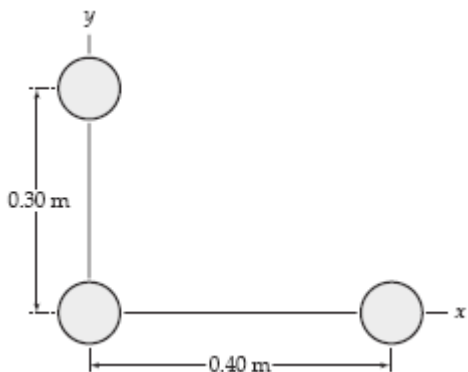


AP Physics - Universal Gravitation

Multiple Choice

Identify the choice that best completes the statement or answers the question.

1. A satellite circles planet Roton every 2.8 h in an orbit having a radius of 1.2×10^7 m. If the radius of Roton is 5.0×10^6 m, what is the magnitude of the free-fall acceleration on the surface of Roton?
A) 31 m/s^2
B) 27 m/s^2
C) 34 m/s^2
D) 40 m/s^2
E) 19 m/s^2
2. What is the magnitude of the free-fall acceleration at a point that is a distance $2R$ above the surface of the Earth, where R is the radius of the Earth?
A) 4.8 m/s^2
B) 1.1 m/s^2
C) 3.3 m/s^2
D) 2.5 m/s^2
E) 6.5 m/s^2
3. Three 5.0-kg masses are located at points in the xy plane, as shown. What is the magnitude of the resultant force (caused by the other two masses) on the mass at $x = 0, y = 0.30$ m?



- A) $2.6 \times 10^{-8} \text{ N}$
B) $2.0 \times 10^{-8} \text{ N}$
C) $2.9 \times 10^{-8} \text{ N}$
D) $2.3 \times 10^{-8} \text{ N}$
E) $2.1 \times 10^{-8} \text{ N}$
4. A spaceship of mass m circles a planet (mass = M) in an orbit of radius R . How much energy is required to transfer the spaceship to a circular orbit of radius $3R$?
A) $GmM/(2R)$
B) $GmM/(3R)$
C) $GmM/(4R)$
D) $GmM/(6R)$
E) $3GmM/(4R)$

5. A projectile is launched from the surface of a planet (mass = M , radius = R). What minimum launch speed is required if the projectile is to rise to a height of $2R$ above the surface of the planet? Disregard any dissipative effects of the atmosphere.
- A) $\left[\frac{4GM}{3R} \right]^{1/2}$
- B) $\left[\frac{8GM}{5R} \right]^{1/2}$
- C) $\left[\frac{3GM}{2R} \right]^{1/2}$
- D) $\left[\frac{5GM}{3R} \right]^{1/2}$
- E) $\left[\frac{GM}{3R} \right]^{1/2}$
6. What is the kinetic energy of a 200-kg satellite as it follows a circular orbit of radius 8.0×10^6 m around the Earth? (Mass of Earth = 6.0×10^{24} kg.)
- A) 5.0×10^9 J
- B) 1.0×10^{10} J
- C) 1.5×10^{10} J
- D) 2.0×10^{10} J
- E) 2.5×10^9 J
7. Two identical planets orbit a star in concentric circular orbits in the star's equatorial plane. Of the two, the planet that is farther from the star must have
- A) the smaller period.
- B) the greater period.
- C) the smaller gravitational mass.
- D) the larger gravitational mass.
- E) the larger universal gravitational constant.

AP Physics - Universal Gravitation Answer Section

MULTIPLE CHOICE

1. ANS: B
2. ANS: B
3. ANS: D
4. ANS: B
5. ANS: A
6. ANS: A
7. ANS: B