

MIME 262 Problem Sets

Structure (1st half)

Set 1 (Assigned 08Jan in lecture): 2.5, 2.6, 2.7, 2.9, 2.11, 2.13, **2.15**, 2.18, 2.20, 2.21, 2.22, 3.1, 3.2, 3.5, 3.6, 3.7, 3.10

Set 2 (Assigned 12Jan via WebCT): 3.17, 3.20, 3.21, 3.37, 3.39, 3.40, 3.41, 3.42, 3.56, 3.57, 3.59

Set 3 (Assigned 17Jan via WebCT): 4.1, 4.3, 4.4, 4.5, 4.7, 4.8, 4.16, 4.17, 4.23, 4.24, 4.27, 4.28, 4.29

Set 4 (Assigned 24Jan in lecture): 5.1, 5.2, 5.3, 5.8, 5.14, 5.23, 5.10, 5.11, 5.21, 5.28 and this additional problem:

A solar converter is being created by diffusing phosphorus into a silicon wafer that has been uniformly doped with boron. A p-n junction will be formed at the depth where the phosphorus concentration is equal to the boron concentration.

The boron concentration in the silicon is 10^{16} atoms/cm³. During the diffusion process, the phosphorus concentration on the surface is held at 10^{20} atoms/cm³. The diffusion coefficient of phosphorus at the temperature of interest is 10^{-12} cm²/s.

- If the diffusion is carried out for one hour, at what depth will a p-n junction be formed?
- What total diffusion time is required to place the p-n junction at double the depth determined in part a?

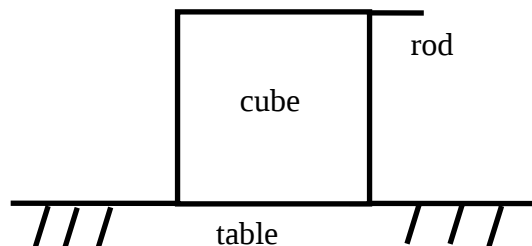
Set 5 (Assigned 01Feb via WebCT): 9.13, 9.18, 9.19, 9.28, 9.29, 9.41, 9.42, 9.43 (for 42 and 43 also label all of the two-phase regions).

Properties (2nd half)

Set 6 (Assigned 05March via WebCT): 6.3 – 6.9, 6.12, 6.14-6.27, 6.28(a)-(e), 6.30 and the two problems below:

6.E1 A metal cube with an edge length of 2 cm is placed on a smooth, flat table. A mass of 100 kg is balanced on top of it. What stress acts on the cube? If the Young's modulus for the cube is 10^{11} Pa, what is the resulting change in vertical dimension for the cube?

6.E2 The same cube as the previous problem is glued to the table and rod is glued to the top side as shown below. Via the rod a pulling force of 3 kN is applied. If the shear modulus is 5×10^{10} Pa, describe the final shape of the cube and the strain within it.



Set 7 (Assigned 13March via WebCT): 7.11, 7.12, 7.20, 7.21, 7.22, 7.23, 7.32, 8.1 – 8.11

Set 8 (Assigned 14 March in lecture): 8.14, 8.15, 8.16, 8.22, 8.25, 8.26, 8.28, 8.29

Set 9 (Assigned 21March via WebCT): 18.1 – 18.5, 18.7 – 18.11, 18.14, 18.16, 18.18, 18.19, 18.20, 18.22, 18.24, 18.26 – 18.28, 18.31, 18.33, 18.34, 18.37 – 18.40, 18.43 – 18.46

Set 10 (Assigned 02Apr via WebCT): 19.4, 19.6, 19.7, 19.10, 19.12, 19.15, 19.17 – 19.21