

Homework #1

2. ① 100 mL 액체 안의 분자수 구하기

액체를 water와 같은 조건으로 가정하면,

$$\text{density} = 1 \text{ g/cm}^3, \text{ molecular weight} = 18 \text{ g/mole}$$

$$\therefore 100 \text{ mL 안의 분자수} = \frac{100 \text{ g}}{18 \text{ g/mole}} \times 6.02 \times 10^{23} \text{ \# / mole}$$
$$\approx 3 \times 10^{24} \text{ 개}$$

② 바닷물의 부피 ≈ 13 억 7천만 $\text{km}^3 = 1.37 \times 10^{24} \text{ cm}^3$
(from naver, or etc.)

③ # of molecules in 100 mL ocean water after mixing

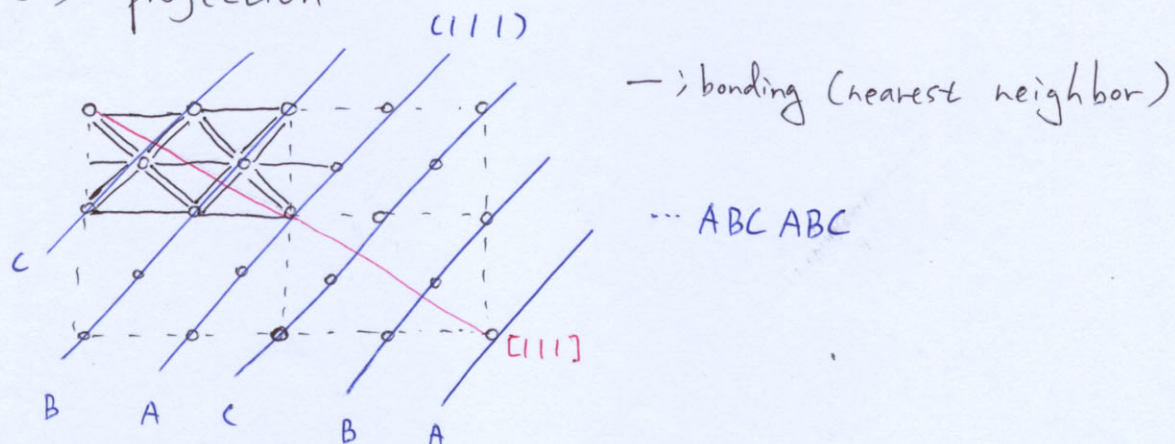
$$\Rightarrow 3 \times 10^{24} \times \frac{100 \text{ cm}^3}{1.37 \times 10^{24} \text{ cm}^3} \approx 220 \text{ 개}$$

... 100 mL 안의 분자가 ocean water에 균등하게 퍼지므로 ...

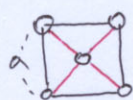
④ 수십개 이상의 분자가 있으므로 빛을 낸다.

3. (a) FCC ... coordination # = 12

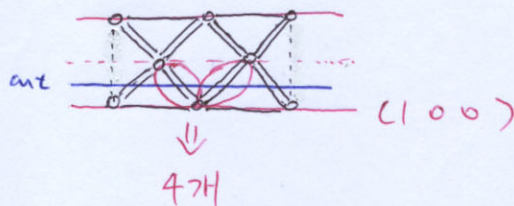
(110) projection



① (100)

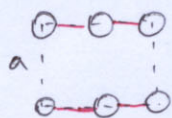


$$\text{density} = \frac{2}{a^2}$$

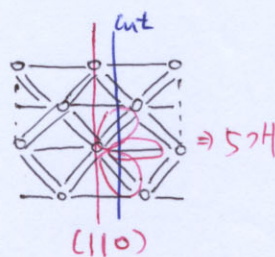


$$\therefore \text{answer} = 4 \times \frac{2}{a^2} = \frac{8}{a^2} = (\# \text{ of broken bonds/atom}) \times (\text{areal density})$$

② (110)

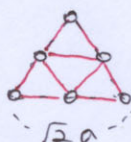


$$\text{density} = \frac{2}{\sqrt{2}a^2}$$

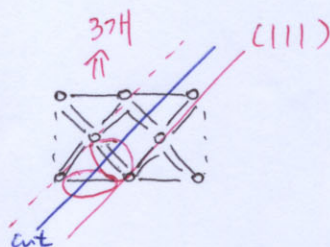


$$\therefore \text{answer} = \frac{10}{\sqrt{2}a^2} = \frac{5\sqrt{2}}{a^2}$$

③ (111)

