Answer all the questions below then check your answers.

1. What is the collective name for the elements in Group 0 of the periodic table?

b. Name the lightest noble gas.

2. Name one use of helium.

3. State the trend in boiling points of noble gases as you go down the group.

4. Explain why noble gases are generally unreactive.

5. Give two properties of noble gases.

6. Argon is used in some types of welding. Explain why it is suitable for this use.

7. Compare and contrast the properties of helium and neon.

8. Discuss the uses of the noble gases helium, neon and argon, linking their properties to their applications.

9. Describe how the density, boiling points, and reactivity of noble gases change as you move down Group 0, and explain why these trends occur.

10. Noble gases are often used in lighting and display technologies. Explain the properties of noble gases that make them suitable for these applications and provide examples.

Answers

1. What is the collective name for the elements in Group 0 of the periodic table?

   Noble gases

b. Name the lightest noble gas.

   Helium.

2. Name one use of helium.

   Filling balloons, airships, or used in MRI scanners

3. State the trend in boiling points of noble gases as you go down the group.

   Boiling points increase down the group

4. Explain why noble gases are generally unreactive.

   Noble gases have a full outer shell of electrons (8, except helium with 2). This stable electron configuration means they have no tendency to gain or lose electrons.

5. Give two properties of noble gases.

   Any two of the following:

   Colourless
   Odourless
   Very low reactivity
   Exist as single atoms (monatomic)

6. Argon is used in some types of welding. Explain why it is suitable for this use.

   Argon is unreactive due to its full outer shell of electrons. This prevents it from reacting with the hot metal being welded, protecting the weld from oxidation.

7. Compare and contrast the properties of helium and neon.

Similarities: Both are noble gases, colourless, odourless, and unreactive.
Differences:
Helium is less dense than neon.
Helium has a lower boiling point than neon.
Helium has only 2 electrons in its outer shell, while neon has 8.

8. Discuss the uses of the noble gases helium, neon and argon, linking their properties to their applications.

Helium: Low density and unreactive nature make it ideal for filling balloons and airships. Also used in MRI scanners due to its superconducting properties at low temperatures.

Neon: Used in advertising signs because it glows reddish-orange when an electric current passes through it.

Argon: Used in welding to create an inert atmosphere, protecting the weld from oxidation. Also used in incandescent light bulbs to prevent the filament from burning out too quickly.

9. Describe how the density, boiling points, and reactivity of noble gases change as you move down Group 0, and explain why these trends occur.

As you move down Group 0 from helium to radon:

Density: Increases. This is because the atomic mass and size of the atoms increase, resulting in more mass per unit volume.

Boiling Points: Increase. The atoms get larger and the van der Waals forces between the atoms become stronger, requiring more energy (higher temperature) to transition from the liquid to the gaseous state.

Reactivity: Generally remains low but can slightly increase. While noble gases are known for their lack of reactivity, the heavier noble gases like xenon and radon

can form compounds under specific conditions. This is because the outer electrons are farther from the nucleus and more shielded by inner electrons, making them slightly easier to remove or share.

10. Noble gases are often used in lighting and display technologies. Explain the properties of noble gases that make them suitable for these applications and provide examples.

Noble gases are ideal for lighting and display technologies because they are inert, meaning they do not react with the filament or other components within the light bulb, extending the life of the bulb. Additionally, noble gases emit distinctive colours when an electric current passes through them:

Neon: Emits a bright red-orange light, used in neon signs for advertising.

Argon: Used in incandescent and fluorescent light bulbs to prevent the oxidation of the filament and emits a blue-violet light.

Krypton and Xenon: Used in high-intensity discharge lamps, such as those in photography and projector bulbs, and emit bright white light. Their heavier atoms and larger number of electrons make them effective in producing intense, bright light.