Topic	Subtopic	Year =	04	05	06	07	08	09	10	11	12	13
		# of Times										
Something About Phonons		10	1	1	1	1	1	1	1	1	1	1
Define Phonon		1	1									
Phonon Density of States		1						1				
	In 2d	1						1				
	In 1d / diatomic	1				1						
How would you measure phonons (light/neutrons)		2		1		1						
Why is there a degeneracy of modes at…		2		1					1			
Debye Specific Heat		4		1	1			1			1	
	Derivation in 3d	2			1						1	
	Derivation In 2d	2		1				1				
	Derivation In 1d	1			1							
How many/ what kind of (acoustic/optical/transverse/longitudinal) phonon modes		5				1	1	1	1		1	
Describe Motion of acoustic/optical modes		4	1			1	1	1				
Some Sort of Harmonic Chain		7		1	1	1	1		1	1		1
	Diatomic with Two Masses	2				1	1					
	Monatomic	3			1					1		1
	Alternating Sprint Constants	2		1					1			
	Second or Further Neighbor interactions	1										1
	monatomic limit of diatomic	2		1			1					
Sketch Dispersions / monotomic diatomic		2	1							1		
Something about the Free Electron Gas		7		1		1	1	1	1		1	1
Derive Specific Heat of Fermi Gas		2		1		1						
Define Fermi Energy / Fermi Surface		2					1		1			
Density of States of Free Electron Gas		3		1			1		1			
	Definition of	1					1					
	Derivation In 3d	1							1			
	Derivation In 2d	2		1			0.5		0.5			
	Derivation In 1d	0.5						0.5				
Estimate a Fermi Energy / Relationship of N to Ef		5		1		1		1			1	1
Something About Diffraction / Crystal Structure		10	1	1	1	1	1	1	1	1	1	1
Derive Structure Factor / Scattering Amplitude		6	1	1			1		1	1		1
Calculate Interplanar distances		3		1							1	1
Diffraction		6	1				1	1	1	1		1
	Derive Systematic Absences	2							1	1		

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		# of Times										
	When two atoms scatter same; H not scattering	2				1				1		
	Analyze a Powder Diffraction Pattern	5		1			1		1		1	1
	Predict Diffraction Data	2				1		1				
	Write Down Structure Factor for X	3						1	1			
	Identify a unit cell doubling	2		1	1							
Plan View		2						1		1		
primitive vs conventional unit cell		4				1		1	1	1		
Identify Lattice/Basis		4				1		1			1	1
Calculate Reciprocal Lattice		2		1	1							
Wigner Seitz / Brillouin Zone Construction		3		1						1	1	
Contrast neutron/xray		1							1			
Describe equipment for neutron/xray		2		1	1							

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		# of Times										
Something about Band Structure/Semiconductor Physics		9	1	1	1	1	1	1	1	1	1	
Nearly Free Electron Model (NFEM)		6			1		1	1	1	1	1	
	Derive Gaps of NFEM at zone boundary	3					1		1	1		
	Draw Dispersion	2						1	1			
	Describe Effective Mass	3					1		1		1	
	Monovalent / Divalent - Metal/Insulator	3					1	1	1			
	Gaps open when doubling unit cell	1						1				
	Draw a fermi surface in 2d/3d for weak/strong potential	2					1			1		
Tight Binding Band		1			1							
	Describe Density of States	1			1							
	Describe opening of gap	1			1							
Define Effective Mass		3	1				1	1				
Define Chemical Potential / Doping		1					1					
Define Mobility		3	1				1	1				
Define Conductivity		1						1				
Define Hole		1		1								
	Signs of velocity, energy, current, …	1		1								
Law of Mass Action / formula for n(T,mu)		5		1		1	1		1		1	
	Derivation	4				1	1		1		1	
	Use to calculate some density/mu when doped	4		1		1			1		1	
Temperature dependence of semiconductors		2	1				1					
	Estimate band gap / doping from data	1					1					
	How this would be measured	2	1				1					
How chemical potential changes with doping		1		1								
Density of States (1d, 2d, 3d)		2				0.5	0.5	0.5	0.5			
Optical Properties of Semiconductors		1						1				
	Direct / Indirect Gap	1						1				
	States bound to donors	1						1				
Drude Theory		1						1				
	Derive Hall Coefficient	1						1				
	Derive Conductivity/Mobility	2	1					1				
	Extract mobility/density from experimental data	1						1				

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		# of Times										
Something about magnetism		8	1	1	1	1	1		1	1		1
Define Para/Diamagnetism		4			1		1		1			1
Estimate Larmor Diamagnetism		1			1							
General Curie Law Derivation		1										1
Curie Law Derivation for Spin 1/2		3			1		1		1			
Derive Pauli Paramagnetism		1					1					
Adiabatic Demagnetization		1							1			
What is exchange J		2	1			1						
Molecular (mean) field		5	1	1	1	1				1		
Relationship of J to Tc		3		1	1	1						
What causes domains		1	1									
Domain Relation to Hysteresis		2	1			1						
Derive Size of Bloch Wall		1	1									