Name: _____ Date: _____ Period: _____

Lesson E&S 5.2 – Stars

Evidence Notebook

Key Ideas

1. A nuclear reaction of small nuclei coming together to form a larger one is known as:

2. The motion of energy in a star from the core to the surface creates _____ fields.
3. Solar Flares
    a. Solar flares are bursts of _____ waves.
    b. They occur when _____.
4. Coronal Mass Ejections (CMEs) are giant clouds of particles hurled out into space. They are mostly made of _____.
5. Sunspots reappear with regularity approximately every _____.
6. My hypothesis: What effect does solar activity have on the sun's energy output?

7. Solar Wind:
    a. comes from _____ and _____. Another term for solar wind is _____.
    b. can disrupt and damage _____.
    c. can move at _____ miles per hour!
8. Earth's magnetic field is created by its _____ and _____.
9. What protects Earth from the sun's solar winds?

10. Aurora: Illustrate how Earth's Northern and Southern lights form. Label the following in your diagram: Earth, sun, solar wind, Earth's magnetic field, Northern lights, Southern lights

11. About _____ of stars are binary or triplets.
12. Apparent magnitude
    a. Definition:

    b. Measurement: The brightest star's value was _____.
    c. *(Circle one)* Fainter stars are assigned higher/lower numbers.
    d. Illustrate an example of apparent magnitude:

13. Absolute magnitude
    a. Absolute magnitude is the measure of how bright stars appear if they were all _____ from Earth.
    b. Illustrate an example of absolute magnitude:

14. Stellar brightness

Common Name	Distance (Light-Years)	Apparent Magnitude	Absolute Magnitude
Sun	–	–26.72	4.8
Sirius	8.6	–1.46	1.4
Capella	42	0.08	–0.48
Rigel	770	0.12	–8.1
Betelgeuse	640	0.50	–7.2
Spica	260	0.98	–3.2
Pollux	34	1.14	0.7
Deneb	1500	1.25	–7.2
Regulus	70	1.35	–0.3

a. How can you use the table above to determine which star appears the brightest when seen from Earth?

b. How can you use the table above to determine which star is the overall faintest of them all?

15. What colors are associated with the temperatures of stars?

16. As the mass of a star increases the:
    a. brightness _____.
    b. temperature _____.
    c. life cycle goes _____.

17. Main-sequence stars
    a. Make a H-R Diagram illustrating the main-sequence star trends. *Include absolute magnitude on your y-axis, temperature on your x-axis and relative size on your graph*.

    b. About _____ to _____ of stars following the main-sequence trend.
    c. Large main-sequence stars are _____ and _____.
    d. Small main-sequence stars are _____ and _____.
18. Interstellar medium is composed of
    _____.
19. Explain how a nebula can form a protostar in four steps:
    a. Step 1: _____.
    b. Step 2: _____.
    c. Step 3: _____.
    d. Step 4: _____.
20. What significant event define a main-sequence star from a protostar?

21. Illustrate the star life cycle:

22. The majority of a star's life will be spent in which stage of the life cycle?

23. How does a main-sequence star stay stable?

24. What causes a main-sequence star to become a red giant?

25. What elements are fused during the red giant star phase?

26. The affect of _____ continues to weaken are the red giant layer drift further into space. This forms a _____.
27. Once the nebula drifts completely away all that is left over is the hot dense core, a _____, and fusion _____.
28. How does a black dwarf form?

29. Besides the larger size, red super giants can fuse elements up to _____ where are normal red giants only fuse up to _____.
30. When fusion of a red super giant ends it collapses and explodes as a supernova. What else forms during this explosion?

31. Neutron stars are made up entirely from _____.
32. The largest main-sequence stars ultimately end up as _____. They gravity is so strong that _____ cannot escape from it.

CHECKPOINTS

33. Where in our sun is energy produced, and how does the process occur?
    a. Nuclear fusion produces energy in the core of stars, including our sun.
    b. Energy is produced in a star's corona by nuclear fission.

