Physicsaholics

DPP – 2

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Q 1. Find the radiation pressure of solar radiation on the equator of earth (assuming radiation is completely absorbed). Solar constant is 1.4 kW/m^2

(a) 4.7×10^{-5} Pa (b) 4.7×10^{-6} Pa

(c) 2.37×10^{-6} Pa (d) 9.4×10^{-6} Pa

Q 2. Parallel beam of Light of intensity I is falling on a perfect mirror of area A. If angle of incidence is 60^0 , Find radiation force on mirror?

(a) IA/2c (b) IA/4c

(c) IA/8c (d) None of these

Q 3. Light of intensity I is incident on a fixed plane surface at an angle 30° with normal to the surface. If 50 % light is reflected and remaining light is absorbed then radiation pressure on the plate is: [Speed of light is c]

(a) $\frac{2I}{C}$ (b) $\frac{9I}{8C}$

(c) $\frac{3I}{8C}$ (d) $\frac{I}{4C}$

Q 4. A radiation of 200W is incident on a surface which is 60% reflecting and 40% absorbing. Find the net Force acting on the surface.

(a) 1.3×10^{-6} N (b) 1.07×10^{-6} N

(c) 1.07×10^{-7} N (d) 1.3×10^{-7} N

Q 5. A monochromatic beam of light (λ = 4900 Å) incident normally upon a surface produces a pressure of 5 x 10^{-7} N/m^2 on it. Assuming that 25% of the light incident is reflected and the rest absorbed, find the number of photons falling per second on a unit area of thin surface.

(a) $6 \times 10^{20} m^{-2} s^{-1}$ (b) $9 \times 10^{20} m^{-2} s^{-1}$

(c) $3 \times 10^{20} m^{-2} s^{-1}$ (d) $12 \times 10^{20} m^{-2} s^{-1}$

Q.6 A point source of light of power 300 watt is placed at centre of Blackbody hemispherical shell of radius 1 meter. Find radiation force on hemisphere ?

(a) 5×10^{-7} N

(b) 6×10^{-7} N

(c) 3×10^{-7} N

(d) 2.5×10^{-7} N

Q 7. A horizontal plane mirror of mass 2 mg is balanced in air by a vertical beam of light having intensity 1000 W/m^2. Assuming 100% reflection, find area of mirror ?

(a) 2 m^2 (b) 3 m^2

(c) 6 m^2 (d) None of these

Q 8. Parallel beam of intensity I is falling on a blackbody sphere of radius R. Radiation force on sphere is
(a) (I/c) × $4\pi R^2$ (b) (I/c) × $2\pi R^2$
(c) (I/c) × πR^2 (d) None of these

Q 9. How many photons of wavelength λ = 6600 nm must strike a totally reflecting screen per second at normal incidence so as to exert a force of 1N?
(a) 1.5×10^{27} (b) 2.5×10^{27}
(c) 5×10^{27} (d) 5.5×10^{27}

Q 10. Light rays are incident on an opaque sheet. Then they
(a) exert a force on the sheet
(b) transfer an energy to the sheet
(c) transfer momentum to the sheet
(d) All of above are correct

Answer Key

Q.1 b	**Q.2 a**	**Q.3 b**	**Q.4 b**	**Q.5 c**
Q.6 d	**Q.7 b**	**Q.8 c**	**Q.9 c**	**Q.10 d**