Name:

1 pt At the present time at the center of the sun, fusion converts hydrogen into

1. **A**◯carbon
   B◯helium
   C◯oxygen
   D◯neon.

1)	B	false	true	false	false

1 pt The temperature of the center of the sun is about

2. **A**◯10 billion K.
   B◯6000 K.
   C◯200 million K.
   D◯10 million K.

2)	D	false	false	false	true

1 pt The sun will use up its hydrogen in

3. **A**◯trillions of years.
   B◯5 billion years.
   C◯5 million years.
   D◯1 billion years.

3)	B	false	true	false	false

1 pt The sun has been shining for about

4. **A**◯5 million years.
   B◯trillions of years.
   C◯1 billion years.
   D◯5 billion years.

4)	D	false	false	false	true

1 pt There is more helium in the center of the sun than the surface primarily because

5. **A**◯helium is repelled by hydrogen.
   B◯helium is being made there.
   C◯the helium displaced the carbon.
   D◯the heavy helium sunk.

5)	B	false	true	false	false

1 pt If I shine a flashlight toward the sun, the light goes as far as the ___ without being absorbed.

6. **A**◯solar wind
   B◯convection zone
   C◯corona
   D◯photosphere

6)	D	false	false	false	true

1 pt The carbon in the photosphere of the sun was made in

7. **A**◯the photosphere of the sun.
   B◯some other star.
   C◯the center of the sun.
   D◯a comet.

7)	B	false	true	false	false

1 pt In addition to the losses in the solar wind, the sun loses 5 million tons of mass every second. Which region is losing mass?

8. **A**◯Core.
   B◯Photosphere.
   C◯Convection zone.
   D◯Chromosphere.

8)	A	true	false	false	false

1 pt If a giant hand doubled the mass of the sun, the new sun would be (1) hotter and (2) slightly bigger. (1) & (2) are

9. **A**◯true & true
   B◯true & false.
   C◯false & true.
   D◯false & false.

9)	A	true	false	false	false

1 pt Compared to a main sequence star of spectral class G, a main sequence star of spectral class F is

10. **A**◯cooler and less massive.
    B◯hotter and less massive.
    C◯hotter and more massive.
    D◯cooler and more massive.

10)	C	false	false	true	false

1 pt In which of these stages does the sun spend the longest time?

11. A◯Giant.
   B◯Main sequence.
   C◯Planetary nebula.
   D◯Giant and main sequence stages last the same time.

11)	B	false	true	false	false

1 pt Has the sun ever been or will be a star like Vega, an A main-sequence star? Same question for Aldebaran, a K giant?

12. A◯Yes for Vega. Yes for Aldebaran.
   B◯No for Vega. No for Aldebaran.
   C◯No for Vega. Yes for Aldebaran.
   D◯Yes for Vega. No for Aldebaran.

12)	C	false	false	true	false

1 pt If a giant hand moved Vega twice as far as it is, it moves (1) down and (2) right on the HR diagram. True or false?

13. A◯FF
   B◯FT
   C◯TF
   D◯FF

13)	A	true	false	false	false

1 pt A dwarf star has twice the mass and 8 times the luminosity as the sun. Compared with the sun, it will live

14. A◯for the same amount of time.
   B◯1/4 as long.
   C◯8 times as long.
   D◯2 times as long.

14)	B	false	true	false	false

1 pt A star cluster has M, F, G, and K main-sequence stars and K and M giants. After a few billion years, a single type of star will be gone. What type will be gone?

15. A◯M giants
   B◯G dwarfs
   C◯F dwarfs
   D◯K giants

15)	C	false	false	true	false

1 pt S1: If the temperature in the center of the sun increases, the electrons move faster. S2: If the temperature in the center of a white-dwarf increases, the electrons move faster. S1 and S2 are

16. A◯FF
   B◯FT
   C◯TT
   D◯TF

16)	D	false	false	false	true

1 pt In a degenerate gas, the pressure increases if (1) the temperature increases, (2) if the space for the gas increases. Clauses (1) and (2) are

17. A◯FF
   B◯TF
   C◯TT
   D◯FT

17)	A	true	false	false	false

1 pt S1: A white dwarf is about the same size as the earth. S2: A neutron star is about the same size as Michigan. Statements S1 and S2 are

18. A◯FF
   B◯TF
   C◯TT
   D◯FT

18)	B	false	true	false	false

1 pt In order of occurence, the sun will be

19. A◯planetary nebula, main-sequence star, giant.
   B◯main-sequence star, giant, planetary nebula.
   C◯main-sequence star, planetary nebula, giant.
   D◯giant, main-sequence star, planetary nebula.
   E◯giant, planetary nebula, main-sequence star.

