Subject: Physics **Class: C2** **Day: Saturday (16/11/2024)**

Topic: Introduction to Dispersion and Electromagnetic Waves

The study of light and electromagnetic waves bridges the gap between physics and our everyday experiences. Dispersion of light explains how white light splits into its constituent colors, revealing the visible spectrum, each color having unique properties tied to its wavelength and frequency. The electromagnetic spectrum, on the other hand, includes a wide array of waves used in modern technology and medicine, from radio waves to gamma rays. Understanding these concepts equips us to explore their applications and recognize their effects on health and the environment.

3.2.4 Dispersion of Light

1. Describe the Dispersion of Light

Dispersion occurs when white light passes through a glass prism and splits into a spectrum of colors. This phenomenon is caused by the varying refractive indices of the prism material for different wavelengths of light. The order of colors from the prism is red, orange, yellow, green, blue, indigo, and violet (ROYGBIV), with red having the longest wavelength and violet the shortest.

2. The Seven Colors of the Visible Spectrum

The traditional seven colors of the visible spectrum can be ordered:

- *By Wavelength (decreasing): Red > Orange > Yellow > Green > Blue > Indigo > Violet*

- *By Frequency (increasing): Violet > Indigo > Blue > Green > Yellow > Orange > Red*

Electromagnetic Waves: Speed and Applications

Speed of Electromagnetic Waves

1. *In a Vacuum: \(3.0 \times 10^8\) m/s.*
2. *In Air: Approximately the same as in a vacuum, due to negligible resistance.*

Applications of Electromagnetic Waves

- *Radio Waves: Communication (radio, TV, astronomy).*
- *Microwaves: Mobile communication, satellite TV, cooking.*
- *Infrared Radiation: Remote controls, thermal imaging.*
- *Visible Light: Vision, photography.*
- *Ultraviolet Light: Sterilization, security marking.*
- *X-Rays: Medical imaging, cancer treatment.*
- *Gamma Rays: Cancer therapy, sterilization.*

Damage Caused by Electromagnetic Radiation

1. *Excessive Exposure: Causes heating, burns.*
2. *Ionizing Effects: Leads to cell mutations, cancer (UV, X-rays, gamma rays).*

Part II: Short Questions

1. List the regions of the electromagnetic spectrum in order of frequency.

2. State the speed of electromagnetic waves in a vacuum.

3. Name three uses of radio waves.

4. Explain the role of microwaves in communication.

5. List two applications of infrared radiation.

6. What is the role of visible light in daily life?

7. How is ultraviolet light useful for security?

8. Describe a medical use of X-rays.

9. How are gamma rays used in medicine?

10. What are the harmful effects of excessive electromagnetic exposure?

11. Discuss the health impacts of ultraviolet radiation.

12. Explain how X-rays and gamma rays cause ionization in human cells.

Part III: Multiple Choice Questions (MCQs)

1. Which of the following has the highest frequency?

- A. Radio waves

- B. Microwaves

- C. X-rays

- D. Visible light

Answer: C. X-rays

2. The speed of electromagnetic waves in a vacuum is approximately:

- A. \(3.0 \times 10^8\) m/s

- B. \(2.0 \times 10^8\) m/s

- C. \(1.5 \times 10^8\) m/s

- D. \(4.0 \times 10^8\) m/s

Answer: A. \(3.0 \times 10^8\) m/s

3. Infrared radiation is commonly used in:

- A. Medical imaging

- B. Microwave ovens

- C. Remote controls

- D. Radio broadcasting

Answer: C. Remote controls

4. Which type of radiation is used for sterilizing water?

- A. Infrared

- B. Visible light

- C. Ultraviolet

- D. Microwaves

Answer: C. Ultraviolet

5. Which of the following causes cell mutation and cancer?

- A. Radio waves

- B. Microwaves

- C. Ultraviolet rays

- D. Infrared radiation

Answer: C. Ultraviolet rays

6. Which electromagnetic wave is used to kill cancer cells?

- A. X-rays

- *B. Gamma rays*

- *C. Microwaves*

- *D. Radio waves*

Answer: B. Gamma rays

7. Excessive exposure to electromagnetic waves can lead to:

- *A. Skin whitening*

- *B. Burns and heating of soft tissues*

- *C. Improved immunity*

- *D. Decreased body temperature*

Answer: B. Burns and heating of soft tissues

- Past Paper Questions: Attempt past paper questions related to the Dispersion and Electromagnetic Waves.

Class	Teachers	Teachers' Email Addresses	Instructions
C2A			
C2B	MN	Nadeem_MN_sadiq@protonmail.com	S3B students will send their home assignments to (MN) for checking and getting feedback.
C2C	UM	Malikusman_um_sadiq@protonmail.com	S3C students will send their home assignments to (UM) for checking and getting feedback.
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C2GB	AR	asma_AR_sadiq@protonmail.com	S3GC students will send their home assignments to (AR) for checking and getting feedback.