Astronomy 162 *Exam 2*

Name: Answer Key

Student ID: Blue Version

Section:

Be sure to read all instructions carefully.

1. [1pt] The pressure that keeps a white dwarf form collapsing further as it cools comes from

A) neutron capture.
B) gravity.
C) the strong force.
D) hot molecules.
E) packing electrons too closely.

2. [1pt] One class of low-mass, erratically variable pre-main-sequence stars is called

A) Cepheids.
B) R. Monocerotis stars.
C) T Tauri stars.
D) RR Lyrae variables.
E) Mira variables.

3. [1pt] The stars that evolve most rapidly are those which are

A) symmetrical.
B) most dense.
C) coolest.
D) most massive.
E) largest.

4. [1pt] Which of the following statements is false?

A) Novae typically occur in a binary system containing a white dwarf.
B) Novae can occur repeatedly for the same star.
C) Stars lose only their outermost layer in a nova explosion.
D) A nova is caused by the buildup of hydrogen on the surface of a white dwarf, which ignites when the temperature and pressure is high enough.
E) A nova is when a star explodes at the end of its life.

5. [1pt] What is probably the primary reason for an upper limiting mass on stars?

A) high radiation pressure in massive stars
B) insufficient hydrogen in a typical nebula to make massive stars
C) the low temperatures for very massive stars
D) the low gas pressures associated with massive stars
E) the limited helium abundance in a nebula

6. [8pt] Indicate whether the following are properties of Type I or Type II supernovae. Enter I or II for each.

I — Could completely explode and leave no remnant behind.

I — The light-curve does not show a plateau.

I — Comes from a binary system of a white dwarf and a red-giant.

II — Produces very heavy elements like Uranium during the explosion.

I — The spectrum shows very little hydrogen.

II — Comes from a massive star that exploded after its core turned to iron.

I — Supernovae of this type have the same peak luminosity.

II — Leaves behind a neutron star or a black hole.

7. [1pt] Which of the following types of variable stars appears to always be a part of a binary star system?

A) Cepheid variable
B) nova
C) RR-Lyra variable
D) long-period red variable
E) type II supernova

8. [1pt] The period-luminosity relation applies to

A) Cepheid variables.
B) Mira variables.
C) eclipsing binaries.
D) irregular variables.
E) RR Lyrae variables.

9. [1pt] Stars retaining less than 1.4 solar masses after their unstable phase will become

A) neutron stars.
B) white dwarfs.
C) variable.
D) red giants.
E) protostars.

10. [1pt] A period-luminosity relationship for a variable star is very important because it allows us to determine _____?

A) the distance to the star
B) the spectral class of the star
C) the space velocity of the star
D) The surface temperature of the star
E) whether the star is part of a binary system

11. [1pt] The number of protons in the nucleus of an atom of ${}_6C^{14}$ is

A) 6.
B) 20.
C) 8.
D) 2.
E) 14.

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12. [1pt] When the core of a massive star collapses, rebounds, and explodes into a supernova, it picks up much of its energy from the outflow of

A) photons.
B) neutrinos.
C) positions.
D) ions.
E) neutral atoms.

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13. [5pt] Match each statement with the appropriate item. Enter the correct letter beside each.

B young, spread out star cluster

C globular clusters stars that are burning helium in their core

A the top of the main sequence of a cluster; more massive stars in the cluster have already evolved

E old, dense star cluster

D group of stars that was formed all at the same time, with the same composition

A. main sequence turnoff
B. open cluster
C. horizontal branch stars
D. star cluster
E. globular cluster

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14. [1pt] A collapsing cloud of gas and dust that is not yet a star but eventually will become one is called a _____?

A) O and B association
B) T-Tauri star
C) protostar
D) pseudostar
E) stellar incubus

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15. [1pt] When a star becomes unstable, it may eject shells of gas into space forming a(n)

A) dust cloud.
B) planetary nebula.
C) ring.
D) asteroid belt.
E) protostar.

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16. [1pt] Although they were first expected to be extremely stable and constant, it was discovered that pulsars

A) intermittently stop.
B) gradually slow down.
C) gradually speed up.
D) disintegrate.
E) decay in radio brightness.

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17. [1pt] Gravitational waves were first detected using Earth-based detectors in

A) 1967.
B) 1999.
C) Gravitational waves have not yet been detected.
D) 1974.

