Physics for Scientists and Engineers, 4e **(Giancoli)**

Chapter 6 Gravitation and Newton's Synthesis

6.1 Conceptual Questions

1) State Newton's Law of Universal Gravitation.
Answer: Every particle in the universe attracts every other particle with a force that is proportional to the product of their masses and inversely proportional to the square of the distance between them. The force acts along the line joining the two particles.
Diff: 1 Page Ref: Sec. 6-1

2) Describe how a satellite is placed into orbit and remains in orbit around the earth.
Answer: A satellite is put into orbit by accelerating it to a sufficiently high tangential speed with the use of rockets. If the speed is too high, the spacecraft will not be confined by the Earth's gravity and will escape, never to return. If the speed is too low, it will return to Earth. If the satellite stopped moving, it would fall directly to Earth.
Diff: 1 Page Ref: Sec. 6-4

3) State Kepler's first law of planetary motion.
Answer: The path of each planet about the Sun is an ellipse with the Sun at one focus.
Diff: 1 Page Ref: Sec. 6-5

4) State Kepler's second law of planetary motion.
Answer: Each planet moves so that an imaginary line drawn from the Sun to the planet sweeps out equal areas in equal periods of time.
Diff: 1 Page Ref: Sec. 6-5

5) State Kepler's third law of planetary motion.
Answer: The ratio of the squares of the periods of any two planets revolving about the Sun is equal to the ratio of the cubes of their semimajor axes.
Diff: 1 Page Ref: Sec. 6-5

6) An astronaut is piloting a spacecraft, which is in a circular orbit around Earth. A space station is ahead, on the same circular orbit. If he fires his rockets briefly to increase the forward speed of the rocket, what will happen?
Answer: The spacecraft will be put into an elliptical orbit with a perigee, the distance of closest approach to the center of Earth, equal to the original radius. The average radius of this orbit is larger, so it will take longer to complete one revolution. So when he completes one revolution, bringing him back to the original radius, he will have fallen further behind.
Diff: 2 Page Ref: Sec. 6-5

7) An astronaut is piloting a spacecraft, which is in a circular orbit around Earth. A space station is ahead, on the same circular orbit. If he fires his rockets briefly to decrease the forward speed of the rocket, what will happen?
Answer: The spacecraft will be put into an elliptical orbit with an apogee equal to the original radius. The average radius of this orbit is smaller, so it will take less time to complete one revolution. So if the speed increment is calculated correctly, when he completes one revolution, bringing him back to the original radius, he could be caught up with the station. At that point, a forward burst could put him in the same circular orbit as the station.
Diff: 2 Page Ref: Sec. 6-5

8) List the fundamental forces in nature.
Answer: gravitational force, electromagnetic force, strong nuclear force, weak nuclear force
Diff: 1 Page Ref: Sec. 6-7

9) State Einstein's principle of equivalence.
Answer: There is no experiment observers can perform to distinguish if an acceleration arises because of a gravitational force or because their reference frame is accelerated.
Diff: 1 Page Ref: Sec. 6-8

10) The gravitational force that the Sun exerts on Earth is much larger than the gravitational force that Earth exerts on the Sun.
Answer: FALSE
Diff: 1 Page Ref: Sec. 6-1

11) The reason that when an object falls towards Earth, Earth does not move toward the object, is that the force exerted by Earth on the object is so much bigger.
Answer: FALSE
Diff: 1 Page Ref: Sec. 6-1

12) The gravitational force exerted on a particle outside a sphere with a spherically symmetric mass distribution is the same as if the entire mass of the sphere was concentrated at its center.
Answer: TRUE
Diff: 1 Page Ref: Sec. 6-1

13) A thin uniform spherical shell exerts a force on a particle located outside of it as if all the shell's mass were located at the center.
Answer: TRUE
Diff: 1 Page Ref: Sec. 6-1

14) A thin uniform spherical shell exerts zero force on a particle located inside of the thin shell.
Answer: TRUE
Diff: 1 Page Ref: Sec. 6-1

15) The acceleration of gravity can vary locally on the Earth's surface because of the presence of rocks of different densities.
Answer: TRUE
Diff: 1 Page Ref: Sec. 6-3

16) A geosynchronous satellite is one that stays above the same point on the Earth, which is possible only if it is above one of the Earth's poles.
Answer: FALSE
Diff: 1 Page Ref: Sec. 6-4

