NUNAVUT PHYSICS 30 · UNIT C · 25 QUESTIONS

Electromagnetic Radiation — Practice Test

This practice test was made by AI and there may be mistakes. If a question or answer looks wrong, use the Flag a mistake button to let Brett know so he can fix it.

1 **A weather radar system emits electromagnetic radiation with a wavelength of 2.0 cm. This radiation is classified as**



A gamma rays

B ultraviolet radiation

C microwaves

D infrared radiation

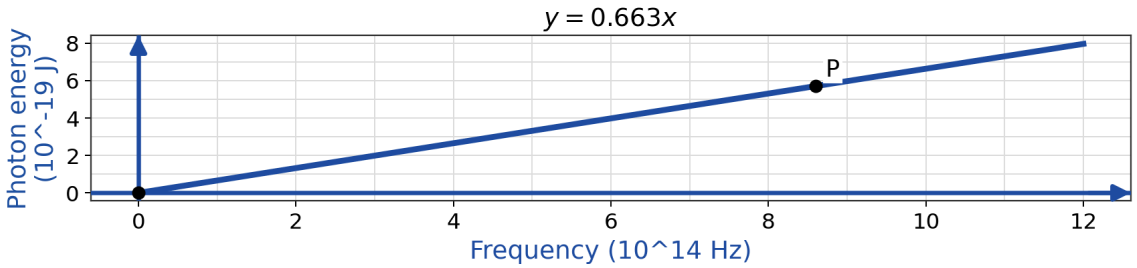
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2 **An electromagnetic wave has a frequency of 6.0×10^{14} Hz. Its wavelength in a vacuum is**

- **A** 5.0×10^{-7} m
- **B** 2.0×10^{6} m
- **C** 5.0×10^{-9} m
- **D** 1.8×10^{23} m

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3 **The graph shows photon energy against frequency, with point P marked on the line. The energy of the photon at point P is**



A 7.71×10^{-49} J

B 5.70×10^{-19} J

C 5.70×10^{-20} J

D 1.16×10^{-18} J

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4 **When a beam of light passes from air into glass, one property of the light does not change. That property is its**

A speed

B wavelength

C frequency

D direction of travel

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5 **A metal surface is illuminated by monochromatic light with a frequency above the threshold frequency. If the intensity of the light is increased while its frequency is kept constant, then**

A the maximum kinetic energy of the photoelectrons increases

B the number of photoelectrons emitted per second increases

C the stopping voltage increases

D the threshold frequency of the metal decreases

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6 **Light travelling in air strikes a flat surface of water (n = 1.33) at an angle of incidence of 40.0°. The angle of refraction, to the nearest tenth of a degree, is ____ degrees.**



ANSWER _____

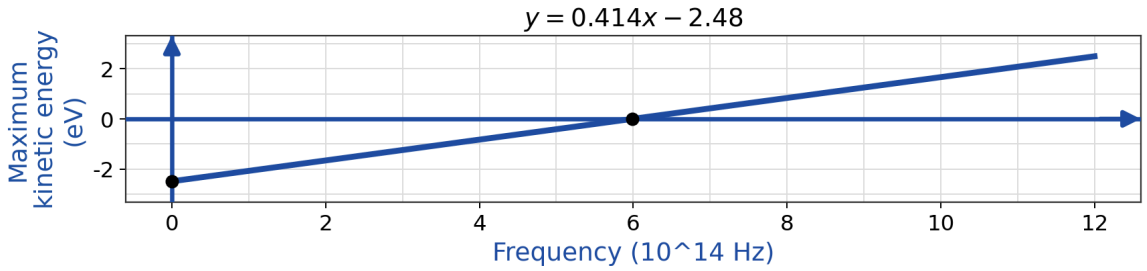
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7 **Yellow light that has a wavelength of 5.89×10^{-7} m in air enters glass (n = 1.52). The wavelength of this light inside the glass is**

- **A** 5.89×10^{-7} m
- **B** 8.95×10^{-7} m
- **C** 3.88×10^{-7} m
- **D** 2.55×10^{-7} m

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8 **The graph shows maximum kinetic energy against frequency for a metal. The maximum wavelength of light that can eject photoelectrons from this metal, to the nearest nanometre, is ____ nm. (Use $c = 3.00 \times 10^{8}$ m/s.)**



