Q.1 The acceleration due to gravity g and mean density of the earth ρ are related by which of the following relations? (Where G is the gravitational constant and R is the radius of the earth.)

(A) $\rho = \frac{3g}{4\pi GR}$ **(B)** $\rho = \frac{3g}{4\pi GR^3}$ **(C)** $\rho = \frac{4\pi gR^2}{3G}$ **(D)** $\rho = \frac{4\pi gR^3}{3G}$

Q.2 At what depth from the surface of earth, the time period of a simple pendulum is 0.5% more than that on the surface of the earth? (Radius of earth is 6400 km)

(A) 32 km **(B)** 64 km **(C)** 96 km **(D)** 128 km

Q.3 What should be the angular speed with which the earth have to rotate on its axis so that a person on the equator would weigh $\frac{3}{5}$ as much as present?

(A) $\sqrt{\frac{2g}{5R}}$ **(B)** $\sqrt{\frac{5g}{2R}}$ **(C)** $\sqrt{\frac{g}{R}}$ **(D)** $\sqrt{\frac{7g}{2R}}$

Q.4 The rotation of the earth having radius R about its axis speeds up to a value such that a man at latitude of 60° feels weightlessness. The duration of the day in such a case is

(A) $\pi\sqrt{\frac{R}{g}}$ **(B)** $\frac{\pi}{2}\sqrt{\frac{R}{g}}$ **(C)** $\frac{\pi}{3}\sqrt{\frac{R}{g}}$ **(D)** $2\sqrt{\frac{g}{R}}$

Q.5 The value of acceleration due to gravity at certain height h above the surface of the earth is $\frac{g}{4}$, where g is the value of acceleration due to gravity at the surface of the earth. The height h is (R is the radius of earth)

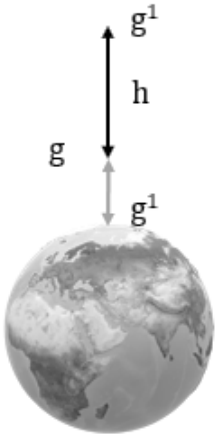
(A) R **(B)** 2R **(C)** 3R **(D)** 4R

Q.6 A simple pendulum has a time period T_1 when on the earth's surface and T_2 when taken to a height R above the earth's surface, where R is the radius of the earth. The value of $\frac{T_2}{T_1}$ is

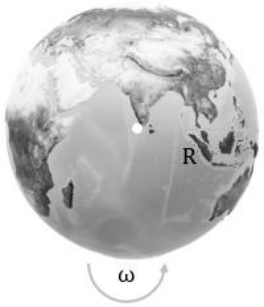
(A) 1 **(B)** $\sqrt{2}$ **(C)** 2 **(D)** 4

Q.7 If the change in value of acceleration due to gravity at a height h above the surface of the earth is same as at a depth x below it, then (Assume, x and h being much smaller than the radius of the Earth)

(A) $x = h$ **(B)** $x = 2h$ **(C)** $x = \frac{h}{2}$ **(D)** $x = h^2$



Q.8 If earth suddenly stops rotating, then the weight of an object of mass m at equator will (ω is angular speed of earth and R is its radius)



(A) Decrease by $m\omega^2R$ **(B)** increase by $m\omega^2R$

(C) Decrease by $m\omega^2R$ **(D)** increase by $m\omega^2R$

Q.9 What should be the angular speed with which the earth must rotate on its axis so that a person on the equator would weigh $\frac{3}{5}$th of weight measured without considering earth's rotation? (Take R as the equatorial radius and g as acceleration due to gravity)

(A) $\sqrt{\frac{2g}{5R}}$ **(B)** $\sqrt{\frac{2g}{R}}$ **(C)** $\sqrt{\frac{g}{R}}$ **(D)** $\sqrt{\frac{g}{R}}$

Q.10 A train of mass m moves with a velocity v on the equator from east to west. If ω is the angular speed of earth about its axis and R is the radius of the earth then the normal reaction acting on the train is

(A) $mg\left[1-\frac{(\omega R-2v)\omega}{g}-\frac{v^2}{Rg}\right]$ **(B)** $mg\left[1-2\frac{(\omega R-v)\omega}{g}-\frac{v^2}{Rg}\right]$

(C) $mg\left[1-\frac{(\omega R-2v)\omega}{g}-\frac{v^2}{Rg}\right]$ **(D)** $mg\left[1-2\frac{(\omega R-v)\omega}{g}-\frac{v^2}{Rg}\right]$

ANSWER KEY

Q.	1	2	3	4	5	6	7	8	9	10
Sol.	(A)	(B)	(A)	(A)	(A)	(D)	(B)	(B)	(A)	(A)