17) Apparent weightlessness can be experienced in freely falling elevator.
Answer: TRUE
Diff: 1 Page Ref: Sec. 6-4

18) Kepler's third law can be used to compare the Moon's orbit around the Earth to the orbit of the Earth around the Sun.
Answer: FALSE
Diff: 1 Page Ref: Sec. 6-5

19) Two massive objects are fixed in position. A third object is placed directly between the first two at the position at which the total gravitational force on the third object due to the two massive objects is zero. The object is displaced slightly toward one of the two massive objects, the total gravitational force on the third object is now

A) zero.
B) in a direction which depends on which of the massive objects has a greater mass.
C) in the same direction the object is displaced.
D) in the opposite direction to the displacement of the object.
E) perpendicular to the displacement of the object.

Answer: C
Diff: 1 Page Ref: Sec. 6-1

20) An object is located inside a thin, uniform density spherical shell. At what locations would the object not be subject to a net gravitational force?

A) only against the inside boundary of the shell
B) only at locations on a sphere that is one-half the inside radius of the shell
C) anywhere within the shell
D) only at locations on a sphere that is one-half the mean radius of the shell
E) only at the center of the shell

Answer: C
Diff: 1 Page Ref: Sec. 6-1

21) Planet Z-34 has a mass equal to one-third that of Earth and a radius equal to one-third that of Earth. With g representing, as usual, the acceleration due to gravity on the surface of Earth, the acceleration due to gravity on the surface of Z-34 is

A) $g/3$. B) $3g$. C) $6g$. D) $g/9$. E) $9g$.

Answer: B
Diff: 1 Page Ref: Sec. 6-3

22) You ride on an elevator that is moving upward with constant speed while standing on a bathroom scale. The reading on the scale is

A) equal to your true weight, mg.
B) more than your true weight, mg.
C) less than your true weight, mg.
D) zero.
E) could be more or less than your true weight, mg, depending on the value of the speed.

Answer: A
Diff: 1 Page Ref: Sec. 6-4

23) You ride on an elevator that is moving with constant upward acceleration while standing on a bathroom scale. The reading on the scale is

A) equal to your true weight, mg.
B) more than your true weight, mg.
C) less than your true weight, mg.
D) zero.
E) could be more or less than your true weight, mg, depending on the magnitude of the acceleration.

Answer: B
Diff: 1 Page Ref: Sec. 6-4

24) Because Earth's orbit is slightly elliptical, Earth actually gets closer to the Sun during part of the year. When Earth is closer to the Sun its orbital speed is
A) less than when Earth is farthest away from the Sun.
B) the same as when Earth is farthest away from the Sun.
C) greater than when Earth is farthest away from the Sun.
D) sometimes greater sometimes smaller than when Earth is farthest away from the Sun.
Answer: C
Diff: 1 Page Ref: Sec. 6-5

25) Kepler's second law tells us that a planet sweepa out equal areas in equal times. If you compare the amount of area per time swept by Earth with the one of Jupiter, you would conclude:
A) They sweep the same area per time.
B) Jupiter sweeps a larger area per time because it has much more mass than Earth.
C) Jupiter sweeps a larger area per time because it has a much larger orbital path than Earth.
D) Earth sweeps a larger area per time because it has much less mass than Jupiter.
E) Earth sweeps a larger area per time because it has a much smaller orbital path than Jupiter.
Answer: C
Diff: 1 Page Ref: Sec. 6-5

26) List the four fundamental forces in nature.
A) gravitational, normal, tension, friction
B) gravitational, normal, kinetic friction, static friction
C) gravitational, electromagnetic, strong nuclear, weak nuclear
D) gravitational, electromagnetic, contact, nuclear
E) gravitational, contact, strong nuclear, weak nuclear
Answer: C
Diff: 1 Page Ref: Sec. 6-7

27) Ordinary forces, such as pushes, pulls, normal forces and friction, are considered to be due to the
A) gravitational force.
B) electromagnetic force.
C) strong nuclear force.
D) weak nuclear force.
E) contact force.
Answer: B
Diff: 1 Page Ref: Sec. 6-7