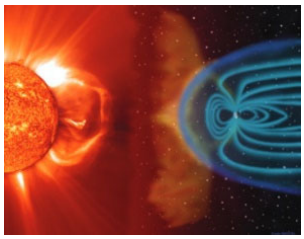
c. A star's radiative zone produces energy by nuclear fusion.
d. All stars generate energy by nuclear fusion at the top of convection cells.

34. Complete the chart by correctly sorting the phases of stellar evolution listed below. *There may be more than one answer for each description.*

Description	Phase
Collapse due to gravitational forces forms a dense accumulation of gas and dust	a. Late in stellar evolution b. A protostar c. A dying star d. A main-sequence star e. Early in stellar evolution
Gravitational forces are stronger than the outward force of fusion	
Hydrogen is fusing to form helium in the star's core	

35. Through your telescope, you observe a star in the constellation Orion. It appears reddish in color and is quite bright compared to other stars in the sky.
Evaluate the information in the passage above and <u>explain</u> what type of star you are looking at. Refer to your diagram in 17a to help you.

36. Through laboratory studies, the spectra of many gases are known. This allows scientists to do what?
    a. Scientists can better understand the composition of the gases in our atmosphere and how they absorb electromagnetic radiation.
    b. By comparing the spectra of known gases to those of objects at great distances, scientists can identify the composition of large-scale features such as nebulae, stars, and galaxies.
    c. Spectral analysis allows scientists to understand the motion of objects in space relative to Earth if they have radial motion.
    d. Scientists can determine the temperature of a star.
37. The figure below shows something important about how the sun affects Earth. Which of the following statements describes the process that is illustrated?



    a. The sun causes Earth's magnetic field to be strongest in the direction of Earth's poles and weaker with distance from Earth.
    b. Sunspots change solar energy output and occur in predictable patterns.
    c. High-energy solar particles are released during solar events, but most are deflected by Earth's magnetic field.
    d. Solar flares release vast amounts of light energy and are related to changes in the sun's magnetic field.
38. Which of the following best explains the effect solar wind has on Earth's magnetic field?
    a. It reduces the field generated by Earth's core.
    b. It causes Earth's field to be stronger everywhere.
    c. It shifts the field in a direction away from the sun.
    d. It causes the shape of the field to be more uniform.

39. What is the small, hot, extremely dense core left after a star collapses called?
    a. red giant
    b. red dwarf
    c. black dwarf
    d. white dwarf
40. During the main-sequence stage, how is energy generated in a star's core?
    a. Carbon fuses into oxygen.
    b. Hydrogen fuses into helium.
    c. Carbon fuses into hydrogen.
    d. Helium fuses into hydrogen.
41. How long would a star with the sun's mass stay on the main sequence?
    a. until it makes iron
    b. until it makes uranium
    c. as long as it fuses helium
    d. as long as it fuses hydrogen
42. After its temperature rises to 10,000,000 °C, when does a protostar becomes a star?
    a. nuclear fusion ends
    b. nuclear fission ends
    c. nuclear fusion begins
    d. nuclear fission begins
43. What is a large, bright star whose hot core has used most of its hydrogen?
    a. Nova
    b. Giant
    c. Pulsar
    d. Supernova
44. Which of these is not a characteristic of white dwarfs?
    a. a long period of existence
    b. a hot, extremely dense core
    c. a ring-like planetary nebula
    d. a position in the lower left of the H-R diagram
45. What is the color of the hottest stars?
    a. Red
    b. Blue
    c. White
    d. Yellow
46. Why might an old main-sequence star have a greater percentage of helium than a younger main-sequence star?

