

Name:

On Pre-flights:

- If you work with anyone else, document what you worked on together.
- If you are not using python, then substitute your language of choice when Python is specified.

Do not write in the table to the right.

Problem	Points	Score
1	14	
2	12	
3	9	
4	3	
5	8	
Total:	46	

1. (a) (3 points) What are the three main blocks in an MCNP input deck?
- (b) (1 point) How are each of the three main blocks in the input deck separated?
- (c) (2 points) How many columns of input can you specify in a MCNP input deck?
- (d) (2 points) What are the two methods of commenting a MCNP input deck?
- (e) (2 points) Describe the role of the ':' union operator.
- (f) (2 points) Describe the role of the '#' complement operator.
- (g) (2 points) Describe the role of the intersection operator.

2. (a) (6 points) Create the surfaces (without using macrobodies) to build a box that is 5 cm on a side centered on the origin.
- (b) (3 points) Create the same surface using a macrobody.
- (c) (3 points) Create a cell filled with water (material #1) that resides entirely inside the box specified in either part a) or b). In this cell, we want to transport neutrons and not photons.
3. (a) (2 points) Create the a material card for HEU (93.15 wt% ^{235}U , 6.85 wt% ^{238}U) for neutron transport.
- (b) (4 points) Create surfaces to define a 10 cm tall half-cylinder (i.e. the cross-sectional area looks like a "D") of radius 1 inch parallel to the z-axis with the base centered on the origin. The half-cylinder is defined in the positive x direction

(i.e. all the "—" of the "D" is the y axis).

- (c) (3 points) Create a cell for photon and neutron transport made of HEU contained within the surfaces defined in part b).
4. (3 points) Create the isotropic source of 14.1 MeV neutrons located at the coordinates (0, 3, 10).
5. (a) (1 point) What tally is used to get the surface current in units of particles?
- (b) (1 point) What tally is used to get the surface energy flux in units of MeV/cm²?
- (c) (1 point) What tally is used to get the volume flux in a cell in units of particles/cm²?
- (d) (1 point) What tally is used to get the detector pulse height distribution in a (detector) cell?

- (e) (4 points) What is the card that would be used to specify the energy structure for the volume flux tally F14? The energy bin structure is 0-100 keV, 100 keV - 1 MeV, 1 -14.1 MeV.