28) According to Einstein's equivalence principle, which of the following cannot be distinguished from a system accelerating with uniform acceleration in the presence of no gravity by any measurement within the system?
A) a system moving with constant velocity in the presence of no gravitational force
B) a system that only contains massless objects
C) a system that is not accelerating, but is subject to a uniform gravitational acceleration
D) a system that is moving at the speed of light
E) a system in free fall
Answer: C
Diff: 1 Page Ref: Sec. 6-8

29) An elevator accelerates upward with an acceleration equal to the acceleration of gravity. A ray of light emitted from one wall inside the elevation at a height h relative to the floor of the elevator will hit the opposite wall at a height (relative to the floor)
A) greater than h. B) less than h. C) equal to h.
Answer: B
Diff: 1 Page Ref: Sec. 6-8

6.2 Quantitative Problems

1) During a lunar eclipse, the Moon, Earth, and Sun all lie on the same line, with the Earth between the Moon and the Sun. The Moon has a mass of 7.36×10^{22} kg; the Earth has a mass of 5.98×10^{24} kg; and the Sun has a mass of 1.99×10^{30} kg. The separation between the Moon and the Earth is given by 3.84×10^{8} m; the separation between the Earth and the Sun is given by 1.496×10^{11} m.
(a) Calculate the force exerted on the Earth by the Moon.
(b) Calculate the force exerted on the Earth by the Sun.
(c) Calculate the net force exerted on the Earth by the Moon and the Sun.
Answer: (a) 1.99×10^{20} N, toward the Moon
(b) 3.55×10^{22} N, toward the Sun
(c) 3.53×10^{22} N, toward the Sun
Diff: 2 Page Ref: Sec. 6-2

2) The International Space Station is orbiting at an altitude of about 370 km above the earth's surface. The mass of the earth is 5.976×10^{24} kg and the radius of the earth is 6.378×10^{6} m.
(a) Assuming a circular orbit, what is the period of the International Space Station's orbit?
(b) Assuming a circular orbit, what is the speed of the International Space Station in its orbit?
Answer: (a) 5.52×10^{3} s
(b) 7.69×10^{3} m/s
Diff: 1 Page Ref: Sec. 6-4

3) A satellite of mass 500 kg orbits the Earth with a period of 6000 s. The Earth has a mass of 5.98×10^{24} kg. (a) Calculate the magnitude of the Earth's gravitational force on the satellite. (b) Determine the altitude of the satellite above the Earth's surface.
Answer: (a) 3900 N
(b) 7×10^{5} m
Diff: 2 Page Ref: Sec. 6-4

4) A satellite orbits just above the Earth's surface. (a) Calculate the period of the satellite. (b) Calculate the speed of the satellite.
Answer: (a) 5040 s
(b) 7900 m/s
Diff: 2 Page Ref: Sec. 6-4

5) The hydrogen atom consists of a proton of mass 1.67×10^{-27} kg and an orbiting electron of mass 9.11×10^{-31} kg. In one of its orbits, the electron is 5.3×10^{-11} m from the proton. What is the mutual attractive gravitational force between the electron and proton?
A) 1.8×10^{-47} N
B) 3.6×10^{-47} N
C) 5.4×10^{-47} N
D) 7.0×10^{-47} N
E) 9.3×10^{-47} N
Answer: B
Diff: 1 Page Ref: Sec. 6-1

6) What is the force exerted by the Sun on the earth? The mass of the Sun is 1.99×10^{30} kg, the mass of the earth is 5.97×10^{24} kg, the Earth-Sun distance is 1.50×10^{11} m, and G = 6.67×10^{-11} N m2/kg2.

A) 5.28×10^{33} N

B) 3.52×10^{22} N

C) 8.85×10^{8} N

D) 7.25×10^{19} N

E) 9.32×10^{11} N

Answer: B

Diff: 1 Page Ref: Sec. 6-1

7) At their closest approach, Venus and Earth are 4.20×10^{10} m apart. The mass of Venus is 4.87×10^{24} kg, the mass of Earth is 5.97×10^{24} kg, and G = 6.67×10^{-11} N•m^2/kg^2. What is the force exerted by Venus on Earth at that point?

A) 1.10×10^{18} N

B) 4.62×10^{28} N

C) 5.43×10^{26} N

D) 6.30×10^{20} N

E) 1.72×10^{19} N

Answer: A

Diff: 1 Page Ref: Sec. 6-1

8) An object with mass m is located halfway between an object of mass M and an object of mass $3M$ that are separated by a distance d. What is the magnitude of the force on the object with mass m?