Name: _____ **Date:** _____ **Period:** _____

47. Color each element based on where it was formed in the star life cycle. Create a key for your colors.

Periodic Table of the Elements

1 H Hydrogen 1.008																	2 He Helium 4.003
3 Li Lithium 6.941	4 Be Beryllium 9.012											5 B Boron 10.811	6 C Carbon 12.011	7 N Nitrogen 14.007	8 O Oxygen 15.999	9 F Fluorine 18.998	10 Ne Neon 20.180
11 Na Sodium 22.990	12 Mg Magnesium 24.305											13 Al Aluminum 26.982	14 Si Silicon 28.086	15 P Phosphorus 30.977	16 S Sulfur 32.065	17 Cl Chlorine 35.453	18 Ar Argon 39.948
19 K Potassium 39.098	20 Ca Calcium 40.078	21 Sc Scandium 44.956	22 Ti Titanium 47.867	23 V Vanadium 50.942	24 Cr Chromium 51.996	25 Mn Manganese 54.938	26 Fe Iron 55.845	27 Co Cobalt 58.933	28 Ni Nickel 58.693	29 Cu Copper 63.546	30 Zn Zinc 65.380	31 Ga Gallium 69.723	32 Ge Germanium 72.640	33 As Arsenic 74.922	34 Se Selenium 78.960	35 Br Bromine 79.904	36 Kr Krypton 83.798
37 Rb Rubidium 85.468	38 Sr Strontium 87.620	39 Y Yttrium 88.906	40 Zr Zirconium 91.224	41 Nb Niobium 92.906	42 Mo Molybdenum 95.950	43 Tc Technetium (98)	44 Ru Ruthenium 101.070	45 Rh Rhodium 102.910	46 Pd Palladium 106.420	47 Ag Silver 107.870	48 Cd Cadmium 112.441	49 In Indium 114.820	50 Sn Tin 118.710	51 Sb Antimony 121.760	52 Te Tellurium 127.900	53 I Iodine 126.900	54 Xe Xenon 131.290
55 Cs Cesium 132.905	56 Ba Barium 137.327	71 Lu Lutetium 174.970	72 Hf Hafnium 178.49	73 Ta Tantalum 180.950	74 W Tungsten 183.840	75 **Re** Rhenium 186.210	76 Os Osmium 190.230	77 Ir Iridium 192.220	78 Pt Platinum 195.080	79 Au Gold 196.970	80 Hg Mercury 200.590	81 Tl Thallium 204.380	82 Pb Lead 207.200	83 Bi Bismuth 208.980	84 Po Polonium (209)	85 At Astatine (210)	86 Rn Radon (222)
87 Fr Francium (223)	88 Ra Radium (226)	103 Lr Lawrencium (266)	104 Rf Rutherfordium (261)	105 Db Dubnium (268)	106 Sg Seaborgium (269)	107 Bh Bohrium (270)	108 Hs Hassium (278)	109 Mt Meitnerium (268)	110 Ds Darmstactium (271)	111 Rg Roentgenium (282)	112 Cn Copernicium (285)	113 Nh Nihonium (286)	114 Fl Flerovium (289)	115 Mc Moscovium (290)	116 Lv Livermonium (293)	117 Ts Tennessine (294)	118 Og Oganesson (294)
		57 La Lanthanum 138.905	58 Ce Cerium 140.116	59 Pr Praseodymium 140.910	60 Nd Neodymium 144.240	61 Pm Promethium (145)	62 Sm Samarium 150.360	63 Eu Europium 151.960	64 Gd Gadolinium 157.250	65 Tb Terbium 158.930	66 Dy Dysprosium 162.500	67 Ho Holmium 164.930	68 Er Erbium 167.260	69 Tm Thulium 168.930	70 Yb Ytterbium 173.050		
		89 Ac Actinium (227)	90 Th Thorium 232.038	91 Pa Protactinium 231.040	92 U Uranium 238.030	93 Np Neptunium (237)	94 Pu Plutonium (244)	95 Am Americium (243)	96 Cm Curium (247)	97 Bk Berkelium (247)	98 Cf Californium (251)	99 Es Einsteinium (252)	100 Fm Fermium (257)	101 Md Mendelevium (258)	102 No Nobelium (259)		

Version 1.3

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