

Course outline

How does an NPTEL online course work?

Week 1

Week 2

Week 3

Week 4

Week 5

Week 6

Week 7

Week 8

● Antiferromagnetism and ferrimagnetism

● Introduction to superconductivity

● Thermodynamics of superconducting transition, London equation

● BCS theory of superconductivity

● Flux quantization in a superconducting ring

● Single particle tunneling and Josephson effect

● AC Josephson effect and microscopic quantum interference

● Week 8 Feedback Form: Solid State Physics

○ Quiz: Week 8: Assignment 8

DOWNLOAD VIDEOS

Lecture notes

Solutions

Week 8: Assignment 8

The due date for submitting this assignment has passed.

Due on 2021-10-20, 23:59 IST.

As per our records you have not submitted this assignment.

A flux quantum (fluxoid) is approximately equal to $2 \times 10^{-7} \text{ gauss} \cdot \text{cm}^2$. A type II superconductor is placed in a small magnetic field, which is then slowly increased till the field starts penetrating the superconductor. The strength of the field at this point is $\frac{2}{\pi} \times 10^5 \text{ gauss}$

1) The penetration depth of this superconductor is

2 points

- 100 Å
 200 Å
 1000 Å
 314 Å

No, the answer is incorrect.

Score: 0

Accepted Answers:

100 Å

2) The applied field is further increased till superconductivity is completely destroyed. The strength of the field is now $\frac{8}{\pi} \times 10^5 \text{ gauss}$. The correlation length of the superconductor is:

2 points

- 20 Å
 50 Å
 628 Å
 2000 Å

No, the answer is incorrect.

Score: 0

Accepted Answers:

50 Å

3) The transition temperature of a BCS superconductor with an average atomic mass of 199.5 is 4.18K. What is the transition temperature for an average atomic mass of 203.4?

2 points

- 4.185
 4.145
 4.226
 4.105

No, the answer is incorrect.

Score: 0

Accepted Answers:

4.145

4) The critical magnetic fields of a super-conductor at temperatures 4K and 8K are 11 mA/m and 5.5 mA/m respectively. The transition temperature is approximately?

2 points

- 8.4 K
 10.6 K
 12.9 K
 15.0 K

No, the answer is incorrect.

Score: 0

Accepted Answers:

10.6 K

5) For Nickel, the number density is $8 \times 10^{23} \text{ atoms/cm}^3$ and the electronic configuration is $1s^2 2s^2 2p^6 3s^2 3p^6 3d^8 4s^2$. The value of saturation magnetisation of Nickel in its ferromagnetic states is : (use $\mu_B = 9.21 \times 10^{-21} \text{ Am}^2$)

0 points

- $3.87 \times 10^8 \text{ A/m}$

 $4.97 \times 10^8 \text{ A/m}$

 $4.87 \times 10^9 \text{ A/m}$

 $3.97 \times 10^9 \text{ A/m}$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$3.97 \times 10^9 \text{ A/m}$