𝑑𝑜𝑛𝑒  𝑝𝑜𝑤𝑒𝑟 =  𝑡𝑖𝑚𝑒  𝑢𝑠𝑒𝑓𝑢𝑙 𝑜𝑢𝑡𝑝𝑢𝑡 𝑒𝑛𝑒𝑟𝑔𝑦 𝑡𝑟𝑎𝑛𝑠𝑓𝑒𝑟  𝑒𝑓𝑓𝑖𝑐𝑖𝑒𝑛𝑐𝑦 =  𝑡𝑜𝑡𝑎𝑙 𝑖𝑛𝑝𝑢𝑡 𝑒𝑛𝑒𝑟𝑔𝑦 𝑡𝑟𝑎𝑛𝑠𝑓𝑒𝑟  𝑢𝑠𝑒𝑓𝑢𝑙 𝑝𝑜𝑤𝑒𝑟 𝑜𝑢𝑡𝑝𝑢𝑡  𝑒𝑓𝑓𝑖𝑐𝑖𝑒𝑛𝑐𝑦 =  𝑡𝑜𝑡𝑎𝑙 𝑝𝑜𝑤𝑒𝑟 𝑖𝑛𝑝𝑢𝑡  𝑐ℎ𝑎𝑟𝑔𝑒 𝑓𝑙𝑜𝑤 = 𝑐𝑢𝑟𝑟𝑒𝑛𝑡 × 𝑡𝑖𝑚𝑒  𝑝𝑜𝑡𝑒𝑛𝑡𝑖𝑎𝑙 𝑑𝑖𝑓𝑓𝑒𝑟𝑒𝑛𝑐𝑒 = 𝑐𝑢𝑟𝑟𝑒𝑛𝑡 × 𝑟𝑒𝑠𝑖𝑠𝑡𝑎𝑛𝑐𝑒  𝑝𝑜𝑤𝑒𝑟 = 𝑝𝑜𝑡𝑒𝑛𝑡𝑖𝑎𝑙 𝑑𝑖𝑓𝑓𝑒𝑟𝑒𝑛𝑐𝑒 × 𝑐𝑢𝑟𝑟𝑒𝑛𝑡  𝑝𝑜𝑤𝑒𝑟 = (𝑐𝑢𝑟𝑟𝑒𝑛𝑡)2 × 𝑟𝑒𝑠𝑖𝑠𝑡𝑎𝑛𝑐𝑒  𝑒𝑛𝑒𝑟𝑔𝑦 𝑡𝑟𝑎𝑛𝑠𝑓𝑒𝑟𝑟𝑒𝑑 = 𝑝𝑜𝑤𝑒𝑟 × 𝑡𝑖𝑚𝑒  𝑒𝑛𝑒𝑟𝑔𝑦 𝑡𝑟𝑎𝑛𝑠𝑓𝑒𝑟𝑟𝑒𝑑  = 𝑐ℎ𝑎𝑟𝑔𝑒 𝑓𝑙𝑜𝑤 × 𝑝𝑜𝑡𝑒𝑛𝑡𝑖𝑎𝑙 𝑑𝑖𝑓𝑓𝑒𝑟𝑒𝑛𝑐𝑒  𝑚𝑎𝑠𝑠  𝑑𝑒𝑛𝑠𝑖𝑡𝑦 =  𝑣𝑜𝑙𝑢𝑚𝑒 |

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| Chemistry Paper 1  𝑀𝑎𝑠𝑠 = 𝐹𝑜𝑟𝑚𝑢𝑙𝑎 𝑚𝑎𝑠𝑠 𝑥 𝑁𝑢𝑚𝑏𝑒𝑟 𝑜𝑓 𝑚𝑜𝑙𝑒𝑠  𝑚𝑜𝑙𝑒𝑠  𝐶𝑜𝑛𝑐𝑒𝑛𝑡𝑟𝑎𝑡𝑖𝑜𝑛 =  𝑣𝑜𝑙𝑢𝑚𝑒 (𝑑𝑚3)  𝑒𝑛𝑒𝑟𝑔𝑦 𝑡𝑟𝑎𝑛𝑠𝑓𝑒𝑟𝑟𝑒𝑑 (∆𝐻)  = 𝑆𝑢𝑚 𝑜𝑓 𝑟𝑒𝑎𝑐𝑡𝑎𝑛𝑡𝑠 𝑏𝑜𝑛𝑑 𝑒𝑛𝑒𝑟𝑔𝑖𝑒𝑠  − 𝑠𝑢𝑚 𝑜𝑓 𝑝𝑟𝑜𝑑𝑢𝑐𝑡𝑠 𝑏𝑜𝑛𝑑 𝑒𝑛𝑒𝑟𝑔𝑖𝑒𝑠 |
| *Physics Paper 1*  𝑘𝑖𝑛𝑒𝑡𝑖𝑐 𝑒𝑛𝑒𝑟𝑔𝑦 = 0.5 × 𝑚𝑎𝑠𝑠 × (𝑠𝑝𝑒𝑒𝑑)2  𝑔𝑟𝑎𝑣𝑖𝑡𝑎𝑡𝑖𝑜𝑛𝑎𝑙 𝑝𝑜𝑡𝑒𝑛𝑡𝑖𝑎𝑙 𝑒𝑛𝑒𝑟𝑔𝑦  = 𝑚𝑎𝑠𝑠 × 𝑔𝑟𝑎𝑣𝑖𝑡𝑎𝑡𝑖𝑜𝑛𝑎𝑙 𝑓𝑖𝑒𝑙𝑑 𝑠𝑡𝑟𝑒𝑛𝑔𝑡ℎ × ℎ𝑒𝑖𝑔ℎ𝑡  𝑒𝑛𝑒𝑟𝑔𝑦 𝑡𝑟𝑎𝑛𝑠𝑓𝑒𝑟𝑟𝑒𝑑  𝑝𝑜𝑤𝑒𝑟 =  𝑡𝑖𝑚𝑒  𝑤𝑜𝑟𝑘 𝑑𝑜𝑛𝑒  𝑝𝑜𝑤𝑒𝑟 =  𝑡𝑖𝑚𝑒  𝑢𝑠𝑒𝑓𝑢𝑙 𝑜𝑢𝑡𝑝𝑢𝑡 