MSE200-002

Answers to Homework Problems

2.2: The electric charge: proton = 1.602×10^{-19}C, Neutron = 0, electron = 1.602×10^{-19}C.

2.3: Atomic number = number of protons in an atom; Atomic mass = weight in grams in a mole of atoms; Avogadro's constant = number of atoms in 1 mole (6.02×10^{23} atoms/mol)

2.5: 3.056×10^{23}

2.6: # of atoms = 1.82×10^{21};

2.12: Cu_3Au

3.6: bcc: Fe, K, Mo, Nb, fcc: Au, Cu, Ni, hcp: Ti, Zr, Zn, Mg,

3.7: 2

3.8: 8

3.9: $a = 4R/\sqrt{3}$

3.10: a=0.3233 nm

3.11: a = 0.3302 nm

3.12: R=0.15195 nm

3.13: R = 0.18579 nm

3.14: 4

3.15: 12

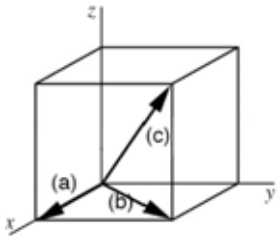
3.16: R = 0.14421 nm

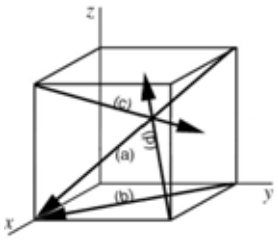
3.18: a = 0.3875 nm

3.20: 0.74

3.21: 6 for the larger cell

3.22: 12

3.31: 

3.32: 

3.34: a= [$\bar{1}$10], b= [4$\bar{4}$1], c=[$\bar{1}$66], d=[212], e=[$\bar{3}\bar{4}$4], f=[$\bar{3}$3$\bar{1}$], g=[4$\bar{4}\bar{1}$], h=[3$\bar{4}$3]

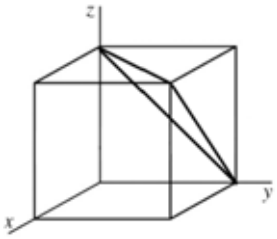
3.36: [$\bar{3}$4$\bar{2}$]

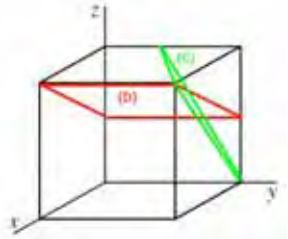
3.38: [100], [010], [001], [$\bar{1}$00], [0$\bar{1}$0], [00$\bar{1}$]

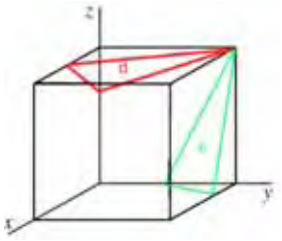
3.39: [111], [11$\bar{1}$], [1$\bar{1}$1], [$\bar{1}$11], [$\bar{1}\bar{1}\bar{1}$], [$\bar{1}\bar{1}$1], [$\bar{1}$1$\bar{1}$], [1$\bar{1}\bar{1}$]

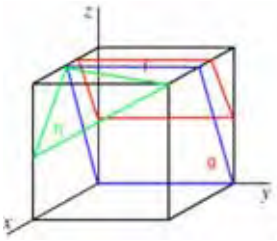
3.40: [1$\bar{1}$0], [10$\bar{1}$], [0$\bar{1}$1], [$\bar{1}$10], [$\bar{1}$01], [01$\bar{1}$]

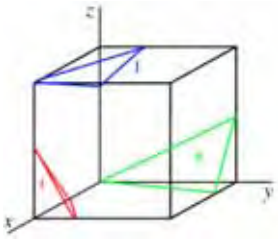
3.41: [1$\bar{1}$1], [$\bar{1}$11], [$\bar{1}$1$\bar{1}$], [1$\bar{1}\bar{1}$]

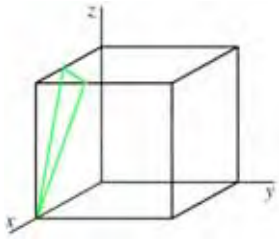
3.43: a 

, b.c. 

d.e. 

, f.g.h 

,
i.j.k. 

l: 

3.44: (a): a=(014), b=(5 12 0), c=(0$\bar{1}$3), d=(223),
(b): a=(103), b=($\bar{2}$23), c=(1 -12 0), d=(1$\bar{1}$2)

3.46: (100), (010), (001)

3.49: (6$\bar{3}$4)

3.50: ($\overline{44}$3)

3.51: (23$\bar{4}$)

3.56: d_{111} = 0.2196 nm, d_{200} = 0.1902 nm, d_{220} = 0.1345 nm

3.57: d_{110} = 0.2238 nm, d_{220} = 0.119 nm, d_{310} = 0.1001 nm

3.58: (a) a= 0.50185 nm, (b) R=0.217309 nm), (c) forget it

3.59: (a) a= 0.40856 nm, (b) R=0.14445 nm, (c) forget it

3.69: fcc: {111}, hcp: (0001)

3.70: fcc: <111>, hcp: <11$\bar{2}$0>

3.71: 55.85 g/mol

3.72: 21.46 g/cm^3

4.17: check the lecture note

4.22: check the lecture note

4.24: check the lecture note

5.3: (a) 3.26x10^{-5}, (b) 2.02x10^{-5}

5.13: 3.4x10^3 s

5.16: 0.39 wt%

5.21: 9.78x10^{-4} cm

5.25: 7.5x10^{-5} m^2/s

6.18: 40.6 MPa

6.19: 960.8 MPa

6.23: 17.5%

6.24: 24.1%

6.25: (a) plot, (b) 76 ksi, (c)19%

6.29: (a) 124.9 ksi, 6.2%, (b) 132.6 MPa, 6.0%

6.30: (a) 1019.1 MPa, 41.7%, (b) 1444.3 MPa, 34.9%

6.46: (a) 30.6 MPa, (b) 0 MPa.

6.47: (a) 22.5 MPa, (b) 0 MPa

6.48: 2.1 MPa

6.49: (a) 1.9 MPa, (b) 1.9 MPa, (c) 0 MPa

6.63: (a) 38%, (b) 0.30 in

6.65: (a) 56.7, (b) 90 ksi, 67 ksi, 6%

7.7: 0.0073 in

7.8: 0.41 mm

7.9: 36.0 ksi

7.10: From Table 7.1: K_{IC}=24.2 MPa$\sqrt{m}$, $\sigma_{0.2}$=495 MPa.
(a) σ_f = 371.25 MPa, a_c = 1.35 mm
(b) σ_f = 247.5 MPa, a_c = 3.04 mm

7.19: (a) 29 ksi (199.6 MPa), (b) 14.5 ksi (99.8 MPa)
(c) 10.5 ksi (72.2 MPa), (d) -0.16

7.22: major factor affecting fatigue strength: see vgs

7.31: P= 26730, t= 6343.3 hr

7.33: P= 29521, σ_f = 100 MPa