Name: _____

Class: _____

Due Date: _____

Physics Topic 70 – Fusion and Stars

Answer the following questions.

1. C: Define *nuclear fusion.*

2. C: Give two examples of *nuclear fusion*:

3. C: Define *celestial.*

4. C: Define *star*.

5. C: Define *thermal gas pressure*.

6. C: Define *radiation pressure.*

7. C: Define *gravitational pressure*.

8. C: Define *stellar equilibrium*. Draw an image.

9. C: Define *main sequence star*.

10. C: Define *Sun*.

11. C: Describe the *proton-proton cycle*. Draw an image.

12.C: Define *apparent brightness b.* Units?

13.C: Define *luminosity L.* Units?

14.C: Define a *perfect black body*. Draw an image.

15.C: Describe *Wien's displacement law*. Draw an image.

16.C: Describe the *absorption spectrum*.

17.C: Describe *main sequence stars*.

18.C: Describe the *Hertzsprung-Russell diagram*. Draw an image.

19.C: Describe the *instability strip*.

20.C: Define a *red giant*.

21.C: Define a *red supergiant*.

22.C: Define a *dwarf star*.

23.C: Define *electron degeneracy pressure*.

24.C: Define a *white dwarf*.

25.C: Describe what happens after a *supernova*.

26.C: Describe the term *evolutionary path*. Draw an image.

27.C: Describe the equation $L \propto M^{3.5}$.

28.C: Define *astronomical unit*.

29.C: Define *light year*.

30.C: Define *stellar parallax* (or *parallax method*).

31.C: Define *parallax angle*. Draw an image.

32.C: Define *arc second*.

33.C: Define *parsec*.

34.C: Describe the equation $d(\text{parsec}) = \frac{1}{p(\text{arc}-\text{second})}$.

35.E: An example of a fusion reaction is when deuterium and tritium combine to create helium, a neutron, and energy.

a. Determine the energy released (in MeV) from this reaction with the data given.

Binding energy of deuterium: 2.22452 MeV
Binding energy of tritium: 8.48179 MeV
Binding energy of helium: 28.2957 MeV
Binding energy of a neutron: 0 MeV

b. Determine the change in mass (in u) from this reaction.

36.E: The temperature of a main sequence star is approximately 2.50×10^4 K.

a. Determine the peak wavelength of this main sequence star.

b. Determine an approximate value of the luminosity of this main sequence star.

c. Determine an approximate value for its radius.

37.E: The surface temperature of a main sequence star is approximately 1.00×10^4 K.

a. Use the Hertzsprung-Russell diagram to estimate the luminosity of the star.

b. The apparent brightness of this main sequence star is approximately $1.60 \times 10^{-9} \frac{\text{W}}{\text{m}^2}$. Determine the approximate distance between this main sequence star and Earth.

38.E: The parallax angle to a star is 0.320 arc-seconds. Determine the distance, in meters, to the star.

39.E: The parallax angle for Betelgeuse is approximately 5.95×10^{-3} arc − seconds. Determine the distance of Betelgeuse from Earth in

a. parsecs,

b. meters,

c. light years, and

d. astronomical units.