𝑒𝑛𝑒𝑟𝑔𝑦 𝑡𝑟𝑎𝑛𝑠𝑓𝑒𝑟  𝑒𝑓𝑓𝑖𝑐𝑖𝑒𝑛𝑐𝑦 =  𝑡𝑜𝑡𝑎𝑙 𝑖𝑛𝑝𝑢𝑡 𝑒𝑛𝑒𝑟𝑔𝑦 𝑡𝑟𝑎𝑛𝑠𝑓𝑒𝑟  𝑢𝑠𝑒𝑓𝑢𝑙 𝑝𝑜𝑤𝑒𝑟 𝑜𝑢𝑡𝑝𝑢𝑡  𝑒𝑓𝑓𝑖𝑐𝑖𝑒𝑛𝑐𝑦 =  𝑡𝑜𝑡𝑎𝑙 𝑝𝑜𝑤𝑒𝑟 𝑖𝑛𝑝𝑢𝑡  𝑐ℎ𝑎𝑟𝑔𝑒 𝑓𝑙𝑜𝑤 = 𝑐𝑢𝑟𝑟𝑒𝑛𝑡 × 𝑡𝑖𝑚𝑒  𝑝𝑜𝑡𝑒𝑛𝑡𝑖𝑎𝑙 𝑑𝑖𝑓𝑓𝑒𝑟𝑒𝑛𝑐𝑒 = 𝑐𝑢𝑟𝑟𝑒𝑛𝑡 × 𝑟𝑒𝑠𝑖𝑠𝑡𝑎𝑛𝑐𝑒  𝑝𝑜𝑤𝑒𝑟 = 𝑝𝑜𝑡𝑒𝑛𝑡𝑖𝑎𝑙 𝑑𝑖𝑓𝑓𝑒𝑟𝑒𝑛𝑐𝑒 × 𝑐𝑢𝑟𝑟𝑒𝑛𝑡  𝑝𝑜𝑤𝑒𝑟 = (𝑐𝑢𝑟𝑟𝑒𝑛𝑡)2 × 𝑟𝑒𝑠𝑖𝑠𝑡𝑎𝑛𝑐𝑒  𝑒𝑛𝑒𝑟𝑔𝑦 𝑡𝑟𝑎𝑛𝑠𝑓𝑒𝑟𝑟𝑒𝑑 = 𝑝𝑜𝑤𝑒𝑟 × 𝑡𝑖𝑚𝑒  𝑒𝑛𝑒𝑟𝑔𝑦 𝑡𝑟𝑎𝑛𝑠𝑓𝑒𝑟𝑟𝑒𝑑  = 𝑐ℎ𝑎𝑟𝑔𝑒 𝑓𝑙𝑜𝑤 × 𝑝𝑜𝑡𝑒𝑛𝑡𝑖𝑎𝑙 𝑑𝑖𝑓𝑓𝑒𝑟𝑒𝑛𝑐𝑒  𝑚𝑎𝑠𝑠  𝑑𝑒𝑛𝑠𝑖𝑡𝑦 =  𝑣𝑜𝑙𝑢𝑚𝑒 |

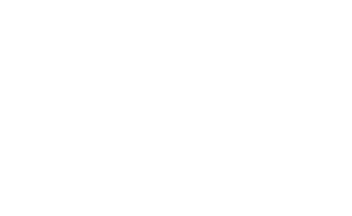
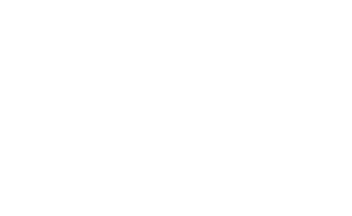


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| Biology Paper 1  𝑠𝑖𝑧𝑒 𝑜𝑓 𝑖𝑚𝑎𝑔𝑒  𝑚𝑎𝑔𝑛𝑖𝑓𝑖𝑐𝑎𝑡𝑖𝑜𝑛 =  𝑠𝑖𝑧𝑒 𝑜𝑓 𝑟𝑒𝑎𝑙 𝑜𝑏𝑗𝑒𝑐𝑡  𝑐ℎ𝑎𝑛𝑔𝑒  𝑝𝑒𝑟𝑐𝑒𝑛𝑡𝑎𝑔𝑒 𝑐ℎ𝑎𝑛𝑔𝑒 = 𝑥 100  𝑖𝑛𝑖𝑡𝑖𝑎𝑙  𝑐ℎ𝑎𝑛𝑔𝑒  𝑟𝑎𝑡𝑒 =  𝑡𝑖𝑚𝑒 |
| Chemistry Paper 1  𝑀𝑎𝑠𝑠 = 𝐹𝑜𝑟𝑚𝑢𝑙𝑎 𝑚𝑎𝑠𝑠 𝑥 𝑁𝑢𝑚𝑏𝑒𝑟 𝑜𝑓 𝑚𝑜𝑙𝑒𝑠  𝑚𝑜𝑙𝑒𝑠  𝐶𝑜𝑛𝑐𝑒𝑛𝑡𝑟𝑎𝑡𝑖𝑜𝑛 =  𝑣𝑜𝑙𝑢𝑚𝑒 (𝑑𝑚3)  𝑒𝑛𝑒𝑟𝑔𝑦 𝑡𝑟𝑎𝑛𝑠𝑓𝑒𝑟𝑟𝑒𝑑 (∆𝐻)  = 𝑆𝑢𝑚 𝑜𝑓 𝑟𝑒𝑎𝑐𝑡𝑎𝑛𝑡𝑠 𝑏𝑜𝑛𝑑 𝑒𝑛𝑒𝑟𝑔𝑖𝑒𝑠  − 𝑠𝑢𝑚 𝑜𝑓 𝑝𝑟𝑜𝑑𝑢𝑐𝑡𝑠 𝑏𝑜𝑛𝑑 𝑒𝑛𝑒𝑟𝑔𝑖𝑒𝑠 |
