First Midterm - Your Name and ID:

Part One: True or False? Please mark with either T for True or F for False. Each is worth one point:

1. **False** Eclipses can only occur when the Moon is full.
2. **False** Only absorption lines can be Doppler-shifted; emission lines can not.
3. **True** Epicycles and deferents were used to explain retrograde motion of planets.
4. **False** Tycho Brahe used a telescope to make his measurements of planetary motion.
5. **False** Eclipse season is scheduled by Congress.
6. **False** The Earth is closest to the Sun when it is summer in the northern hemisphere.
7. **True** The Earth on its path around the Sun is moving slower in northern hemisphere summer than in northern hemisphere winter.
8. **True** Wien's law relates the peak of a blackbody radiation spectrum to the temperature of the radiating body.
9. **False** The blackbody radiation spectrum of the Earth has its peak at shorter wavelength than the blackbody radiation spectrum of the Sun.
10. **False** A solar eclipse can only happen when the Moon is full.

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Part Two: Essay questions. Please explain your answer in a short (few sentences) essay that you enter into the Blue Book. Each is worth three points:

1. What does it mean if a star's spectral lines are blue-shifted, and what can we learn from the amount they are blue-shifted by?
   Answer: If spectral lines are blue shifted, it means that the body emitting these lines is moving towards us.

2. Describe how an absorption spectrum is created by a star's blackbody radiation passing through an interstellar gas.
   Answer: The blackbody radiation spectrum contains all wavelength. As the "beam" of blackbody radiation is passing through the gas, the wavelengths that correspond to a spectral line in the atoms and/or molecules constituting the gas get excited by absorbing photons at their respective spectral line wavelengths from the beam. Even if these photons get re-emitted at the same wavelength as they were absorbed, they will be emitted in random directions, which more likely than not will mean they do not continue in the "beam". The blackbody radiation beam will therefore lose photons (intensity) at the absorption wavelengths of the material in the gas.

3. What in the Earth's motion around the Sun and the Moon's motion around the Earth determines whether a solar eclipse is annular or full?
   Answer: The varying distance of the Earth to the Sun and of the Earth to the Moon. If the Moon is relatively close to the Earth and the Sun is relatively far, we may have a full solar eclipse, but if the Moon is relatively far and the Sun is relatively close we will have an annular eclipse.

4. Give an example for Newton's third law at work. (Do not ask me which one is Newton's third law; you should know...)
   Answer: An easy example is us pushing on something. If I push a table, with my hand, I can feel how it pushes back against my hand. Newton's third law states that the force my pushing exerts on the table is the same as the force the table exerts on my hand.

5. Explain how two objects as different in size as the Moon and the Sun can have almost the same angular size in the sky. (Hint: Which two measurements determine angular size?)
   Answer: The ratio of an object's true size (diameter) and its distance determine its angular size. The Sun is big, but far away, while the Moon is small, but close by. The ratio of size and distance happens to be the same for both objects.

Grand total: 25 points. Hope it worked out for you.