19)	B	false	true	false	false	false

1 pt When the sun first runs out of hydrogen in the center, (1) it burns helium and (2) it becomes hotter in the center. Clause (1) and (2) are

20. A◯TT
   B◯TF
   C◯FT
   D◯FF

20)	C	false	false	true	false

1 pt In 1054, Chinese astronomers saw a supernova in the constellation Cancer. Now it is a neutron star and a supernova remnant. What was that star burning a year before the explosion?

21. **A**◯only hydrogen, helium, & iron.
B◯only neon.
C◯only iron.
D◯hydrogen, helium, neon, as well as other elements.

21) | D | false | false | false | true |

1 pt The oxygen and calcium nuclei in your bones were made most likely in

22. **A**◯a massive star that exploded as a supernova.
B◯rocks.
C◯plants.
D◯the sun.

22) | A | true | false | false | false |

1 pt S1: The sun will become supernova. S2: The sun will become a white dwarf. Statements S1 and S2 are

23. **A**◯FF
B◯TF
C◯FT
D◯TT

23) | C | false | false | true | false |

1 pt Spica, which has 12 times the mass of the sun, will become

24. **A**◯a supernova and then a white dwarf.
B◯neither a supernova nor a white dwarf.
C◯a white dwarf.
D◯a supernova.

24) | D | false | false | false | true |

1 pt The last supernova that was visible to the naked eye was in

25. **A**◯1987
B◯1604
C◯2004
D◯1054

25) | A | true | false | false | false |

1 pt Suppose star A and star B are both main sequence stars. The luminosity of Star A is 100 times less than that of star B. Which answer is always true?

26. **A**◯Star A is hotter.
B◯Star A is cooler.
C◯Star A is closer.
D◯Star A is farther away.

26) | B | false | true | false | false |

1 pt Suppose the temperature of star A and star B are the same. The luminosity of Star A is 100 times less than that of star B. Which answer is always true?

27. **A**◯Star A is farther away.
B◯Star A is bigger.
C◯Star A is smaller.
D◯Star A is closer.

27) | C | false | false | true | false |

1 pt Stars A and B in the Pleiades star cluster have the same temperature. The luminosity of Star A is 100 times less than that of star B. Star A is on the main sequence. Which answer is always true?

28. **A**◯Star B is a white dwarf.
B◯Star A is a lot older.
C◯Star B is a giant.
D◯Star B is a lot older.

28) | C | false | false | true | false |

1 pt S1: A new binary star is found. S2: The mass of the main-sequence star is 4 times the mass of the sun. S3: The giant has the same mass as the sun. Recall that the stars in a binary system formed at the same time. What is surprising about this discovery?

29. **A**◯S1 & S2 together
B◯S1 & S3 together
C◯S2 & S3 together
D◯Nothing

29) | C | false | false | true | false |

1 pt Having an iron core causes a massive star to explode because iron

30. **A**◯is the most stable element.
B◯fuses to produce uranium.
C◯is very heavy.
D◯has many neutrons.

30) | A | true | false | false | false |

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1 pt When will the earth first become too hot for humans?

31. **A**◯In 1000 yr.
  B◯In 1-4 Byr.
  C◯In 1 Myr.
  D◯In 5 Byr.

31) | B | false | true | false | false |

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1 pt The maximum mass for a white dwarf is 1.4 times the mass of the sun. The reason for this limit is:

32. **A**◯Oxygen can ignite at higher masses.
  B◯Electrons condense.
  C◯Carbon can ignite at higher masses.
  D◯Electrons cannot move faster than light.

32) | D | false | false | false | true |

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1 pt The size (Schwartzschild radius) of a black hole having the same mass as the sun is about the size of

33. **A**◯the MSU campus.
  B◯Michigan.
  C◯the BMPS building.
  D◯the earth.

33) | A | true | false | false | false |

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1 pt Some X-ray sources are black holes because

34. **A**◯X-rays can escape from a black hole.
  B◯material falling toward a black hole is heated to high temperature.
  C◯black hole suck up the other types of light
  D◯X-rays are not absorbed by the black hole.

34) | B | false | true | false | false |

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1 pt Which system contains a black hole?

35. **A**◯Crab nebula
  B◯Betelgeuse
  C◯Cygnus X1
  D◯Sirius

35) | C | false | false | true | false |