| *Physics Paper 1*  𝑘𝑖𝑛𝑒𝑡𝑖𝑐 𝑒𝑛𝑒𝑟𝑔𝑦 = 0.5 × 𝑚𝑎𝑠𝑠 × (𝑠𝑝𝑒𝑒𝑑)2  𝑔𝑟𝑎𝑣𝑖𝑡𝑎𝑡𝑖𝑜𝑛𝑎𝑙 𝑝𝑜𝑡𝑒𝑛𝑡𝑖𝑎𝑙 𝑒𝑛𝑒𝑟𝑔𝑦  = 𝑚𝑎𝑠𝑠 × 𝑔𝑟𝑎𝑣𝑖𝑡𝑎𝑡𝑖𝑜𝑛𝑎𝑙 𝑓𝑖𝑒𝑙𝑑 𝑠𝑡𝑟𝑒𝑛𝑔𝑡ℎ × ℎ𝑒𝑖𝑔ℎ𝑡  𝑒𝑛𝑒𝑟𝑔𝑦 𝑡𝑟𝑎𝑛𝑠𝑓𝑒𝑟𝑟𝑒𝑑  𝑝𝑜𝑤𝑒𝑟 =  𝑡𝑖𝑚𝑒  𝑤𝑜𝑟𝑘 𝑑𝑜𝑛𝑒  𝑝𝑜𝑤𝑒𝑟 =  𝑡𝑖𝑚𝑒  𝑢𝑠𝑒𝑓𝑢𝑙 𝑜𝑢𝑡𝑝𝑢𝑡 𝑒𝑛𝑒𝑟𝑔𝑦 𝑡𝑟𝑎𝑛𝑠𝑓𝑒𝑟  𝑒𝑓𝑓𝑖𝑐𝑖𝑒𝑛𝑐𝑦 =  𝑡𝑜𝑡𝑎𝑙 𝑖𝑛𝑝𝑢𝑡 𝑒𝑛𝑒𝑟𝑔𝑦 𝑡𝑟𝑎𝑛𝑠𝑓𝑒𝑟  𝑢𝑠𝑒𝑓𝑢𝑙 𝑝𝑜𝑤𝑒𝑟 𝑜𝑢𝑡𝑝𝑢𝑡  𝑒𝑓𝑓𝑖𝑐𝑖𝑒𝑛𝑐𝑦 =  𝑡𝑜𝑡𝑎𝑙 𝑝𝑜𝑤𝑒𝑟 𝑖𝑛𝑝𝑢𝑡  𝑐ℎ𝑎𝑟𝑔𝑒 𝑓𝑙𝑜𝑤 = 𝑐𝑢𝑟𝑟𝑒𝑛𝑡 × 𝑡𝑖𝑚𝑒  𝑝𝑜𝑡𝑒𝑛𝑡𝑖𝑎𝑙 𝑑𝑖𝑓𝑓𝑒𝑟𝑒𝑛𝑐𝑒 = 𝑐𝑢𝑟𝑟𝑒𝑛𝑡 × 𝑟𝑒𝑠𝑖𝑠𝑡𝑎𝑛𝑐𝑒  𝑝𝑜𝑤𝑒𝑟 = 𝑝𝑜𝑡𝑒𝑛𝑡𝑖𝑎𝑙 𝑑𝑖𝑓𝑓𝑒𝑟𝑒𝑛𝑐𝑒 × 𝑐𝑢𝑟𝑟𝑒𝑛𝑡  𝑝𝑜𝑤𝑒𝑟 = (𝑐𝑢𝑟𝑟𝑒𝑛𝑡)2 × 𝑟𝑒𝑠𝑖𝑠𝑡𝑎𝑛𝑐𝑒  𝑒𝑛𝑒𝑟𝑔𝑦 𝑡𝑟𝑎𝑛𝑠𝑓𝑒𝑟𝑟𝑒𝑑 = 𝑝𝑜𝑤𝑒𝑟 × 𝑡𝑖𝑚𝑒  𝑒𝑛𝑒𝑟𝑔𝑦 𝑡𝑟𝑎𝑛𝑠𝑓𝑒𝑟𝑟𝑒𝑑  = 𝑐ℎ𝑎𝑟𝑔𝑒 𝑓𝑙𝑜𝑤 × 𝑝𝑜𝑡𝑒𝑛𝑡𝑖𝑎𝑙 𝑑𝑖𝑓𝑓𝑒𝑟𝑒𝑛𝑐𝑒  𝑚𝑎𝑠𝑠  𝑑𝑒𝑛𝑠𝑖𝑡𝑦 =  𝑣𝑜𝑙𝑢𝑚𝑒 |

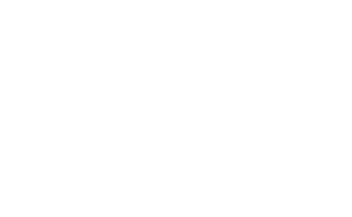
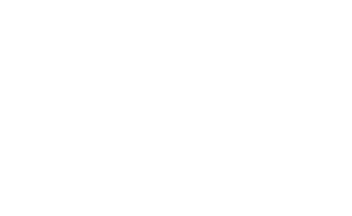
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| Biology Paper 1  𝑠𝑖𝑧𝑒 𝑜𝑓 𝑖𝑚𝑎𝑔𝑒  𝑚𝑎𝑔𝑛𝑖𝑓𝑖𝑐𝑎𝑡𝑖𝑜𝑛 =  𝑠𝑖𝑧𝑒 𝑜𝑓 𝑟𝑒𝑎𝑙 𝑜𝑏𝑗𝑒𝑐𝑡  𝑐ℎ𝑎𝑛𝑔𝑒  𝑝𝑒𝑟𝑐𝑒𝑛𝑡𝑎𝑔𝑒 𝑐ℎ𝑎𝑛𝑔𝑒 = 𝑥 100  𝑖𝑛𝑖𝑡𝑖𝑎𝑙  𝑐ℎ𝑎𝑛𝑔𝑒  𝑟𝑎𝑡𝑒 =  𝑡𝑖𝑚𝑒 |