ANSWER _____

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9 **In a Michelson-type experiment to measure the speed of light, a rotating mirror with 8 sides is used with a stationary mirror placed 25.0 km away. The light signal is next detected when the rotating mirror has turned through $\frac{1}{8}$ of a revolution during the round trip of the light. The rotation frequency at which this first occurs is**

- **A** 750 rev/s
- **B** 375 rev/s
- **C** 1.50×10^3 rev/s
- **D** 3.00×10^3 rev/s

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10 **An object that is 1.6 m tall is located 6.0 m in front of a concave mirror that has a focal length of 2.0 m. The height and orientation of the image are**

- **A** Height: 0.80 m Orientation: erect
- **B** Height: 0.80 m Orientation: inverted
- **C** Height: 3.2 m Orientation: inverted
- **D** Height: 0.53 m Orientation: erect

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11 **Light with a wavelength of 4.00×10^{-7} m is incident on a metal that has a work function of 2.14 eV. The stopping voltage for the emitted photoelectrons is (Use $h = 6.63 \times 10^{-34}$ J · s, $c = 3.00 \times 10^{8}$ m/s, and 1 eV = 1.60×10^{-19} J.)**

- **A** 2.14 V
- **B** 3.11 V
- **C** 5.25 V
- **D** 0.97 V

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12 **An X-ray photon has a wavelength of 2.40×10^{-11} m. The magnitude of the momentum of this photon is (Use $h = 6.63 \times 10^{-34}$ J · s.)**

- **A** 2.76×10^{-23} kg · m/s
- **B** 7.96×10^{-31} kg · m/s
- **C** 2.76×10^{-22} kg · m/s
- **D** 3.62×10^{22} kg · m/s

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13 **In a Compton scattering event, an X-ray photon collides with a stationary electron and is scattered. Compared with the incident photon, the scattered photon has**

A Energy: greater Wavelength: shorter

B Energy: greater Wavelength: longer

C Energy: less Wavelength: shorter

D Energy: less Wavelength: longer

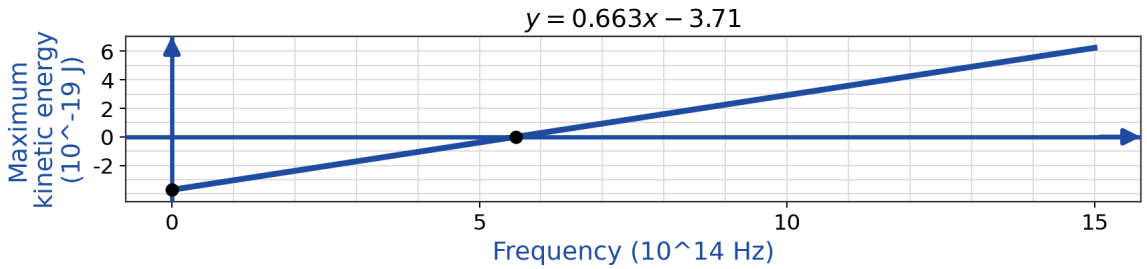
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14 **An atom makes a transition from an energy level of -1.51 eV to an energy level of -3.40 eV, emitting a photon. Expressed in the form a.bc × 10^{14} Hz, the frequency of the photon has a.bc = ____. (Use h = 6.63 × 10^{-34} J · s and 1 eV = 1.60 × 10^{-19} J.)**

ANSWER _____

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15 **The graph shows the maximum kinetic energy of the photoelectrons versus the frequency of the incident light. The slope of this line is equal to**



A the threshold frequency

B the work function

C the elementary charge

D Planck constant

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16 **A ray of light travels in glass that has an index of refraction of 1.52. The critical angle for this glass-to-air boundary is**