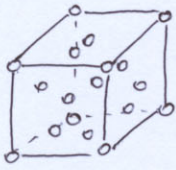


$$\text{density} = \frac{4}{\sqrt{3}a^2}$$

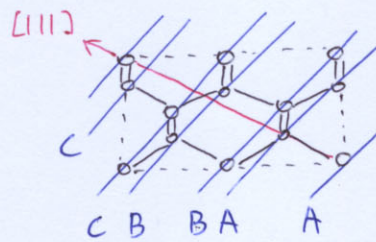


$$\therefore \text{answer} = \frac{4}{\sqrt{3}a^2} \times 3 = \frac{4\sqrt{3}}{a^2}$$

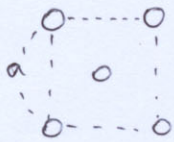
3. (b) Diamond --- coordination # = 4



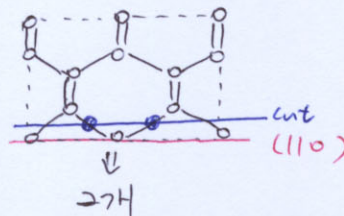
(110) projection



① (100)



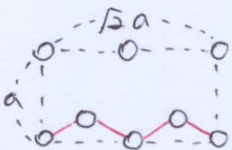
$$\text{density} = \frac{2}{a^2}$$



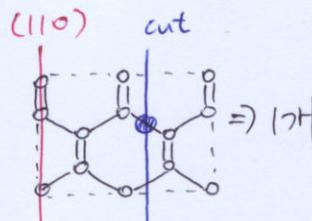
$$\therefore \text{answer} = \left(\begin{array}{c} \# \text{ of broken} \\ \text{bonds / atom} \end{array} \right) \times (\text{areal density})$$

$$= 2 \times \frac{2}{a^2} = \frac{4}{a^2}$$

② (110)

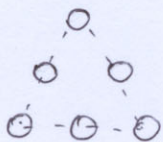


$$\text{density} = \frac{4}{\sqrt{2}a^2}$$

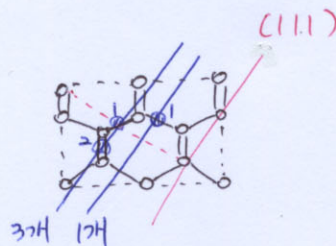


$$\therefore \text{answer} = 1 \times \frac{4}{\sqrt{2}a^2} = \frac{2\sqrt{2}}{a^2}$$

③ (111)



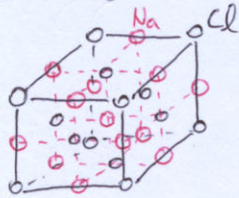
$$\text{density} = \frac{2}{\frac{\sqrt{3}}{2}a^2} = \frac{4}{\sqrt{3}a^2}$$



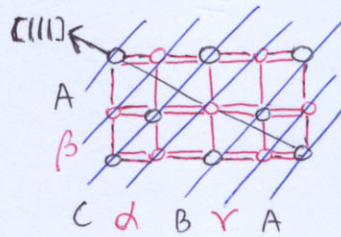
각 cutting 방향에 따라 1개 또는 3개의 broken bonds 발생 \Rightarrow 이 중 energy가 더 낮은 쪽으로 cleavage가 일어나므로,
of broken bond = 1

$$\therefore \text{answer} = 1 \times \frac{4}{\sqrt{3}a^2} = \frac{4}{\sqrt{3}a^2}$$

3. (c) NaCl

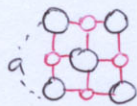


(110) projection

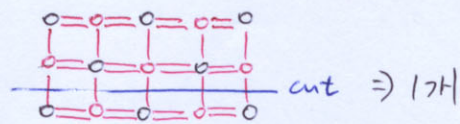


coordination number = 6

① (100)

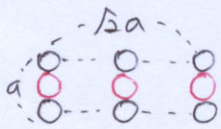


$$\text{density} = \frac{4}{a^2}$$

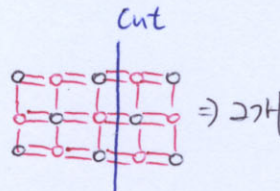


$$\therefore \text{answer} = 1 \times \frac{4}{a^2} = \frac{4}{a^2}$$

② (110)



$$\text{density} = \frac{4}{\sqrt{2}a^2}$$

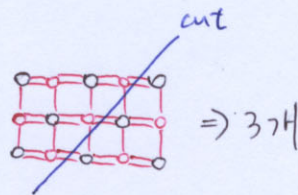


$$\therefore \text{answer} = 2 \times \frac{4}{\sqrt{2}a^2} = \frac{4\sqrt{2}}{a^2}$$

③ (111)



$$\text{density} = \frac{2}{\frac{\sqrt{3}a^2}{2}} = \frac{4}{\sqrt{3}a^2}$$



$$\therefore \text{answer} = 3 \times \frac{4}{\sqrt{3}a^2} = \frac{4\sqrt{3}}{a^2}$$

Broken bond의 개수를 구할 때, (110) projection을 이용하여 이해할 것을 교수님께서 당부하셨습니다. 모두 연습해보시길...