| Chemistry Paper 1  𝑀𝑎𝑠𝑠 = 𝐹𝑜𝑟𝑚𝑢𝑙𝑎 𝑚𝑎𝑠𝑠 𝑥 𝑁𝑢𝑚𝑏𝑒𝑟 𝑜𝑓 𝑚𝑜𝑙𝑒𝑠  𝑚𝑜𝑙𝑒𝑠  𝐶𝑜𝑛𝑐𝑒𝑛𝑡𝑟𝑎𝑡𝑖𝑜𝑛 =  𝑣𝑜𝑙𝑢𝑚𝑒 (𝑑𝑚3)  𝑒𝑛𝑒𝑟𝑔𝑦 𝑡𝑟𝑎𝑛𝑠𝑓𝑒𝑟𝑟𝑒𝑑 (∆𝐻)  = 𝑆𝑢𝑚 𝑜𝑓 𝑟𝑒𝑎𝑐𝑡𝑎𝑛𝑡𝑠 𝑏𝑜𝑛𝑑 𝑒𝑛𝑒𝑟𝑔𝑖𝑒𝑠  − 𝑠𝑢𝑚 𝑜𝑓 𝑝𝑟𝑜𝑑𝑢𝑐𝑡𝑠 𝑏𝑜𝑛𝑑 𝑒𝑛𝑒𝑟𝑔𝑖𝑒𝑠 |
| *Physics Paper 1*  𝑘𝑖𝑛𝑒𝑡𝑖𝑐 𝑒𝑛𝑒𝑟𝑔𝑦 = 0.5 × 𝑚𝑎𝑠𝑠 × (𝑠𝑝𝑒𝑒𝑑)2  𝑔𝑟𝑎𝑣𝑖𝑡𝑎𝑡𝑖𝑜𝑛𝑎𝑙 𝑝𝑜𝑡𝑒𝑛𝑡𝑖𝑎𝑙 𝑒𝑛𝑒𝑟𝑔𝑦  = 𝑚𝑎𝑠𝑠 × 𝑔𝑟𝑎𝑣𝑖𝑡𝑎𝑡𝑖𝑜𝑛𝑎𝑙 𝑓𝑖𝑒𝑙𝑑 𝑠𝑡𝑟𝑒𝑛𝑔𝑡ℎ × ℎ𝑒𝑖𝑔ℎ𝑡  𝑒𝑛𝑒𝑟𝑔𝑦 𝑡𝑟𝑎𝑛𝑠𝑓𝑒𝑟𝑟𝑒𝑑  𝑝𝑜𝑤𝑒𝑟 =  𝑡𝑖𝑚𝑒  𝑤𝑜𝑟𝑘 𝑑𝑜𝑛𝑒  𝑝𝑜𝑤𝑒𝑟 =  𝑡𝑖𝑚𝑒  𝑢𝑠𝑒𝑓𝑢𝑙 𝑜𝑢𝑡𝑝𝑢𝑡 𝑒𝑛𝑒𝑟𝑔𝑦 𝑡𝑟𝑎𝑛𝑠𝑓𝑒𝑟  𝑒𝑓𝑓𝑖𝑐𝑖𝑒𝑛𝑐𝑦 =  𝑡𝑜𝑡𝑎𝑙 𝑖𝑛𝑝𝑢𝑡 𝑒𝑛𝑒𝑟𝑔𝑦 𝑡𝑟𝑎𝑛𝑠𝑓𝑒𝑟  𝑢𝑠𝑒𝑓𝑢𝑙 𝑝𝑜𝑤𝑒𝑟 𝑜𝑢𝑡𝑝𝑢𝑡  𝑒𝑓𝑓𝑖𝑐𝑖𝑒𝑛𝑐𝑦 =  𝑡𝑜𝑡𝑎𝑙 𝑝𝑜𝑤𝑒𝑟 𝑖𝑛𝑝𝑢𝑡  𝑐ℎ𝑎𝑟𝑔𝑒 𝑓𝑙𝑜𝑤 = 𝑐𝑢𝑟𝑟𝑒𝑛𝑡 × 𝑡𝑖𝑚𝑒  𝑝𝑜𝑡𝑒𝑛𝑡𝑖𝑎𝑙 𝑑𝑖𝑓𝑓𝑒𝑟𝑒𝑛𝑐𝑒 = 𝑐𝑢𝑟𝑟𝑒𝑛𝑡 × 𝑟𝑒𝑠𝑖𝑠𝑡𝑎𝑛𝑐𝑒  𝑝𝑜𝑤𝑒𝑟 = 𝑝𝑜𝑡𝑒𝑛𝑡𝑖𝑎𝑙 𝑑𝑖𝑓𝑓𝑒𝑟𝑒𝑛𝑐𝑒 × 𝑐𝑢𝑟𝑟𝑒𝑛𝑡  𝑝𝑜𝑤𝑒𝑟 = (𝑐𝑢𝑟𝑟𝑒𝑛𝑡)2 × 𝑟𝑒𝑠𝑖𝑠𝑡𝑎𝑛𝑐𝑒  𝑒𝑛𝑒𝑟𝑔𝑦 𝑡𝑟𝑎𝑛𝑠𝑓𝑒𝑟𝑟𝑒𝑑 = 𝑝𝑜𝑤𝑒𝑟 × 𝑡𝑖𝑚𝑒  𝑒𝑛𝑒𝑟𝑔𝑦 𝑡𝑟𝑎𝑛𝑠𝑓𝑒𝑟𝑟𝑒𝑑  = 𝑐ℎ𝑎𝑟𝑔𝑒 𝑓𝑙𝑜𝑤 × 𝑝𝑜𝑡𝑒𝑛𝑡𝑖𝑎𝑙 𝑑𝑖𝑓𝑓𝑒𝑟𝑒𝑛𝑐𝑒  𝑚𝑎𝑠𝑠  𝑑𝑒𝑛𝑠𝑖𝑡𝑦 =  𝑣𝑜𝑙𝑢𝑚𝑒 |



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| Biology Paper 2  𝑐ℎ𝑎𝑛𝑔𝑒  𝑝𝑒𝑟𝑐𝑒𝑛𝑡𝑎𝑔𝑒 𝑐ℎ𝑎𝑛𝑔𝑒 = 𝑥 100  𝑖𝑛𝑖𝑡𝑖𝑎𝑙  𝑐ℎ𝑎𝑛𝑔𝑒  𝑟𝑎𝑡𝑒 =  𝑡𝑖𝑚𝑒 |
