Astr 01 **HW 03: The Telescopes** Name_____

Show ALL work for full credit. Each problem 2 pts unless otherwise noted.

1) Galileo is credited with designing the first reflector telescope.

2) All optical telescopes will bring the light from a star to a focus.

3) The Cassegrain reflector needs a primary concave main mirror and a smaller, convex secondary mirror to reflect light back through a hole in the primary.

4) The light-gathering ability of a telescope is most dependent on the diameter of its primary objective.

5) All modern large optical telescopes are refractors.

6) Optical telescopes are usually used only at night, but radio telescopes can be used day or night.

7) Radio astronomy can only be done from up in space, due to our ionosphere.

8) Due to our ozone layer, ultraviolet astronomy must be done from space.

9) It is diffraction that limits the _____ of a telescope of a given objective diameter.
A) aperture
B) magnification
C) light grasp
D) interference
E) resolution

10) Green light has a shorter wavelength than orange light. In a 5–inch telescope, green light will
A) reduce the effects of atmospheric turbulence.
B) provide worse angular resolution than orange light.
C) come to the same exact focus as orange light.
D) allow dimmer stars to be observed.
E) provide better angular resolution than orange light.

11) What is true of radio telescopes?
A) They have poorer angular resolution than a refractor of the same size.
B) They are most sensitive to the opacity of the ozone layer.
C) They can only be used above the atmosphere.
D) They have better angular resolution than a reflector.
E) They are the smallest, most compact telescopes.

12) In astronomy, an interferometer can be used to
A) yield better seeing conditions with optical telescopes.
B) speed up the processing of CCD images.
C) improve the angular resolution of radio telescopes.
D) increase the sensitivity of infrared telescopes to longer wavelengths.
E) decrease the effects of light pollution in getting darker sky backgrounds.

13) Which of the following is currently supplying high resolution X-ray images from space?
A) COBE B) Einstein C) HEAO-2 D) ROSAT E) Chandra

14) _____ optics deform the shape of the mirror to compensate for the turbulence in the atmosphere and yield a close to diffraction-limited image.
A) Adaptive
B) Collimating
C) CCD
D) Coherent
E) Parabolic

15) The _____ Space Telescope still gives us the highest resolution optical images.
A) Einstein B) Fermi C) Chandra D) Kepler E) Hubble

16) Grazing incidence optics are critical to focusing
A) X-rays.
B) gamma rays.
C) ultraviolet light.
D) radio waves.
E) infrared radiation.

17) An advantage a reflector has over a refractor is the elimination of _____.

18) The separation of red and blue light in single-lens telescopes is called _____ aberration.

19) A mirror must be _____ in shape to reflect the light back to a focus.

20) A lens must be _____ in shape to focus the transmitted light.

21) In general, as a telescope's diameter increases, its angular resolution _____.

22) The ability of a telescope to separate two closely spaced stars is called _____.

23) _____ optics greatly reduces the effect of atmospheric turbulence by deforming the shape of the mirror by computer control.

24) In design, most radio telescopes, like Arecibo, are a _____ type reflector..

25) There are ground-based telescopes much larger than Hubble, yet the HST still reveals the faintest objects yet seen. Explain.

26) Contrast the main mirrors of Newtonian and Cassegrain designs.

27) Why do stars appear to twinkle?

28) Why is the angular resolution of radio telescopes much worse than that of smaller optical telescopes?

29) Why is UV astronomy difficult to do from the ground?

30) Discuss several disadvantages of refractor versus reflector telescopes.

31) What is a CCD, and how does it work? Why is it replacing film?

32) What are some advantages of radio telescopes over optical telescopes?