PHYSICS

RESONANCE ENGLISH

GRAVITATION

Exercise

1. A point mass m is placed inside a spherical shell of radius R and mass M at a distance $\frac{R}{2}$

form the centre of the shell. The gravitational force exerted by the shell on the point mass is

A. $\frac{2Gm^2}{R^2}$

B. $\frac{Gm^2}{R^2}$

C. $\frac{Gm^2}{2R}$

D. zero

Answer: D

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2. The radius of the earth is R . The height of a point vertically above the earth's surface at which acceleration due to gravity becomes 1% of its value at the surface is

A. 9R

B. 8R

C. 11R

D. none of these

Answer: A

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3. A satellite with kinetic energy E_k is revolving round the earth in a circular orbit. How much more kinetic energy should be given to it so that it may just escape into outer space

A. E_k

B. $E_k/2$

C. $E_k/4$

D. $2E_k$

Answer: A

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4. Two particles of equal mass go around a circle of radius R under the action of their mutual gravitational attraction. Find the speed of each particle.

A. $\sqrt{\frac{GM}{R}}$

B. $\sqrt{\frac{GM}{2R}}$

C. $\sqrt{\frac{GM}{4R}}$

D. $\sqrt{\frac{2GM}{R}}$

Answer: C

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5. With what angular velocity the earth should spin in order that a body lying at 37° latitude may become weightless.

A. $\frac{5}{4}\sqrt{\frac{g}{R}}$

B. $\frac{25}{16}\sqrt{\frac{g}{R}}$

C. $\frac{5}{3}\sqrt{\frac{g}{R}}$

D. $\frac{25}{9}\sqrt{\frac{g}{R}}$

Answer: A

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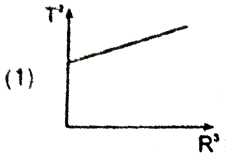
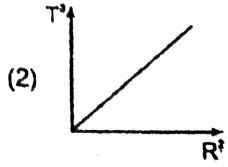
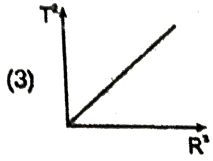
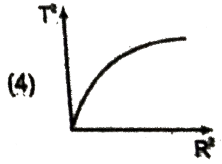
6. Which of the following graphs represents the motion of the planet moving about the Sun. T is the periode of revolution and r is the average distance (from centre to centre) between the sun and the planet

A. 

B. 

C. 

D. 

Answer: C

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7. The orbital velocity of an artificial in a circular orbit just above the earth's surface v. For a satellite orbiting at an altitude of half the earth's radius the orbital velocity is

A. $\left(\frac{3}{2}\right)V_0$

B. $\sqrt{\frac{3}{2}}V_0$

C. $\sqrt{\frac{2}{3}}V_0$

D. $\left(\frac{2}{3}\right)V_0$

Answer: C

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8. Maximum height reached by a rocket fired with a speed equal to 50% of the escape velocity from earth's surface is:

A. R/2

B. 16R/9

C. R/3

D. R/8

Answer: C

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9. A geostationary satellite is one

A. which is used for geophysics

B. whose mass is equal to earth's mass

C. whose time period is same as that of earth

D. none of these

Answer: C

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10. The period of a satellite in a circular orbit of radius R is T. What is the period of another satellite in a circular orbit of radius 4 R ?

A. 64hrs

B. 32hrs

C. 16 hrs

D. 8 hrs

Answer: B

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11. Find the workdone to move an earth satellite of mass m from a circular orbit of radius 2R to one of radius 3R.

A. GMm/12R

B. GMm/3R

C. GMm/8R

D. GMm/6R

Answer: A

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12. A satellite of mass m revolves around the earth of radius R at a height x from its surface. It g is the acceleration due to gravity on the surface of the earth, the orbit speed of the satellite is

A. gx

B. $\frac{gR}{R-x}$

C. $\frac{gR^2}{R+x}$

D. $\left(\frac{gR^2}{R+x}\right)^{1/2}$

Answer: D

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13. If the change in the value of g at a height h above the surface of earth is the same as at a depth d below it (both h and d are much smaller than the radius of the earth), then

A. $d = \frac{h}{2}$

B. $d = \frac{3h}{2}$

C. d=2h

D. d=h

Answer: C

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

A. zero

B. $\frac{3GM}{L^2}$

C. $\frac{9GM}{L^2}$

D. $\frac{12}{\sqrt{3}}\frac{GM}{L^2}$

Answer: A

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15. A comet orbits the sun in a highly elliptical orbit. Which of the following quntities remains constant throughout its orbit ?

(i) Linear Spped (ii) Angular speed

(iii) Angular momentum (iv) Kinetic energy

(v) Potential energy (vi) Total energy

A. linear speed

B. angular momentum about the sun

C. kinetic energy

D. potential energy

Answer: B

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16. According to Kepler's second law, the radius vector to a planet from the Sun sweeps out equal areas in equal intervals of time. This law is a consequence of the conservation of _____.

A. linear momentum

B. energy

C. angular momentum

D. all of them

Answer: C

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17. Two artificial satellites of the same mass are moving around the earth in circular orbits of different radii. In comparision to the satellite with lesser orbital radius, the other satellite with higher orbital radius will have:

A. greater kinetic energy

B. less potential energy

C. greater total energy

D. less magnitude of angular momentum, about the centre of the circular orbit.

Answer: C

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18. Two satellities s_1 a & s_2 of equal masses revolves in the same sense around a heavy planet in coplaner circular orbit of radii R & $4R$

A. the ratio of period of revolution s_1 and s_2 1:4

B. their velocities are in the 2:1

C. their angular momentum about the planet are in the ration 2:1

D. the ratio of angular velocities of s_2 w.r.t. s_1 when all three are in the same line is 4:1

Answer: B

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19. Radius of the earth is R and the mean density is ρ. Find out the gravitational potential at the earth's surface

A. $-\frac{4}{3}\pi G\rho R^2$

B. $-2\pi G\rho R^2$

C. $-\frac{1}{3}\pi G\rho R^2$

D. $-\frac{2}{3}\pi G\rho R^2$

Answer: A

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20. A body which is initially at rest at a height R above the surface of the earth of radius R, falls freely towards the earth, then its velocity on reaching the surface of the earth is

A. $\sqrt{2gR}$

B. $\sqrt{\frac{3}{2}gR}$

C. $\sqrt{gR}$

D. $\sqrt{\frac{1}{2}gR}$

Answer: C

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21. A tunnel is dug along the diameter of the earth. There is particle of mass m at the centre of the tunnel. Find the minimum velocity given to the particle so that is just reaches to the surface of the earth. ($R =$ radius of earth)

A. $\sqrt{\frac{GM}{R}}$

B. $\sqrt{\frac{GM}{2R}}$

C. $\sqrt{\frac{2GM}{R}}$

D. it will reach with the help of negligible velocity.

Answer: A

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