Numerical answers to past exams

2016

2) 1.6×10^{-11}s

4) 2.01 mT; 25.5 A

6) 3.87μ_B; 3μ_B; 0.8314

7) d) 4.01 Å; e) (001) 22.019°, (100) 22.248°, (101) 31.503°

9) a) i) B=0, H=398 A/m, M=−398 A/m; ii) H=398 A/m. B=398 A/m, M=0.0043 A/m

10) c) 89.6 μA

2015

2) 6.4 eV

7) d) (110), (200), (211); BCC; a = 4.5 Å

2014

2) 68%

6) (111)

8) c) (111), (200), (220); d) 3.61 Å

10) b) 0.79;

2013

2) Bond length $r = r_0$; cohesive energy $-3U_0$

4)

h k l	2θ
1 0 0	21.61°
1 1 0	30.75°
1 1 1	37.90°

6) $E_F = 4.7$ eV; $T_F \sim 54{,}000$ K

7) d) $T_i \sim 195$ K

10) d) (1 1 1), (2 0 0), (2 2 0); FCC; a = 4.05 Å

2012

1) $R = (2)^{1/6}\sigma$

4) 68%

7) e) (111), (200), (220); a = 4.05 Å

8) b) $2k_BTN$ for energy; $C_V \sim 2k_BN$

9) e) $E_F = 2.1$ eV; $v_F = 8.6 \times 10^5$ m/s; f) $\frac{k_F}{\frac{\pi}{a}} \sim 98\%$

2011

1) 0.74

3)

h k l	2θ
1 0 0	25.9°
1 1 0	36.9°
1 1 1	45.6°

7) 2D: $g(\omega) \propto \omega \rightarrow C_V \propto T^2$; 1D: $g(\omega)$ independent of ω, $C_V \propto T$

8) Monovalent: $k_F = \frac{\sqrt{2\pi}}{a}$

9) (110), (200), (211); a = 2.88 Å

10) $T_i \sim 360$ K