

# Astronomy 1504/1514 Section 10

## Midterm 3, Version 2

### Apr 16, 2010

Choose the answer that **best** completes the question. Read each problem carefully and read through all the answers. Take your time. If a question is unclear, ask for clarification during the exam. Mark your answers on the scantron sheet and on your copy of the exam. Keep your copy of the exam and check your grade with the posted answers on my website and the grade posted on D2LRN. You will have 1 week to ask for corrections.

1. The Cosmic Background Radiation:

I. Was discovered by Penzias and Wilson at Bell Labs

II. Was emitted at a redshift of  $z = 1100$

III. Is nearly a perfect blackbody

- (a) I
- (b) I and II
- (c) I and III
- (d) I, II, and III

2. The observational evidence that the universe is flat (or very nearly so) is based on:

- (a) measuring the distance to Type Ia supernovae
- (b) measuring the cosmic background radiation
- (c) The cosmological principle
- (d) The general theory of relativity

3. The heavy elements in our bodies were formed:

- (a) in a black hole
- (b) in neutron stars
- (c) in the interiors of stars
- (d) in interstellar space

4. The most mass a neutron star can have is about:

- a) 1 solar mass
- (b) 3 solar masses
- c) 10 solar masses
- d) there is no limit to the mass

5. Stars leave the main sequence because:

- a) they want to go to the center of the galaxy
- (b) they have exhausted their hydrogen supply near the center
- c) they have exhausted their helium supply near the center
- d) their center becomes a black hole

6. The fact that the Cosmic Background Radiation has the same temperature everywhere is explained by:
- (a) The theory of inflation
  - (b) Olber's paradox
  - (c) dark energy
  - (d) dark matter
7. From our studies of galactic rotation curves and galaxy clusters we know that most of the matter in the universe is:
- (a) Ordinary (baryonic) matter
  - (b) Dark Matter
  - (c) Hydrogen and Helium
  - (d) all of the above
8. Standard Candles of choice for measuring the nature of the dark energy are:
- (a) RR Lyra stars
  - (b) Type Ia Supernovae
  - (c) M dwarf stars
  - (d) Extra solar giant planets
  - (e) Cepheid Variables
9. The Cosmological Constant,  $\Lambda$ , was introduced by Einstein to:
- (a) Make the universe static
  - (b) Make his equations stable
  - (c) Explain Hubble's Law
  - (d) Make his equations pleasing to the eye
10. We *CANNOT* see the center of our galaxy in which waveband?
- (a) IR
  - (b) Radio
  - (c) Optical
  - (d) X-ray
11. We use the Period-Luminosity relation find distances to which variable stars?
- (a) Mira Variables
  - (b) Cataclysmic Variables
  - (c) Cepheid Variables
  - (d) RR Lyrae Variables
12. Which of these stars is used in the most reliable method for measuring distances to nearby galaxies?
- (a) white dwarfs
  - (b) G2 V stars
  - (c) main sequence M stars
  - (d) Cepheid variables

13. 21-cm radiation is produced by:
- (a) cold hydrogen gas
  - (b) electrons spiraling in a magnetic field
  - (c) small dust grains
  - (d) the cooling big bang
14. The central engines of quasars are thought to be:
- (a) supernova explosions
  - (b) nova explosions
  - (c) accretion onto a supermassive black hole
  - (d) nobody knows
15. Which is *not* true about Population I stars in our Galaxy?
- (a) They tend to be found in the disk
  - (b) They are relatively young stars
  - (c) They have high metallicities like our sun
  - (d) They are found in the halo
16. The metal content (metallicity) of the Galaxy:
- (a) Increased as the galaxy got older
  - (b) Decreased as the galaxy got older
  - (c) Stayed the same as the galaxy got older
  - (d) This is nonsense, the galaxy doesn't get older
17. In order to be a spiral galaxy, a galaxy must have:
- (a) Hot gas
  - (b) Cool gas
  - (c) No gas
  - (d) A disk
18. The most massive nucleus that can be produced in *normal* stellar fusion is:
- a) helium
  - b) hydrogen
  - c) iron
  - d) uranium
19. A pulsar is believed to be:
- a) a rotating neutron star
  - b) a rotating black hole
  - c) a rotating white dwarf
  - d) a planetary nebula
20. The bending of light rays around the sun is explained by:
- a) Einstein's theory of general relativity
  - b) Newton's gravity
  - c) Kepler's laws
  - d) the heliocentric solar system

21. For a star cluster, the position of the “main sequence turnoff” tells us
- a) the cluster age
  - b) the number of stars in the cluster
  - c) the mass of the cluster
  - d) all of the above
  - e) none of the above
22. The H-R diagram is:
- a) a plot of apparent magnitude vs. absolute magnitude for stars
  - b) a plot of temperature vs. color for stars
  - c) a plot of luminosity vs. temperature for stars
  - d) a plot of mass vs. distance for stars
23. Stars spend 90% of their lives, where in the HR diagram?
- a) on the main sequence
  - b) on the supergiant branch
  - c) on the sub giant branch
  - d) on the white dwarf branch
24. When a black hole is formed the singularity is surrounded by:
- a) nothing
  - b) an accretion disk
  - c) an event horizon
  - d) hair
25. Type Ia supernovae are caused by:
- a) the core-collapse of a massive star
  - b) the thermonuclear explosion of a Chandrasekhar mass white dwarf
  - c) accretion onto a neutron star
  - d) accretion onto a black hole
26. Which of these types of objects is NOT found in the halo of our galaxy?
- a) globular clusters
  - b) main sequence M stars
  - c) O stars
  - d) dark matter
27. Why are hot stars better than cool stars at forming H II regions?
- a) cool stars are surrounded by dust, rather than gas
  - b) hot stars are more massive
  - c) cool stars are too old
  - d) hot stars emit more ultraviolet radiation
28. Rotation curves of galaxies show us that
- a) Galaxies do not rotate like solid bodies
  - b) They flatten at large radii
  - c) There must be some unseen matter at large radii
  - d) They are evidence for Dark Matter
  - e) All of the above

29. The dust in our Galaxy makes stars seen through it appear
- a) too faint and too red
  - b) too faint and too blue
  - c) too bright and too red
  - d) too bright and too blue
30. SS 433 is our model for AGN and quasars. Which is NOT one of essential elements?
- a) a black hole
  - b) an accretion disk
  - c) magnetic fields
  - d) rotation
  - e) all of the above are elements of the microquasar model
31. Synchrotron Radiation is:
- a) The same as blackbody radiation
  - b) Produced by thermal electrons
  - c) Produced by relativistic electrons in a magnetic field
  - d) all of the above
32. Pulsars are produced by:
- a) Planetary nebulae
  - b) H II regions
  - c) Globular clusters
  - d) Core-collapse supernovae
33. The r-process is responsible for producing:
- a) hydrogen
  - b) helium
  - c) carbon
  - d) iron
  - e) platinum
34. Observationally, gamma-ray bursts (GRB) have been associated with:
- a) novae
  - b) supernovae
  - c) neutron stars
  - d) white dwarfs
35. Our Galaxy is most like which of the following?
- a) the Andromeda galaxy
  - b) M82
  - c) the Large Magellanic cloud
  - d) M87

**-END OF TEST-**

