

### Midterm Test 3

Circle the letter next to your choice of answer for each multiple-choice question (do not write the letter next to the question).

(1) How far is the Sun from the Earth?

- a. 11 billion km.
- b. 150 million km.
- c. 700,000 km.
- d. 6,400 km.

(2) What do you need to know about a star to place it in the HR diagram?

- a. Velocity and temperature.
- b. Temperature and luminosity.
- c. Luminosity and distance.
- d. Distance and velocity.

(3) In a star cluster, why do massive stars leave the main sequence before low-mass stars?

- a. Because gravity affects them more, and they end up being ejected from the cluster.
- b. Because they tend to move less, and are disrupted by more frequent collisions.
- c. Because they are much brighter, and burn the hydrogen in their cores more quickly.
- d. Because they develop a black hole in their core, which eats them up.

(4) Which of these could possibly be the radius of a neutron star?

- a. 15 km.
- b. 15,000 km.
- c. 15 million km.
- d. 15 million light years.

(5) If we say that a star is among the "cooler" ones, what is its surface temperature, approximately?

- a. 10 K.
- b. 3000 K.
- c. 30,000 K.
- d. 10 million K.

(6) How can we find neutron stars?

- a. They can often be seen as pulsars, from which we get pulses of radio waves.
- b. We recognize them because they shine more brightly than any other regular star.
- c. We look for stars whose brightness changes over a period of a few days.
- d. If they are not surrounded by glowing matter there is no way for us to find them.

(7) What is stellar parallax used for in astronomy today?

- a. To align the axis of a telescope with the Earth's rotation.
- b. To locate the point representing a star on an HR diagram.
- c. To find the distance to a star from its apparent displacement.
- d. To find the mass of a star from the rate at which it rotates.

(8) Which of these is not a good method to check if a certain star is actually a binary?

- a. Look for periodic changes in its brightness.
- b. Locate a second, fainter star on a telescope image.
- c. See what part of the HR diagram the star is located in.
- d. Look for small changes in the wavelength of its light.

(9) How large are the clouds that collapse to form stars, initially?

- a. Tens of millions of km.
- b. Several astronomical units.
- c. Tens of light years.
- d. Several millions of parsecs.

- (10) If star A appears larger than star B in a photograph of the night sky, you can conclude that
- Star A is closer to us than star B.
  - Star A appears brighter than star B, as seen from Earth.
  - Star A is younger than star B.
  - Star A is actually larger in size than star B.
- (11) When can an object in space be called a star?
- When it has a clearly defined surface and spherical shape.
  - When it starts shining because it emits light and radiation.
  - When energy is produced in its core by nuclear reactions.
  - When we can see it with our telescopes from Earth.
- (12) Which is hotter, a supergiant star or a main sequence star?
- The supergiant star.
  - The main sequence star.
  - They have the same temperature.
  - It could be either one, we need more information to answer this question.
- (13) For how long does a star like the Sun lead a normal life?
- 10 billion years.
  - 150 million years.
  - 40 million years.
  - 4 million light years.
- (14) What kinds of stars are more common in our neighborhood?
- Large, bright, supergiant stars.
  - Small but very bright white dwarf stars.
  - Colder and dimmer stars than the Sun.
  - Neutron stars.
- (15) What are the sunspots we see on the surface of the Sun?
- Dark holes in the surface of the Sun, through which we can see deep inside it.
  - Places on the Sun's surface that are so hot that they emit X-rays rather than visible light.
  - Clouds hovering over the Sun, which prevent us from seeing the surface.
  - Places that appear dark because cooler gas from the Sun's surface is plunging inwards.
- (16) What are the letters O B A F G K M most directly related to?
- The distance to a star.
  - The size of a star.
  - The brightness of a star.
  - The temperature of a star.
- (17) What is the main factor that makes interstellar matter collapse and form new stars?
- Gravity.
  - Heat.
  - Rotation.
  - Magnetic fields.
- (18) Which stars live longer?
- All stars last about the same amount of time.
  - More massive stars, because they have more fuel available.
  - Less massive stars, because they burn more slowly.
  - Stars which can burn elements heavier than hydrogen in their cores.
- (19) Is it common for two stars to be so close that they orbit around each other?
- No, only about 1% of stars are sufficiently close to each other.
  - Yes, possibly about half of all stars are that close to each other.
  - Yes, every star we know revolves around one or more other stars.
  - No, stars never orbit around each other, only planets orbit around stars.
- (20) What is interesting about the middle star of the handle in the Big Dipper, Mizar?
- It is a binary star.
  - It is a supergiant star.
  - It is the fastest moving star.
  - It is the brightest star in the sky.

(21) What is Omega Centauri?

- a. A dark nebula in the Orion constellation.
- b. An open cluster of galaxies in Centaurus.
- c. A globular cluster of stars in Centaurus.
- d. Two stars in a very close, tight binary system.