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18. [1pt] If one Cepheid variable has the same period as another Cepheid but appears 4 magnitudes brighter, then its absolute magnitude is

A) 1/4 magnitude fainter.
B) 1 magnitude fainter.
C) the same.
D) 4 magnitudes brighter.
E) 4 magnitudes fainter.

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19. [1pt] In a Type Ia supernova the energy to sustain its brightness after the initial explosion comes from

A) radioactive decay.
B) neutrinos.
C) shock waves.
D) circumstellar matter.
E) falling debris.

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20. [1pt] In a main-sequence star, the gravitational forces are balanced by

A) thermal pressure.
B) chemical reactions.
C) electromagnetic force.
D) strong force.
E) centrifugal force.

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21. [1pt] When the core of a star is crushed to the point where electrons combine with protons, it is supported against collapse by

A) metallic compressibility.
B) magnetic fields.
C) rebounding neutrinos.
D) neutron pressure.
E) electron pressure.

22. [1pt] The single most important factor governing how long it takes a star to collapse to the main sequence is its _____?

(A) mass
B) percentage of helium
C) diameter
D) angular momentum
E) percentage of hydrogen

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23. [1pt] The typical radius of a white dwarf star is _____ ?

(A) that of the Earth
B) that of the Sun
C) 10 times that of the Sun
D) 1/10 that of the Sun
E) that of the Moon

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24. [1pt] The final proof of the nature of pulsars came from observations of the
A) Orion Nebula.
B) Large Magellanic Cloud.
(C) Crab Nebula.
D) Andromeda galaxy.
E) Small Magellanic Cloud.

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25. [1pt] The primary source of 'metals' in Population I stars is probably _____ that have enriched the galaxy in heavy elements.
A) novae
B) pulsars
C) planetary nebulae
(D) supernovae

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26. [1pt] Star clusters with irregular shapes and containing stars with relatively large amounts of heavier elements are called
A) star clusters.
(B) open clusters.
C) Population II areas.
D) Population I areas.
E) globular clusters.

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27. [1pt] Life on the main sequence is characterized by _____?

A) the thermonuclear burning of helium to heavier elements
(B) fusion of hydrogen to helium in the star's core
C) strong radiation of gravitational energy
D) a steadily decreasing luminosity
E) rapid variations in brightness

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28. [1pt] As a white dwarf ages it will
A) shrink but remain the same temperature.
B) cool and expand.
C) cool and shrink.
(D) cool but remain the same size.
E) heat up and expand.

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29. [1pt] The 'lighthouse' effect associated with pulsar beams is thought to be associated with _____ ?

(A) the strong magnetic field of the rotating neutron star
B) the drag exerted on the pulsar by the surrounding nebula
C) thermonuclear explosions on the surface of the central white dwarf star
D) the strong gravitational field of the neutron star
E) the enormous graviational field of the black hole inside the pulsar

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30. [1pt] The process of building heavier atoms from lighter ones is called
A) atom building.
B) nuclear mitosis.
C) ionization.
(D) nucleosynthesis.
E) isotope production.

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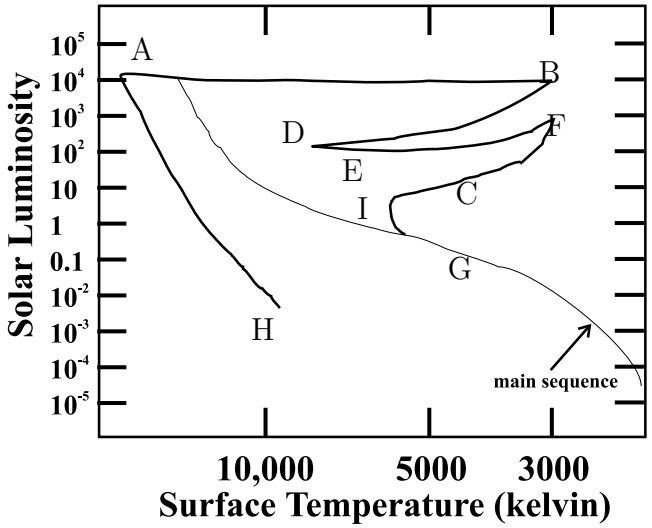
31. [9pt] Identify the location in the H-R diagram of the phases of stellar evolution. (For each statement select the proper symbol in the picture.)



I — hydrogen used up, core collapses

E — helium fusion in core

B — red giant with helium burning shell

G — main-sequence star

H — white dwarf

D — helium used up, core collapses

F — red giant, helium flash

A — envelope ejected, planetary nebula

C — hydrogen fusion in shell around core