

Problemset 1

Physics 363
Apr. 2, 2008

Spring Quarter 2008
Due in class Wed. Apr. 9.

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Reading: Perkins Chapters 1 and 11 (4th Edition)

Problems:

1. Perkins Chapter 1, Problem 1
2. Perkins Chapter 1, Problem 2
3. Perkins Chapter 1, Problem 5
4. Perkins Chapter 1, Problem 6
5. Perkins Chapter 1, Problem 7
6. Describe (briefly- a few sentences) the operating principles of a (an):
 - (a) electron gun,
 - (b) Van der Graaf accelerator,
 - (c) Alvarez linear accelerator
 - (d) Cyclotron
 - (e) Betatron
 - (f) Synchrotron
 - (g) Free Electron Laser
7. Draw the coil structure (and show the current directions) for:
 - (a) A picture-frame dipole magnet
 - (b) A cos-theta winding dipole magnet
 - (c) An old-fashioned quadrupole magnet in which the field is determined by the 4 iron pole faces
 - (d) A superconducting magnet in which the field is determined by the quadrupole distribution of current in the coils.
8. Draw a picture showing the operating principle of Strong Focusing. What (simple) property of thin lenses does it depend on?
9. Write down the matrix representation in the 5-dimensional space of (x, x-prime, y, y-prime, delta-p/p) of the following beam elements:
 - (a) a drift space
 - (b) a bend magnet
 - (c) a focusing lens of focal length f