(22) What is a visual binary star system?

- a. One in which we can actually see two stars.
- b. One in which the visual brightness changes periodically in time.
- c. One whose spectrum of visible light changes in time.
- d. One in whose spectrum we can see both emission and absorption lines.

(23) How many stars do open clusters usually have?

- a. Between 2 and 5.
- b. A few dozen or so.
- c. Hundreds or possibly thousands.
- d. Hundreds of thousands or more.

(24) Which of these contains more stars?

- a. The Solar System.
- b. An open cluster.
- c. A globular cluster.
- d. The Alpha Centauri system.

(25) What is the chromosphere?

- a. The layer just below the surface of the Sun, hidden from view.
- b. The thin, faint, reddish layer just above the surface of the Sun.
- c. The extensive, hot atmosphere of the Sun, extending out to millions of km.
- d. The part of the Sun's interior that surrounds the core.

(26) What is the first element produced from hydrogen fusion inside stars?

- a. Helium.
- b. Carbon.
- c. Iron.
- d. Plutonium.

(27) Why can't neutron stars be more massive than about 3 solar masses?

- a. Because the heavier stars that would form them have not exploded yet.
- b. Because even the heaviest stars only leave behind a core of 3 solar masses.
- c. Because the ones that would be heavier collapse to form black holes instead.
- d. Because there are no stars whose mass is more than 3 solar masses.

(28) Why are the apparent and absolute magnitudes of a star usually different?

- a. Because the apparent magnitude depends on how far the star is.
- b. Because we use different types of telescopes to measure them.
- c. Because the two magnitudes have the same value only for main sequence stars.
- d. Because the two magnitudes have the same value only if the star is not moving.

(29) When does a star like the Sun become a red giant in the late stages of its life?

- a. When all of the nuclear fuel in the core has been spent, gravity weakens, and the outer layers of the star drift away.
- b. When another star that had previously been orbiting it is drawn in and the two stars merge into a more massive one.
- c. When the core cools and shrinks and the material around it contracts and heats up, pushing the outer layers outwards.
- d. When the core starts burning helium into heavier elements like carbon, producing more heat than in earlier stages.

(30) What is a black hole?

- a. A star made of dark matter, which annihilates ordinary matter on contact.
- b. A star which looks black because it is too cold to emit any radiation.
- c. A region of space where gravity is so strong that light cannot come out.
- d. A cloud of gas and dust so thick that it hides any star that is inside it.

(31) Can the same star explode as a supernova more than once?

- a. No, because afterwards the star stays on the main sequence.
- b. No, because most or all of the star is blown away.
- c. Yes, several times over a few weeks or months.
- d. Yes, about once every 100 years.

(32) Which of these stars is brightest in our sky?

- a. Betelgeuse.
- b. Alpha centauri.
- c. Sirius.
- d. Polaris.

(33) What is the difference between type Ia and type II supernovas?

- a. Type Ia supernovas are 100 times as bright as type II supernovas.
- b. Type Ia are produced by binary stars, type II by single massive stars.
- c. Type Ia supernovas emit visible light, type II only radio waves.
- d. Type Ia explosions produce interstellar gas, type II produce dust.

(34) Would you be able to land on the surface of a black hole?

- a. No, there is no hard surface to stand on, you would just fall inward.
- b. No, because black holes spin so fast you would be thrown outward.
- c. Yes, but you would be permanently stuck on the black hole's surface.
- d. For a moment, but then you would be flattened by its strong gravity.

(35) Vega is a main-sequence star of spectral type A0 and apparent magnitude 0.04, about 25 light years away. Can we see its parallax?

- a. No, because it is too far away.
- b. Yes, because it is close enough to us.
- c. No, because it is not bright enough.
- d. Yes, because its spectrum has enough lines.

(36) How often do we expect supernovae to occur inside our galaxy, on average?

- a. We see several every year.
- b. We expect to see one every 100 years or so on average.
- c. Only one every 30-40 million years.
- d. Never; supernovas only occur in young, distant galaxies.

(37) Which stars can become black holes?

- a. Only small stars; the big ones are blown away by supernova explosions.
- b. Very massive stars; smaller ones become white dwarfs or neutron stars.
- c. Stars which get too close to other black holes turn into new black holes.
- d. All stars; a small one forms in their core, and then grows.

(38) What is the temperature at the Sun's core?

- a. 6000 K.
- b. One million K.
- c. 15 million K.
- d. One billion K.

(39) How many black holes do we think are in the Solar System?

- a. 0.
- b. 1.
- c. 200 or so.
- d. 100 billion or so.

(40) Can the Sun become a supernova?

- a. Yes, if we wait another 5 billion years.
- b. Yes, if it is hit by a large asteroid.
- c. No, it is not massive enough.
- d. No, it has already been through that stage.