# Prayas JEE (2025)

## Physics
## Gravitation

DPP: 1

**Q1** Gravitational force between two point masses $m$ and $M$ separated by a distance $r$ is $F$. Now if a point mass $3\,\mathrm{m}$ is placed next to $m$, the force on $M$ due to m becomes

(A) $F$        (B) $2F$

(C) $3F$       (D) $4F$

**Q2** A $3\,\mathrm{kg}$ mass and a $4\,\mathrm{kg}$ mass are placed on $\mathrm{x}$ and $y$ axes at a distance of 1 metre from the origin and a $1\,\mathrm{kg}$ mass is placed at the origin. Then the resultant gravitational force on $1\,\mathrm{kg}$ mass is

(A) $7\mathrm{G}$

(B) $\mathrm{G}$

(C) $5\mathrm{G}$

(D) $3\mathrm{G}$

**Q3** Three uniform spheres each of mass $\mathrm{m}$ and diameter $\mathrm{D}$ are kept in such a way that each touches the other two, then magnitude of the gravitational force on any one sphere due to the other two is

(A) $\dfrac{3\mathrm{Gm}^2}{D^2}$

(B) $\dfrac{2\sqrt{3}\mathrm{Gm}^2}{D^2}$

(C) $\dfrac{\sqrt{3Gm^2}}{4D^2}$

(D) $\dfrac{\sqrt{3}Gm^2}{D^2}$

**Q4** Two spheres of masses $\mathrm{m}$ and $\mathrm{M}$ are situated in air and the gravitational force between them is $F$. The space between the masses is now filled with a liquid of specific gravity 3. The gravitational force will now be

(A) $\mathrm{F}/9$

(B) $3\,\mathrm{F}$

(C) $\mathrm{F}$

(D) $\mathrm{F}/3$

**Q5** Two particles of equal mass go round a circle of radius $R$ under the action of their mutual gravitational attraction. The speed of each particle is

(A) $v = \dfrac{1}{2R}\sqrt{\dfrac{1}{Gm}}$

(B) $v = \sqrt{\dfrac{Gm}{2R}}$

(C) $v = \dfrac{1}{2}\sqrt{\dfrac{Gm}{R}}$

(D) $v = \sqrt{\dfrac{4Gm}{R}}$

**Q6** Which of the following statements is correct about gravitational force?

(A) It depends upon the product of two masses

(B) It depends upon the medium between the masses

(C) It depends upon the separation between the two masses

(D) Both (A) & (C)

**Q7** Four particles of equal mass $m$ are placed at the four corners of a square $ABCD$ as shown in the figure. Gravitational force on $C$ is along
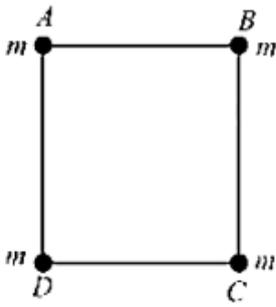
(A) $CB$

(B) $CD$

(C) $CA$

(D) $AB$

**Q8** A large solid sphere of diameter $d$ attracts a small particle with a force $F$. If the central portion of the sphere of diameter $\frac{d}{2}$ be removed leaving behind a cavity, then the new force of attraction becomes

(A) $\frac{9F}{8}$

(B) $\frac{7F}{8}$

(C) $\frac{3F}{2}$

(D) $\frac{3F}{4}$

**Q9** The radius of Earth is about $6400 \text{ km}$ and that of mars is $3200 \text{ km}$. The mass of the Earth is 10 times the mass of mars. An object weight $200 \text{ N}$ on the surface of Earth. Its weight on the surface of mars will be

(A) $80 \text{ N}$

(B) $40 \text{ N}$

(C) $20 \text{ N}$

(D) $8 \text{ N}$

**Q10** The intensity of the gravitational field of the earth is maximum at

(A) Centre of earth

(B) Equator

(C) Poles

(D) Same everywhere

**Q11** Three particles each of mass $m$ are kept at the vertices of an equilateral triangle of side $L$. The gravitational field at the centre due to these particles is

(A) Zero

(B) $\frac{3GM}{L^2}$

(C) $\frac{9GM}{L^2}$

(D) $\frac{2GM}{L^2}$

**Q12** A straight rod of length $\mathrm{L}$ extends from $x = a$ to $x = L + a$. Find the gravitational force it exerts on a point mass $m$ at $x = 0$ is (if the linear density of $\mathrm{rod}\ \mu = A + Bx^2$ )

(A) $Gm\left[\frac{A}{a} + BL\right]$

(B) $Gm\left[A\left(\frac{1}{a} - \frac{1}{a+L}\right) + BL\right]$

(C) $Gm\left[BL + \frac{A}{a+L}\right]$

(D) $Gm\left[BL - \frac{A}{a}\right]$

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# Answer Key

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|---|---|---|---|---|
| Q1 | A | | Q7 | C |
| Q2 | C | | Q8 | B |
| Q3 | D | | Q9 | A |
| Q4 | C | | Q10 | C |
| Q5 | C | | Q11 | A |
| Q6 | D | | Q12 | B |

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