| Chemistry Paper 2  𝑞𝑢𝑎𝑛𝑡𝑖𝑡𝑦 𝑜𝑓 𝑟𝑒𝑎𝑐𝑡𝑎𝑛𝑡 𝑢𝑠𝑒𝑑  𝑚𝑒𝑎𝑛 𝑟𝑎𝑡𝑒 𝑜𝑓 𝑟𝑒𝑎𝑐𝑡𝑖𝑜𝑛 =  𝑡𝑖𝑚𝑒 𝑡𝑎𝑘𝑒𝑛  𝑞𝑢𝑎𝑛𝑡𝑖𝑡𝑦 𝑜𝑓 𝑝𝑟𝑜𝑑𝑢𝑐𝑡 𝑓𝑜𝑟𝑚𝑒𝑑  𝑚𝑒𝑎𝑛 𝑟𝑎𝑡𝑒 𝑜𝑓 𝑟𝑒𝑎𝑐𝑡𝑖𝑜𝑛 =  𝑡𝑖𝑚𝑒 𝑡𝑎𝑘𝑒𝑛  Chromatography  𝑑𝑖𝑠𝑡𝑎𝑛𝑐𝑒 𝑚𝑜𝑣𝑒𝑑 𝑏𝑦 𝑠𝑢𝑏𝑠𝑡𝑎𝑛𝑐𝑒  𝑅𝑓 = 𝑑𝑖𝑠𝑡𝑎𝑛𝑐𝑒 𝑚𝑜𝑣𝑒𝑑 𝑏𝑦 𝑠𝑜𝑙𝑣𝑒𝑛𝑡 |
| Physics Paper 2  𝑤𝑒𝑖𝑔ℎ𝑡 = 𝑚𝑎𝑠𝑠 × 𝑔𝑟𝑎𝑣𝑖𝑡𝑎𝑡𝑖𝑜𝑛𝑎𝑙 𝑓𝑖𝑒𝑙𝑑 𝑠𝑡𝑟𝑒𝑛𝑔𝑡ℎ  𝑤𝑜𝑟𝑘 𝑑𝑜𝑛𝑒 = 𝑓𝑜𝑟𝑐𝑒 × 𝑑𝑖𝑠𝑡𝑎𝑛𝑐𝑒  𝑓𝑜𝑟𝑐𝑒 𝑎𝑝𝑝𝑙𝑖𝑒𝑑 𝑡𝑜 𝑎 𝑠𝑝𝑟𝑖𝑛𝑔  = 𝑠𝑝𝑟𝑖𝑛𝑔 𝑐𝑜𝑛𝑠𝑡𝑎𝑛𝑡 × 𝑒𝑥𝑡𝑒𝑛𝑠𝑖𝑜𝑛  𝑑𝑖𝑠𝑡𝑎𝑛𝑐𝑒 𝑡𝑟𝑎𝑣𝑒𝑙𝑙𝑒𝑑 = 𝑠𝑝𝑒𝑒𝑑 × 𝑡𝑖𝑚𝑒  𝑐ℎ𝑎𝑛𝑔𝑒 𝑖𝑛 𝑣𝑒𝑙𝑜𝑐𝑖𝑡𝑦  𝑎𝑐𝑐𝑒𝑙𝑒𝑟𝑎𝑡𝑖𝑜𝑛 =  𝑡𝑖𝑚𝑒 𝑡𝑎𝑘𝑒𝑛  𝑟𝑒𝑠𝑢𝑙𝑡𝑎𝑛𝑡 𝑓𝑜𝑟𝑐𝑒 = 𝑚𝑎𝑠𝑠 × 𝑎𝑐𝑐𝑒𝑙𝑒𝑟𝑎𝑡𝑖𝑜𝑛  𝑚𝑜𝑚𝑒𝑛𝑡𝑢𝑚 = 𝑚𝑎𝑠𝑠 × 𝑣𝑒𝑙𝑜𝑐𝑖𝑡𝑦  𝑤𝑎𝑣𝑒 𝑠𝑝𝑒𝑒𝑑 = 𝑓𝑟𝑒𝑞𝑢𝑒𝑛𝑐𝑦 × 𝑤𝑎𝑣𝑒𝑙𝑒𝑛𝑔𝑡ℎ |
| Other skills you will need…  Mean – The sum of all numbers in the range divided by the total number of values (check for any anomalies and don’t include these)  Using standard form – Make sure you know either how to convert these to normal numbers OR how to use your scientific calculator  Standard units – Scientists use standard units for calculations so make sure you know how to convert values into standard units. |

