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4. Estimate the surface area of the mica sample in the Langmuir experiment, assuming that the area covered by a single carbon monoxide molecule is  $16 \times 10^{-20} \text{ m}^2$ . Assume ideal gas behavior for carbon monoxide. i.e. one mole of carbon monoxide ( $6.02 \times 10^{23}$  molecules) occupies  $22,400 \text{ cm}^3$  at STP. (7 marks)

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5. The mass ( $m$ ) of adsorbed solute on a solid is given by the following expression which is known as the Freundlich isotherm.

$$m = k C_2^n$$

Where,  $C_2$  is the concentration of the species. If  $C_2$  is expressed in units of  $\text{mol dm}^{-3}$ , the values of  $k$  and  $n$  are 0.160 and 0.431 respectively. This would give the units of  $m$  as (g of acetic acid) / (g of charcoal). Calculate the amount of acetic acid that would be adsorbed by 1 kg of charcoal if  $1 \text{ dm}^3$  of  $0.837 \text{ mol dm}^{-3}$  vinegar solution was treated. (7 marks)

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