A 48.8°

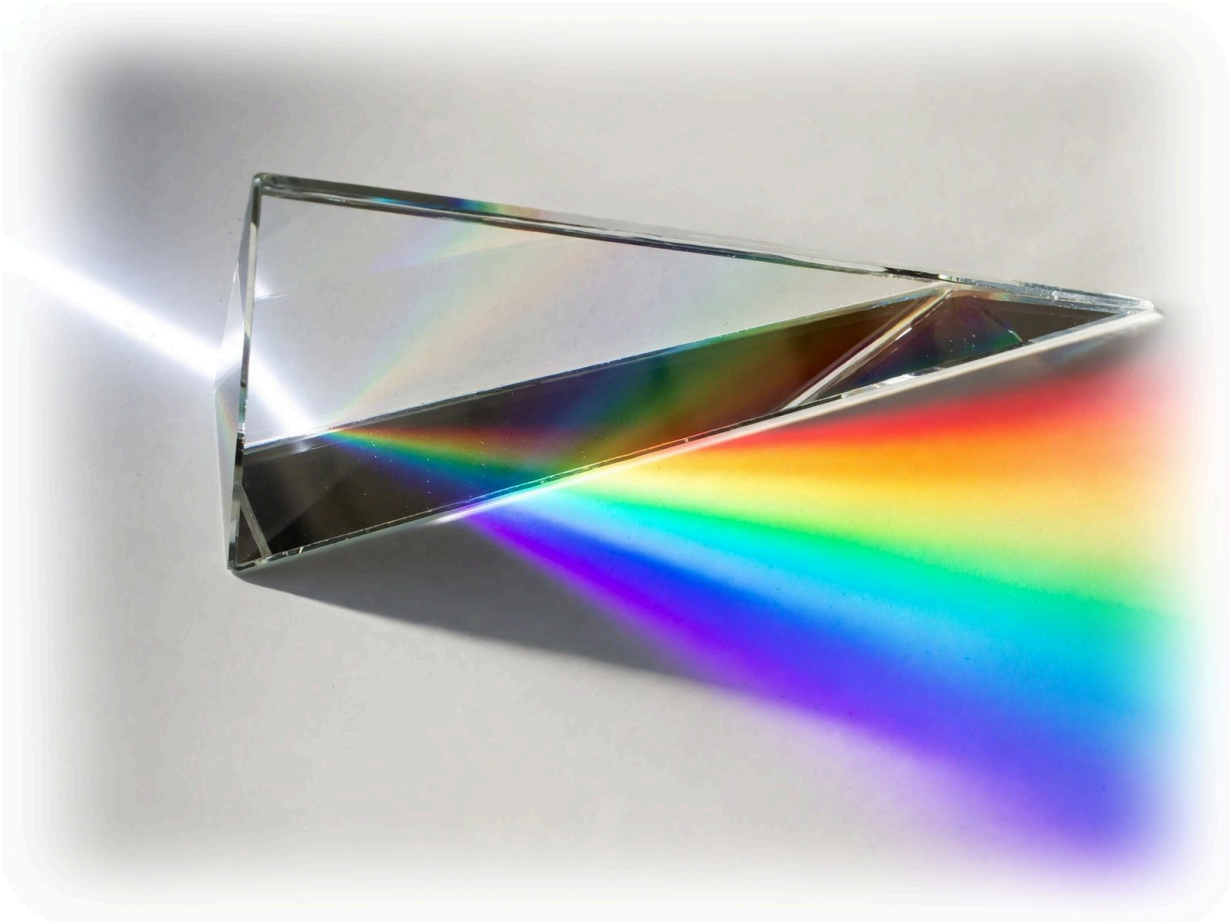
B 41.1°

C 33.0°

D 65.3°

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17 **A beam of white light passes through a glass prism and separates into a spectrum. The violet light is deviated (bent) more than the red light because**



A the index of refraction of glass is greater for violet light than for red light

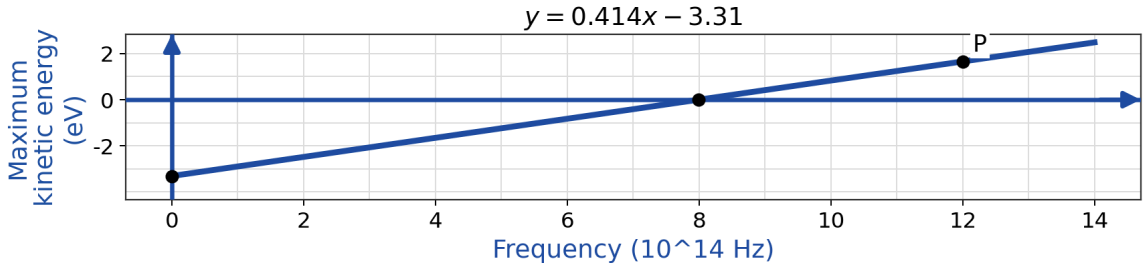
B violet light travels faster through glass than red light does