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| Biology Paper 2  𝑐ℎ𝑎𝑛𝑔𝑒  𝑝𝑒𝑟𝑐𝑒𝑛𝑡𝑎𝑔𝑒 𝑐ℎ𝑎𝑛𝑔𝑒 = 𝑥 100  𝑖𝑛𝑖𝑡𝑖𝑎𝑙  𝑐ℎ𝑎𝑛𝑔𝑒  𝑟𝑎𝑡𝑒 =  𝑡𝑖𝑚𝑒 |
| Chemistry Paper 2  𝑞𝑢𝑎𝑛𝑡𝑖𝑡𝑦 𝑜𝑓 𝑟𝑒𝑎𝑐𝑡𝑎𝑛𝑡 𝑢𝑠𝑒𝑑  𝑚𝑒𝑎𝑛 𝑟𝑎𝑡𝑒 𝑜𝑓 𝑟𝑒𝑎𝑐𝑡𝑖𝑜𝑛 =  𝑡𝑖𝑚𝑒 𝑡𝑎𝑘𝑒𝑛  𝑞𝑢𝑎𝑛𝑡𝑖𝑡𝑦 𝑜𝑓 𝑝𝑟𝑜𝑑𝑢𝑐𝑡 𝑓𝑜𝑟𝑚𝑒𝑑  𝑚𝑒𝑎𝑛 𝑟𝑎𝑡𝑒 𝑜𝑓 𝑟𝑒𝑎𝑐𝑡𝑖𝑜𝑛 =  𝑡𝑖𝑚𝑒 𝑡𝑎𝑘𝑒𝑛  Chromatography  𝑑𝑖𝑠𝑡𝑎𝑛𝑐𝑒 𝑚𝑜𝑣𝑒𝑑 𝑏𝑦 𝑠𝑢𝑏𝑠𝑡𝑎𝑛𝑐𝑒  𝑅𝑓 = 𝑑𝑖𝑠𝑡𝑎𝑛𝑐𝑒 𝑚𝑜𝑣𝑒𝑑 𝑏𝑦 𝑠𝑜𝑙𝑣𝑒𝑛𝑡 |
| Physics Paper 2  𝑤𝑒𝑖𝑔ℎ𝑡 = 𝑚𝑎𝑠𝑠 × 𝑔𝑟𝑎𝑣𝑖𝑡𝑎𝑡𝑖𝑜𝑛𝑎𝑙 𝑓𝑖𝑒𝑙𝑑 𝑠𝑡𝑟𝑒𝑛𝑔𝑡ℎ  𝑤𝑜𝑟𝑘 𝑑𝑜𝑛𝑒 = 𝑓𝑜𝑟𝑐𝑒 × 𝑑𝑖𝑠𝑡𝑎𝑛𝑐𝑒  𝑓𝑜𝑟𝑐𝑒 𝑎𝑝𝑝𝑙𝑖𝑒𝑑 𝑡𝑜 𝑎 𝑠𝑝𝑟𝑖𝑛𝑔  = 𝑠𝑝𝑟𝑖𝑛𝑔 𝑐𝑜𝑛𝑠𝑡𝑎𝑛𝑡 × 𝑒𝑥𝑡𝑒𝑛𝑠𝑖𝑜𝑛  𝑑𝑖𝑠𝑡𝑎𝑛𝑐𝑒 𝑡𝑟𝑎𝑣𝑒𝑙𝑙𝑒𝑑 = 𝑠𝑝𝑒𝑒𝑑 × 𝑡𝑖𝑚𝑒  𝑐ℎ𝑎𝑛𝑔𝑒 𝑖𝑛 𝑣𝑒𝑙𝑜𝑐𝑖𝑡𝑦  𝑎𝑐𝑐𝑒𝑙𝑒𝑟𝑎𝑡𝑖𝑜𝑛 =  𝑡𝑖𝑚𝑒 𝑡𝑎𝑘𝑒𝑛  𝑟𝑒𝑠𝑢𝑙𝑡𝑎𝑛𝑡 𝑓𝑜𝑟𝑐𝑒 = 𝑚𝑎𝑠𝑠 × 𝑎𝑐𝑐𝑒𝑙𝑒𝑟𝑎𝑡𝑖𝑜𝑛  𝑚𝑜𝑚𝑒𝑛𝑡𝑢𝑚 = 𝑚𝑎𝑠𝑠 × 𝑣𝑒𝑙𝑜𝑐𝑖𝑡𝑦  𝑤𝑎𝑣𝑒 𝑠𝑝𝑒𝑒𝑑 = 𝑓𝑟𝑒𝑞𝑢𝑒𝑛𝑐𝑦 × 𝑤𝑎𝑣𝑒𝑙𝑒𝑛𝑔𝑡ℎ |
