Science of Light Pollution Questions

1) How does the full moon impact people's sleep patterns?
    a. Answer
        i. People sleep the same amount during the full moon.
        ii. People get less sleep during the full moon.
        iii. People get slightly more sleep during the full moon.
        iv. People get a lot more sleep during the full moon.
    b. Source
        i. https://www.sciencenewsforstudents.org/article/full-moon-shortchanges-sleep

2) Define Circadian Rhythm
    a. Answer
        i. Biological functions such as body temperature and sleeping/waking times that operate on a roughly 24-hour cycle.
    b. Source
        i. https://www.sciencenewsforstudents.org/article/explainer-our-bodies-internal-clocks

3) List three of the most common sources of light pollution. This could be asked to the next three students in the line.
    a. Answer
        i. Streetlamps
        ii. Parking lot/shopping mall lights
        iii. Exterior home lights
        iv. Exterior business lights
        v. Neon signs
        vi. Illuminated signboards
        vii. Car lights
        viii. Public centers such as city parks, bus and train stations, and airports
    b. Sources
        i. https://darksky.org/resources/what-is-light-pollution/causes/
        ii. https://eartheclipse.com/pollution/various-causes-of-light-pollution.html

4) Sky glow is the brightening of the night sky, mostly over urban areas, due to the electric lights of cars, streetlamps, offices, factories, outdoor advertising, and buildings. What percent of the Earth's population lives under skyglow?
    a. Answer
        i. 80% (could also be US which is 99%)
    b. Source
        i. https://darksky.org/news/80-of-world-population-lives-under-skyglow-new-study-finds/

5) Light pollution can have significant negative effects on wildlife. List a way that light pollution can negatively impact wildlife. As above, have the next three students in line answer the question.
    a. Answer
        i. Migration
            1. Example: Sea turtle hatchlings instinctively know to head toward the brightest source of light, because for hundreds of years before mankind mastered the darkness, moonlight and starlight reflecting off the ocean were the brightest lights on the beaches
        ii. Reproduction
            1. Example: Many animals have reproductive cycles that require complete darkness. Light pollution interferes with their ability to reproduce.
        iii. Hunting
            1. Example: Many animals have evolved their eyesight to be more effective hunters in the dark. Light pollution interferes with their ability to find and target prey.
        iv. Feeding
            1. Example: Deer and animals are killed on roads by vehicles in the evenings while they are looking for food, because the glare of these cars blind them, and they are unable to run off the streets in time.
    b. Sources
        i. https://www.jmu.edu/planetarium/light-pollution.shtml
        ii. https://eartheclipse.com/pollution/serious-effects-of-light-pollution.html

6) The hormone melatonin is secreted as a response to darkness or light and is thought to be responsible for regulating sleep. What might be some negative human health problems associated with a light pollution-induced reduction in melatonin? As above, have the next three students in line answer the question.
    a. Acceptable answers:
        i. Lack of sleep/sleep deprivation
        ii. Fatigue
        iii. Headaches
        iv. Stress
        v. Anxiety
        vi. Cancer
    b. Sources
        i. https://pmc.ncbi.nlm.nih.gov/articles/PMC2627884/
        ii. https://eartheclipse.com/pollution/serious-effects-of-light-pollution.html

7) List three ways to reduce light pollution that would be effective. As above, have the next three students in line answer the question.
    a. Answer
        i. Improved Government regulation of lights
        ii. Improved lighting technology
        iii. Purchases of more energy-reduced lights
        iv. Laws that control outdoor lighting
        v. Improved manufacturing design and production of high-efficiency light sources
        vi. Using outdoor lighting only when and where it is needed
        vii. Shielding outdoor lights
        viii. Directing light down instead of outwards or up into the sky
        ix. Closing window blinds, shades, and curtains at night to keep light inside
    b. Sources
        i. https://eschooltoday.com/learn/light-pollution-prevention/
        ii. https://education.nationalgeographic.org/resource/light-pollution/

8) According to DarkSky International, approximately 1/3 of all lighting is wasted. Estimate the annual cost of this waste.
    a. Answer
        i. Approximately $3.3 billion dollars (teacher can decide the acceptable level of accuracy).
    b. Sources
        i. https://darksky.org/resources/what-is-light-pollution/effects/energy-climate/
        ii. https://www.darksky.org/wp-content/uploads/2021/01/Light-Pollution-Wastes-Energy-and-Money-English.pdf
        iii. https://www.jmu.edu/planetarium/light-pollution.shtml

9) List three ways light pollution can interfere with measurements from optical telescopes used for astronomy. The next three students in line may answer this question.
    a. Answer
        i. Forcing the decommissioning of observatories in light-polluted areas
        ii. Reducing the usefulness of observational equipment
        iii. Making data collected from light-polluted areas more difficult to interpret
        iv. Reducing astronomers' ability to observe, study, and make predictions about celestial objects such as asteroids and comets
        v. Visual interference from satellites
    b. Source
        i. https://www.vaticanobservatory.org/light-pollution/

10) Suppose you wanted to assess your community's awareness of light pollution and its associated issues by distributing a survey. Which scenario would be the best way to collect these responses?
    a. Answer
        i. Posting your survey on social media for your friends to complete
        ii. Asking parents, teachers, and other adults you know to complete the survey
        iii. Asking parents, teachers, and other adults you know to complete the survey and share with their friends to collect more data
        iv. Asking your teacher to review your survey and help you contact a city official about distributing it to residents in your town
    b. Source
        i. https://www.qualtrics.com/experience-management/research/sampling-methods/