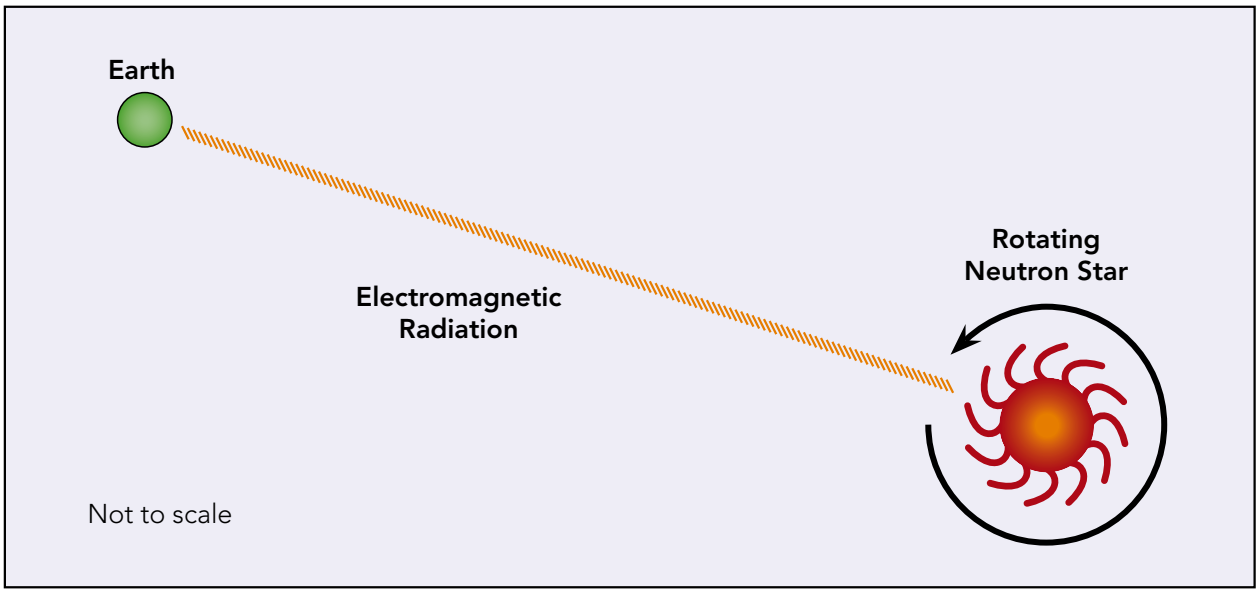
Neutron Stars and Pulsars

Pulsars have been called the lighthouses of deep space. They are rotating, dense, exploded neutron stars that emit huge amounts of electromagnetic radiation, including light, X-rays and radio waves. The explosion is so fast, and so intense, it sets the remains of the star, which are mostly neutrons, spinning up to 1000 times per second. Since there is no force (such as gravity) acting to stop it, the star just continues spinning. The light pulses at a steady rate and the pulses remain constant over time.

In the same way as the bulb in a lighthouse revolves, creating a flash of light, so the neutron star spins. A famous pulsar is the Crab nebula. In the year 1054 a supernova explosion occurred that was so powerful that stargazers in China, the Middle East and North America witnessed it. The pulsar was visible night and day for nearly one month even though it occurred 6500 light years from Earth! The Crab still pulses at about 30 flashes per second and is visible as a misty patch in the skies.



Exercise: Demonstrate The Motion Of A Pulsar

In a darkened room, ask another student to turn at a steady rate while holding a lit torch. The light will 'pulse' as the student faces the class, and dim as it faces the opposite direction. Now imagine the student with the torch spinning at a rate of up to 1000 times per second.

1 Define "nebula " _____

2 Define " comet" _____

3 Define "asteroid " _____

4 Define " meteor" _____

5 Define "black hole " _____

6 Define "neutron star " _____

7 Define "red giant " _____

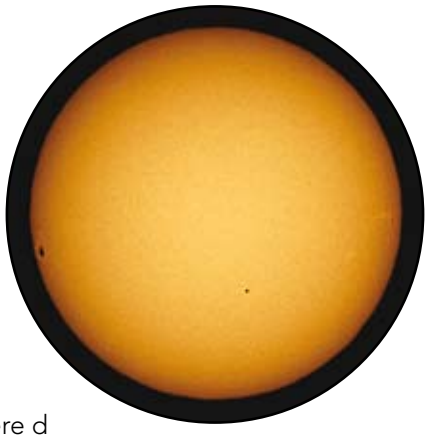
8 Define " super giant" _____

9 Define "white dwarf " _____

10 Define " red dwarf" _____

11 Define " black dwarf" _____

1 Complete the passage below using words from this list:



second	star	heat	blind
hot	orbit	centre	hydrogen
light	Earth	billions	

All stars are a _____ gaseous bodies. The Sun is a b _____ we all know. As stars go, it is an average, stable, middle-aged star and one of an estimated 200 million stars in the Milky Way. It is a G2 type star. The Sun is found at the c _____ _____ of our Solar System. It is not a solid structure, but an enormous ball of gas where d _____ is reacting at a rate of 400 million tons per e _____ . The product of this fusion reaction is helium and heat. Among stars, the sun is not outstanding, yet life on f _____ could not survive without its g and h _____ . Scientists estimate that the Sun has been giving out energy at around its present rate for i _____ of years. The temperature at the Sun's core is estimated to be 15 million°C and its surface temperature is a cool 6000°C. In the same way hot fat splatters out of a frying pan, so do burning tongues of fire 'splatter' off the Sun. The Sun also orbits the galaxy, taking about 250 million years to complete one j _____ . This is called a cosmic year. The Sun is so bright it will k _____ you if you stare at it for any length of time. So remember, if you do not wish to risk damaging the retina of your eyes, never look directly at the Sun.

Sunspots

Using special equipment, scientists· have discovered sunspots. Sunspots are dark regions on the Sun's surface where the temperature is lower. Chinese astronomers may have observed sunspots over 2000 years ago. Galileo used a telescope early in the seventeenth century to observe and record sunspots. Sunspots seem to follow a cycle of 11 (Earth) years. Often, when sunspots are created, spectacular light shows, known as Aurorae, that can be seen at the Earth's poles, occur.

Solar Winds

As the Sun 'burns', great tongues of fire are sent out from its surface. From these fiery flares tiny, charged particles stream out and can react with gases in the lower atmosphere. Such reactions are also thought to contribute to Aurorae. The particles can also become trapped in the Earth's magnetic field, creating electrically charged belts around the Earth's equator. Solar flares can cause disruption to radio communication on Earth.

2 Despite the Sun using millions of tonnes of hydrogen a second, why do scientist estimate it can continue to give out its current rate of energy for billions of years? _____

_____

4 Why could it be dangerous to study sunspots with a telescope? _____

_____

5 What is the maximum temperature of the Sun's centre? _____

6 What substance is produced in the Sun by the fusion of hydrogen? _____

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