| Other skills you will need…  Mean – The sum of all numbers in the range divided by the total number of values (check for any anomalies and don’t include these)  Using standard form – Make sure you know either how to convert these to normal numbers OR how to use your scientific calculator  Standard units – Scientists use standard units for calculations so make sure you know how to convert values into standard units. |





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| Biology Paper 2  𝑐ℎ𝑎𝑛𝑔𝑒  𝑝𝑒𝑟𝑐𝑒𝑛𝑡𝑎𝑔𝑒 𝑐ℎ𝑎𝑛𝑔𝑒 = 𝑥 100  𝑖𝑛𝑖𝑡𝑖𝑎𝑙  𝑐ℎ𝑎𝑛𝑔𝑒  𝑟𝑎𝑡𝑒 =  𝑡𝑖𝑚𝑒 |
| Chemistry Paper 2  𝑞𝑢𝑎𝑛𝑡𝑖𝑡𝑦 𝑜𝑓 𝑟𝑒𝑎𝑐𝑡𝑎𝑛𝑡 𝑢𝑠𝑒𝑑  𝑚𝑒𝑎𝑛 𝑟𝑎𝑡𝑒 𝑜𝑓 𝑟𝑒𝑎𝑐𝑡𝑖𝑜𝑛 =  𝑡𝑖𝑚𝑒 𝑡𝑎𝑘𝑒𝑛  𝑞𝑢𝑎𝑛𝑡𝑖𝑡𝑦 𝑜𝑓 𝑝𝑟𝑜𝑑𝑢𝑐𝑡 𝑓𝑜𝑟𝑚𝑒𝑑  𝑚𝑒𝑎𝑛 𝑟𝑎𝑡𝑒 𝑜𝑓 𝑟𝑒𝑎𝑐𝑡𝑖𝑜𝑛 =  𝑡𝑖𝑚𝑒 𝑡𝑎𝑘𝑒𝑛  Chromatography  𝑑𝑖𝑠𝑡𝑎𝑛𝑐𝑒 𝑚𝑜𝑣𝑒𝑑 𝑏𝑦 𝑠𝑢𝑏𝑠𝑡𝑎𝑛𝑐𝑒  𝑅𝑓 = 𝑑𝑖𝑠𝑡𝑎𝑛𝑐𝑒 𝑚𝑜𝑣𝑒𝑑 𝑏𝑦 𝑠𝑜𝑙𝑣𝑒𝑛𝑡 |
| Physics Paper 2  𝑤𝑒𝑖𝑔ℎ𝑡 = 𝑚𝑎𝑠𝑠 × 𝑔𝑟𝑎𝑣𝑖𝑡𝑎𝑡𝑖𝑜𝑛𝑎𝑙 𝑓𝑖𝑒𝑙𝑑 𝑠𝑡𝑟𝑒𝑛𝑔𝑡ℎ  𝑤𝑜𝑟𝑘 𝑑𝑜𝑛𝑒 = 𝑓𝑜𝑟𝑐𝑒 × 𝑑𝑖𝑠𝑡𝑎𝑛𝑐𝑒  𝑓𝑜𝑟𝑐𝑒 𝑎𝑝𝑝𝑙𝑖𝑒𝑑 𝑡𝑜 𝑎 𝑠𝑝𝑟𝑖𝑛𝑔  = 𝑠𝑝𝑟𝑖𝑛𝑔 𝑐𝑜𝑛𝑠𝑡𝑎𝑛𝑡 × 𝑒𝑥𝑡𝑒𝑛𝑠𝑖𝑜𝑛  𝑑𝑖𝑠𝑡𝑎𝑛𝑐𝑒 𝑡𝑟𝑎𝑣𝑒𝑙𝑙𝑒𝑑 = 𝑠𝑝𝑒𝑒𝑑 × 𝑡𝑖𝑚𝑒  𝑐ℎ𝑎𝑛𝑔𝑒 𝑖𝑛 𝑣𝑒𝑙𝑜𝑐𝑖𝑡𝑦  𝑎𝑐𝑐𝑒𝑙𝑒𝑟𝑎𝑡𝑖𝑜𝑛 =  𝑡𝑖𝑚𝑒 𝑡𝑎𝑘𝑒𝑛  𝑟𝑒𝑠𝑢𝑙𝑡𝑎𝑛𝑡 𝑓𝑜𝑟𝑐𝑒 = 𝑚𝑎𝑠𝑠 × 𝑎𝑐𝑐𝑒𝑙𝑒𝑟𝑎𝑡𝑖𝑜𝑛  𝑚𝑜𝑚𝑒𝑛𝑡𝑢𝑚 = 𝑚𝑎𝑠𝑠 × 𝑣𝑒𝑙𝑜𝑐𝑖𝑡𝑦  𝑤𝑎𝑣𝑒 𝑠𝑝𝑒𝑒𝑑 = 𝑓𝑟𝑒𝑞𝑢𝑒𝑛𝑐𝑦 × 𝑤𝑎𝑣𝑒𝑙𝑒𝑛𝑔𝑡ℎ |
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| Chemistry Paper 2  𝑞𝑢𝑎𝑛𝑡𝑖𝑡𝑦 𝑜𝑓 𝑟𝑒𝑎𝑐𝑡𝑎𝑛𝑡 𝑢𝑠𝑒𝑑  𝑚𝑒𝑎𝑛 𝑟𝑎𝑡𝑒 𝑜𝑓 𝑟𝑒𝑎𝑐𝑡𝑖𝑜𝑛 =  𝑡𝑖𝑚𝑒 𝑡𝑎𝑘𝑒𝑛  𝑞𝑢𝑎𝑛𝑡𝑖𝑡𝑦 𝑜𝑓 𝑝𝑟𝑜𝑑𝑢𝑐𝑡 𝑓𝑜𝑟𝑚𝑒𝑑  𝑚𝑒𝑎𝑛 𝑟𝑎𝑡𝑒 𝑜𝑓 𝑟𝑒𝑎𝑐𝑡𝑖𝑜𝑛 =  𝑡𝑖𝑚𝑒 𝑡𝑎𝑘𝑒𝑛  Chromatography  𝑑𝑖𝑠𝑡𝑎𝑛𝑐𝑒 𝑚𝑜𝑣𝑒𝑑 𝑏𝑦 𝑠𝑢𝑏𝑠𝑡𝑎𝑛𝑐𝑒  𝑅𝑓 = 𝑑𝑖𝑠𝑡𝑎𝑛𝑐𝑒 𝑚𝑜𝑣𝑒𝑑 𝑏𝑦 𝑠𝑜𝑙𝑣𝑒𝑛𝑡 |
| Physics Paper 2  𝑤𝑒𝑖𝑔ℎ𝑡 = 𝑚𝑎𝑠𝑠 × 𝑔𝑟𝑎𝑣𝑖𝑡𝑎𝑡𝑖𝑜𝑛𝑎𝑙 𝑓𝑖𝑒𝑙𝑑 𝑠𝑡𝑟𝑒𝑛𝑔𝑡ℎ  𝑤𝑜𝑟𝑘 𝑑𝑜𝑛𝑒 = 𝑓𝑜𝑟𝑐𝑒 × 𝑑𝑖𝑠𝑡𝑎𝑛𝑐𝑒  𝑓𝑜𝑟𝑐𝑒 𝑎𝑝𝑝𝑙𝑖𝑒𝑑 𝑡𝑜 𝑎 𝑠𝑝𝑟𝑖𝑛𝑔  = 𝑠𝑝𝑟𝑖𝑛𝑔 𝑐𝑜𝑛𝑠𝑡𝑎𝑛𝑡 × 𝑒𝑥𝑡𝑒𝑛𝑠𝑖𝑜𝑛  𝑑𝑖𝑠𝑡𝑎𝑛𝑐𝑒 𝑡𝑟𝑎𝑣𝑒𝑙𝑙𝑒𝑑 = 𝑠𝑝𝑒𝑒𝑑 × 𝑡𝑖𝑚𝑒  𝑐ℎ𝑎𝑛𝑔𝑒 𝑖𝑛 𝑣𝑒𝑙𝑜𝑐𝑖𝑡𝑦  𝑎𝑐𝑐𝑒𝑙𝑒𝑟𝑎𝑡𝑖𝑜𝑛 =  𝑡𝑖𝑚𝑒 𝑡𝑎𝑘𝑒𝑛  𝑟𝑒𝑠𝑢𝑙𝑡𝑎𝑛𝑡 𝑓𝑜𝑟𝑐𝑒 = 𝑚𝑎𝑠𝑠 × 𝑎𝑐𝑐𝑒𝑙𝑒𝑟𝑎𝑡𝑖𝑜𝑛  𝑚𝑜𝑚𝑒𝑛𝑡𝑢𝑚 = 𝑚𝑎𝑠𝑠 × 𝑣𝑒𝑙𝑜𝑐𝑖𝑡𝑦  𝑤𝑎𝑣𝑒 𝑠𝑝𝑒𝑒𝑑 = 𝑓𝑟𝑒𝑞𝑢𝑒𝑛𝑐𝑦 × 𝑤𝑎𝑣𝑒𝑙𝑒𝑛𝑔𝑡ℎ |
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