NOVA SUN LAB

NAME _____

Go to the NOVA LABS sun lab: https://www.pbs.org/wgbh/nova/labs/lab/sun/

Click on 

and then click Sun to begin watching the short videos about the sun. There are 10, and it will take 27 minutes to complete.

VIDEO 1 "ANATOMY OF THE SUN"

1. Temperature at surface: _____
2. % hydrogen: _____
3. % helium: _____
4. Solid? _____ liquid? _____ gas? _____
5. What is plasma? _____
6. What layer is the nuclear reactor? _____
7. What process makes it so hot in the core? _____
8. On average, it takes more than _____ years for a photon, a packet of energy released by the core, to escape the dense radiative zone.
9. How long does it take for a photon to move through the convective zone? _____
10. What is the visible surface called? _____
11. What are the 2 layers of the sun that make up its atmosphere? _____ + _____

VIDEO 2 "THE SUN'S ENERGY"

12. How long has the sun been shining? _____
13. What is the high energy mix of charged particles called? _____
14. Protons (Hydrogen) fuses together to form _____ atoms and release a staggering amount of _____.
15. These nuclear _____ reactions are the source of the sun's limitless energy.
16. Fusion pushes _____ (what direction?)
17. Gravity pushes _____ (what direction?)

VIDEO 3 THE DYNAMIC SUN

18. True or False The sun has a north and south pole.

19. Plasma spins faster at the _____ than the _____.
20. As magnetic fields emerge (on the surface) they form _____.
21. Where they break through the surface they create the cool dark regions we call _____.
22. Sometimes the magnetic field lines cross, unleashing a solar _____.
23. A coronal mass ejection (or CME) can propel huge amounts of _____ away from the sun's surface.
24. A single CME can blast _____ billion tons of matter out into the solar system.
25. Every 11 years the sun's magnetic field shifts, flipping magnetic north and _____.

VIDEO 4 SOLAR WINDS AND STORMS

26. How far away is the sun? _____
27. The sun belches out a million tons of energetic particles every second, called solar _____.
28. What are the 2 main kinds of storms? _____ and _____
29. Mark solar flare (SF) or coronal mass ejection (CME)
    - — Most common solar storm
    - — Quick, powerful, and localized
    - — Shoots high energy particles, as well as x-rays and gamma rays
    - — Bigger
    - — Slower
    - — About 30 million miles across
30. A sunspot is cool because magnetic fields suppress the flow of _____from below.

VIDEO 5 EARTH'S MAGNETIC FIELD

31. The area of space where the magnetic field interacts with the solar wind is called Earth's _____.
32. As positively charged protons and negatively charged electrons enter the magnetosphere, most of them are deflected _____Earth, long before they reach the atmosphere.
33. As charged particles from the Sun _____with nitrogen and oxygen molecules in our atmosphere, they create the cosmic light shows known as _____.
34. Some storms are so big they interfere with _____, and can cause _____ to alter their routes.

VIDEO 6 THE THREAT TO EARTH

35. Solar wind and storms hit Earth all the time, but our _____ _____ protects us.

36. In 1859 the aurora were so strong, they turned night into _____.
37. Currents in telegraph lines were so strong they _____ operators and started _____ in offices.
38. How long might it take to repair a blown transformer? _____
39. Put a check next to items that might be affected by a nasty solar storm:
    - — Global positioning satellites (GPS)
    - — Long distance communication
    - — Airplane tracking
    - — Astronauts in space
    - — Plant growth
    - — Thunderstorms
40. Will we be able to predict when the next megastorm will come? _____

VIDEO 7 THE ELECTROMAGNETIC SPECTRUM

41. Nuclear reactions release a tremendous amount of energy in the form of electromagnetic _____.
42. Particles that carry this energy, called _____, can take thousands of years to reach the surface.
43. Waves that carry more energy oscillate more quickly, with a shorter _____ between the crest of each wave.
44. List the electromagnetic waves in order from lowest energy to highest. (Use last year's knowledge.)

_____ _____ _____ _____ _____ _____ _____

VIDEO 8 SOLAR SPACE TELESCOPES

45. What are the 3 solar telescopes?

    _____ _____ _____

*****WATCH THE LAST 2 VIDEOS—NO QUESTIONS TO ANSWER*****

When the videos are finished, click the "back" arrow in chrome 2 times. (Get to the original page.) Now click the button CHALLENGE, then SOLAR CYCLE. Read the info to the left and work through the activities. Be sure you read and understand before you click "next." You can't go back; you can only start over. ☹ Answer questions below as you go along.

46. We count sunspots to estimate the level of _____ activity.
47. What is the difference between a spot and a group? _____
48. What is your first estimate for groups? _____ spots? _____

49. Fill in the chart below: (10pts)

DATE	SUNSPOT NUMBER (R) YOUR ESTIMATE	SCIENTIFIC ESTIMATE
Dec 2010		
Mar 2011		
Jul 2011		
Oct 2011		
Jan 2012		

Now click **STORM PREDICTION**, read, then click Huge Spots.

50. The size of a sunspot is a good indicator of the strength of the _____ _____.
51. The larger the spot, the greater its potential for generating _____ _____.
52. Which region was a very active region for flares? _____
53. What was the name of the sunspot? _____
54. What class of flares did it release? _____

Make sure you are still in **STORM PREDICTION**, then click Complicated Spots.

55. Highly complex sunspot groups are more likely to produce _____ than simple groups.
56. Which region is more likely to flare? _____
57. What was the date for this flare? (did you watch the video?) _____

Make sure you are still in **STORM PREDICTION**, then click Rapid Growth.

58. One of the clearest signs of a powerful _____ field just under the Sun's surface is a sunspot region that grows very _____.
59. Sometimes, these grow from nothing to larger than the diameter of _____ in less than a day.
60. Which region is more likely to flare? _____
61. What was the date for this flare? (did you watch the video?) _____

Make sure you are still in **STORM PREDICTION**, then click Mixed-Up Magnetic Fields.

62. When magnetic fields in an active region become _____, the potential for solar storms increases.
63. White magnetic fields point which direction? _____
64. What color are positive magnetic fields? _____
65. Which region produced the eruption? _____
66. What kind of eruption was it? _____

Make sure you are still in STORM PREDICTION, then click Threatening Filaments.

67. What are filaments? _____
68. Where are filaments located? _____
69. If a filament is seen stretching across large regions this can indicate the strong possibility of a _____.
70. Which region erupted? _____
71. The filament that spanned across this region prior to the eruption made up a large portion of _____ _____ _____.

Now click OPEN INVESTIGATION and then BEGIN.

72. How many different types of sun images are available? _____

Name them.

73. _____
74. _____
75. _____
76. _____
77. _____

78. Look at today's sunspots. How many groups? _____ How many individual spots?_____
79. Go to the year 2019, December 25th. How many sunspots do you see? _____
80. Was this date sunspot maximum or sunspot minimum? _____
81. Now set the timestep for 28 days and click the right arrow to progress month by month. How much time passed before you finally see some significant sunspots? (In what month+year were there significant sunspot events?) _____
82. How does solar activity today compare with 4 years ago? _____