A) $8GMm/d^2$ B) $4GMm/d^2$ C) $3GMm/2d^2$ D) $GMm/(2d^2)$ E) $GMm/(4d^2)$

Answer: A

Diff: 2 Page Ref: Sec. 6-1

9) A planet of mass M has a moon of mass m in a circular orbit of radius R. An object is placed between the planet and the moon on the line joining the center of the planet to the center of the moon so that the net gravitational force on the object is zero. How far is the object placed from the center of the planet?

A) $\left(\frac{\sqrt{M}+\sqrt{m}}{M-m}\right)\sqrt{M}R$

B) $\left(\frac{M-m}{M+m}\right)R$

C) $\sqrt{\left(\frac{M-m}{M+m}\right)}R$

D) $\left(\frac{\sqrt{M}-\sqrt{m}}{M-m}\right)\sqrt{M}R$

E) $\left(\frac{M+m}{M-m}\right)R$

Answer: D

Diff: 2 Page Ref: Sec. 6-1

10) What is the distance from the moon to the point between Earth and the Moon where the gravitational pulls of Earth and Moon are equal? The mass of Earth is 5.97×10^{24} kg, the mass of the Moon is 7.35×10^{22} kg, the distance between Earth and the Moon is 3.84×10^{8} m, and G = 6.67 x 10^{-11} N•m^2/kg^2.

A) 3.45×10^{8} m B) 3.83×10^{7} m C) 4.69×10^{6} m D) 3.83×10^{6} m E) 4.69×10^{7} m

Answer: B
Diff: 2 Page Ref: Sec. 6-1

11) A spherical shell of inner diameter R and outer diameter $3R$ has a uniform density ϱ. What is the magnitude of the gravitational acceleration a distance $2R$ from the center of the spherical shell?

A) $15\pi G\varrho R/7$ B) $32\pi G\varrho R/5$ C) $25\pi G\varrho R/12$ D) $7\pi G\varrho R/6$ E) $7\pi G\varrho R/3$

Answer: E
Diff: 3 Page Ref: Sec. 6-1

12) A spherical shell of inner diameter R and outer diameter $3R$ has a uniform density ϱ. What is the magnitude of the gravitational acceleration a distance $4R$ from the center of the spherical shell?

A) $7\pi G\varrho R/6$ B) $104\pi G\varrho R/3$ C) $27\pi G\varrho R/12$ D) $27\pi G\varrho R/3$ E) $13\pi G\varrho R/6$

Answer: E
Diff: 3 Page Ref: Sec. 6-1

13) Three identical 50-kg masses are held at the corners of an equilateral triangle, 30 cm on each side. If one of the masses is released, what is its initial acceleration, if the only forces acting on it are the gravitational forces due to the other two masses?

A) 3.7×10^{-8} m/s^2
B) 2.5×10^{-8} m/s^2
C) 1.9×10^{-8} m/s^2
D) 4.2×10^{-8} m/s^2
E) 6.4×10^{-8} m/s^2

Answer: E
Diff: 1 Page Ref: Sec. 6-2

14) A 2.00×10^{8}-kg mass is located at x = 100 m, y = 0.00 m. A 5.00×10^{8}-kg mass is located at x = 0.00 m, y = 200 m. Determine the gravitational force on a 3.00-kg mass located at x = 0.00 m, y = 0.00 m.

A) 4.00×10^{-4} N $\hat{i}$ - 5.00×10^{-4} N j
B) 4.00×10^{-4} N $\hat{i}$ + 5.00×10^{-4} N j
C) -4.00×10^{-4} N $\hat{i}$ + 5.00×10^{-4} N j
D) 4.00×10^{-6} N $\hat{i}$ - 2.50×10^{-6} N j
E) 4.00×10^{-6} N $\hat{i}$ + 2.50×10^{-6} N j

Answer: E
Diff: 2 Page Ref: Sec. 6-2

15) You are on an airplane traveling with a constant velocity at an altitude of 20,000 m. What is the acceleration of gravity at that altitude? The radius of Earth is 6.37×10^{6} m.

