Q1. 21 January Shift 1

Initially a satellite of 100 kg is in a circular orbit of radius $1.5R_E$. This satellite can be moved to a circular orbit of radius $3R_E$ by supplying $\alpha \times 10^6$ J of energy. The value of α is ____. (Take Radius of Earth $R_E = 6 \times 10^6$ m and $g = 10\ m/s^2$)

(1) 150 (2) 1000 (3) 500 (4) 100

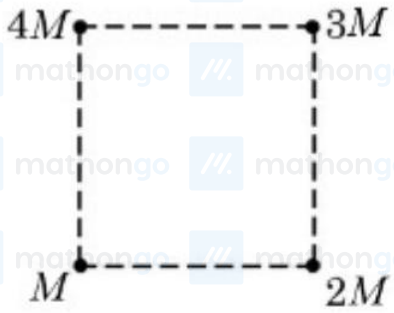
Q2. 22 January Shift 1

The escape velocity from a spherical planet A is 10 km/s. The escape velocity from another planet B whose density and radius are 10% of those of planet A, is ____ m/s.

(1) 1000 (2) $1000\sqrt{2}$ (3) $200\sqrt{5}$ (4) $100\sqrt{10}$

Q3. 22 January Shift 1

Net gravitational force at the center of a square is found to be F_1 when four particles having mass $M, 2M, 3M$ and $4M$ are placed at the four corners of the square as shown in figure and it is F_2 when the positions of $3M$ and $4M$ are interchanged. The ratio $\frac{F_1}{F_2}$ is $\frac{\alpha}{\sqrt{5}}$. The value of α is ____.



(1) $2\sqrt{5}$ (2) 3 (3) 1 (4) 2

Q4. 22 January Shift 2

Given below are two statements:

Statement I: A satellite is moving around earth in the orbit very close to the earth surface. The time period of revolution of satellite depends upon the density of earth.

Statement II: The time period of revolution of the satellite is $T = 2\pi\sqrt{\frac{R_e}{g}}$ (for satellite very close to the earth surface), where R_e radius of earth and g acceleration due to gravity.

In the light of the above statements, choose the correct answer from the options given below :

(1) Both Statement I and Statement II are true (2) Statement I is false but Statement II is true

(3) Statement I is true but Statement II is false (4) Both Statement I and Statement II are false

Q5. 24 January Shift 1

Three masses 200 kg, 300 kg and 400 kg are placed at the vertices of an equilateral triangle with sides 20 m. They are rearranged on the vertices of a bigger triangle of side 25 m and with the same centre. The work done in this process ____ J. (Gravitational constant $G = 6.7 \times 10^{-11}\ N\ m^2/kg^2$)

(1) 2.85×10^{-7} (2) 4.77×10^{-7} (3) 1.74×10^{-7} (4) 9.86×10^{-6}

ANSWER KEYS

1. (2) **2.** (4) **3.** (4) **4.** (1) **5.** (3)