C violet light has a lower frequency than red light

D the glass absorbs more red light than violet light

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18 **The graph shows maximum kinetic energy against frequency for a metal, with point P marked on the line. The stopping voltage for light at the frequency of point P is**



A 1.66 V

B 0.83 V

C 3.32 V

D 2.49 V

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19 **Light with a frequency above the threshold frequency of a metal is shone on the metal. The frequency of the light is then increased while the intensity is kept constant. As a result, the number of photoelectrons emitted per second and the maximum kinetic energy of the photoelectrons will**

- **A** Rate: increases Maximum kinetic energy: increases
- **B** Rate: decreases Maximum kinetic energy: increases
- **C** Rate: decreases Maximum kinetic energy: unchanged
- **D** Rate: unchanged Maximum kinetic energy: increases

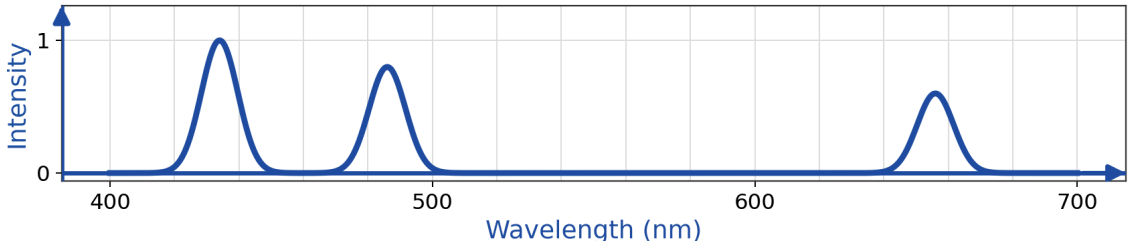
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20 **An X-ray photon with a wavelength of 1.06×10^{-10} m strikes a stationary electron and is scattered. The scattered photon has a wavelength of 1.20×10^{-10} m. The kinetic energy gained by the electron is (Use $h = 6.63 \times 10^{-34}$ J · s and $c = 3.00 \times 10^{8}$ m/s.)**

- **A** 1.66×10^{-15} J
- **B** 1.88×10^{-15} J
- **C** 2.19×10^{-16} J
- **D** 4.15×10^{-16} J

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21 **The graph shows intensity against wavelength for a sample of light. The spectrum shown is**



A a continuous spectrum

B a line emission spectrum

C a line absorption spectrum

D no spectrum

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22 **Diamond has an index of refraction of 2.42. Expressed in the form a.bc × 10^{8} m/s, the speed of light in diamond has a.bc = ____. (Use c = 3.00 × 10^{8} m/s in a vacuum.)**



ANSWER

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23 **Which of the following phenomena can be explained only by the particle model of light?**

- A reflection
- B refraction
- C diffraction
- D the photoelectric effect

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24 **When light with a wavelength of 3.50×10^{-7} m strikes a metal surface, the photoelectrons emitted have a maximum kinetic energy of 1.40 eV. The work function of the metal is (Use $h = 6.63 \times 10^{-34}$ J · s, $c = 3.00 \times 10^{8}$ m/s, and 1 eV = 1.60×10^{-19} J.)**

- A 2.15 eV
- B 4.95 eV
- C 3.55 eV
- D 1.40 eV

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25 **A metal has a threshold wavelength of 6.20×10^{-7} m. Light with a wavelength of 4.50×10^{-7} m strikes the metal. Expressed in the form $a.b \times 10^{5}$ m/s, the maximum speed of the emitted photoelectrons has a.b = ____. (Use $h = 6.63 \times 10^{-34}$ J · s, $c = 3.00 \times 10^{8}$ m/s, 1 eV = 1.60×10^{-19} J, and $m_e = 9.11 \times 10^{-31}$ kg.)**

ANSWER

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ANSWER KEY

1. C
2. A
3. B
4. C
5. B
6. 28.9
7. C
8. 500
9. A
10. B
11. D
12. A
13. D
14. 4.56
15. D
16. B
17. A
18. A
19. B
20. C
21. B
22. 1.24
23. D
24. A
25. 5.2

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