A) 9.81 m/s^2 B) 9.78 m/s^2 C) 9.75 m/s^2 D) 9.72 m/s^2 E) 9.69 m/s^2

Answer: C
Diff: 1 Page Ref: Sec. 6-3

16) The mass of the Moon is 7.4×10^{22} kg and its mean radius is 1.75×10^{3} km. What is the acceleration due to gravity at the surface of the Moon?

A) 2.8×10^{6} m/s^2
B) 9.8 m/s^2
C) 4.9 m/s^2
D) 1.6 m/s^2
E) 0.80 m/s^2

Answer: D
Diff: 1 Page Ref: Sec. 6-3

17) The gravitational acceleration on a planet's surface is 16.00 m/s^2. What is the gravitational acceleration at distance of one planet diameter above the surface of the planet?

A) 5.33 m/s^2 B) 1.78 m/s^2 C) 1.60 m/s^2 D) 4.00 m/s^2 E) 8.00 m/s^2

Answer: B
Diff: 2 Page Ref: Sec. 6-3

18) The radius of the Earth is R. At what distance above the Earth's surface will the acceleration of gravity be 4.9 m/s^2?

A) 0.41 R B) 0.50 R C) 1.0 R D) 1.4 R E) 2.0 R

Answer: A
Diff: 2 Page Ref: Sec. 6-3

19) By how many newtons does the weight of a 100-kg person change when he goes from sea level to an altitude of 5000 m? (The mean radius of the Earth is 6.38×10^{6} m.)

A) 0.6 N B) 1.6 N C) 2.6 N D) 3.6 N E) 5.2 N

Answer: B
Diff: 3 Page Ref: Sec. 6-3

20) A 36.0-kg child steps on a scale in an elevator. The scale reads 400 N. What is the magnitude of the acceleration of the elevator?

A) 4.91 m/s^2 B) 9.81 m/s^2 C) 46.9 m/s^2 D) 0.206 m/s^2 E) 1.30 m/s^2

Answer: E
Diff: 1 Page Ref: Sec. 6-4

21) At what altitude should a satellite be placed into circular orbit so that its orbital period is 48.0 hours? The mass of the earth is 5.976×10^{24} kg and the radius of the earth is 6.378×10^{6} m.

A) 4.22×10^{7} m B) 7.58×10^{7} m C) 8.22×10^{7} m D) 6.07×10^{7} m E) 6.71×10^{7} m

Answer: D
Diff: 1 Page Ref: Sec. 6-4

22) What is the period of a satellite circling Mars 100 km above the planet's surface? The mass of Mars is 6.42×10^{23} kg, its radius is 3.40×10^{6} m, and $G = 6.67 \times 10^{-11}$ m^3/kg/s^2.

A) 1.75 hours B) 1.25 hours C) 1.15 hours D) 1.00 hours E) 1.45 hours

Answer: A
Diff: 1 Page Ref: Sec. 6-4

23) A planet has two small satellites in circular orbits around the planet. The first satellite has a period 18.0 hours and an orbital radius 2.00×10^{7} m. The second planet has an orbital radius 3.00×10^{7} m. What is the period of the second satellite?

A) 60.8 hours B) 12.0 hours C) 33.1 hours D) 9.80 hours E) 27.0 hours

Answer: C
Diff: 1 Page Ref: Sec. 6-4

24) A planet has two small satellites in circular orbits around the planet. The first satellite has a period 12.0 hours and an orbital radius 6.00×10^7 m. The second planet has a period 16.0 hours. What is the orbital radius of the second satellite?

A) 4.50×10^7 m B) 3.90×10^7 m C) 9.24×10^7 m D) 8.00×10^7 m E) 7.27×10^7 m

Answer: E

Diff: 1 Page Ref: Sec. 6-4

25) Jupiter completes one revolution about its own axis every 9.92 hours. What is the radius of the orbit required for a satellite to revolve about Jupiter with the same period? Jupiter has a mass of 1.90×10^{27} kg and $G = 6.67 \times 10^{-11}$ N•m^2/kg^2.

A) 1.04×10^7 m B) 2.26×10^9 m C) 1.60×10^8 m D) 3.41×10^8 m E) 7.45×10^8 m

Answer: C

Diff: 2 Page Ref: Sec. 6-4

26) Uranus completes one revolution about its own axis every 17.24 hours. What is the radius of the orbit required for a satellite to revolve about Uranus with the same period? Uranus has a mass of 8.69×10^{25} kg and $G = 6.67 \times 10^{-11}$ N•m^2/kg^2.

A) 8.27×10^7 m B) 3.41×10^8 m C) 2.56×10^8 m D) 9.03×10^7 m E) 1.04×10^7 m

Answer: A

Diff: 2 Page Ref: Sec. 6-4

27) Neptune circles the Sun at a distance of 4.50×10^{12} m once every 164 years. Saturn circles the Sun at a distance of 1.43×10^{12} m. What is the orbital period of Saturn?

A) 304 years B) 121 years C) 109 years D) 88.6 years E) 29.4 years

Answer: E

Diff: 1 Page Ref: Sec. 6-5

28) The moons of Mars, Phobos (Fear) and Deimos (Terror), are very close to the planet compared to Earth's Moon. Their orbital radii are 9,378 km and 23,459 km respectively. What is the ratio of the period of revolution of Phobos to that of Deimos?

A) 0.2528 B) 0.3998 C) 1.582 D) 2.858 E) 3.956

Answer: A

Diff: 2 Page Ref: Sec. 6-5

29) The moons of Mars, Phobos (Fear) and Deimos (Terror), are very close to the planet compared to Earth's Moon. Their orbital radii are 9,378 km and 23,459 km respectively. What is the ratio of the orbital speed of Phobos to that of Deimos?

A) 0.2528 B) 0.3998 C) 1.582 D) 2.858 E) 3.956

Answer: C

Diff: 2 Page Ref: Sec. 6-5

30) Two moons orbit a planet in nearly circular orbits. Moon A has orbital radius r, and moon B has orbital radius 4r. Moon A takes 20 days to complete one orbit. How long does it take moon B to complete an orbit?

A) 20 days B) 40 days C) 80 days D) 160 days E) 320 days

Answer: D

Diff: 2 Page Ref: Sec. 6-5

31) You have discovered a new asteroid, which has a moon in an elliptical orbit around it. From a series of observations, you establish that the closest approach occurs when the moon is 49,000 m from the asteroid, the furthest separation is 98,000 m, and the speed of the moon at the point of closest approach is 7.50 m/s. What is the mass of the asteroid? $G = 6.67 \times 10^{-11}$ N•m^2/kg^2.

A) 4.25×10^{16} kg
B) 9.87×10^{16} kg
C) 3.10×10^{16} kg
D) 2.04×10^{16} kg
E) 5.05×10^{16} kg

Answer: C
Diff: 3 Page Ref: Sec. 6-5

32) *Sputnik I* was launched into orbit around Earth in 1957. It had a perigee (the closest approach to Earth, measured from Earth's center) of 6.81×10^6 m and an apogee (the furthest point from Earth's center) of 7.53×10^6 m. What was its speed when it was at its perigee? The mass of Earth is 5.97×10^{24} kg and $G = 6.67 \times 10^{-11}$ N•m^2/kg^2.

A) 7.18×10^3 m/s
B) 7.84×10^3 m/s
C) 8.23×10^3 m/s
D) 11.0×10^3 m/s
E) 13.4×10^3 m/s

Answer: B
Diff: 3 Page Ref: Sec. 6-5

33) A satellite is in a circular parking orbit 6.98×10^6 m from the center of Earth. To initiate a Hohmann transfer, a rocket gives it an accelerating thrust so that its speed is increased to 8300 m/s. How far from the center of Earth will the satellite be when it reaches its apogee? The mass of Earth is 5.97×10^{24} kg and $G = 6.67 \times 10^{-11}$ N•m^2/kg^2.

A) 3.12×10^7 m B) 2.48×10^7m C) 1.06×10^7m D) 6.73×10^7m E) 4.75×10^7m

Answer: C
Diff: 3 Page Ref: Sec. 6-5

34) A light beam traveling horizontally enters a hole in the side of a laboratory on planet X. The laboratory is 40.0 m wide. If the light beam hits the far wall a distance 0.20 mm below the height it entered the laboratory, what is the acceleration of gravity on planet X?

A) 2.25×10^{10} m/s^2
B) 8.00×10^6 m/s^2
C) 9.81 m/s^2
D) 4.50×10^5 m/s^2
E) 3.75×10^3 m/s^2

Answer: A
Diff: 1 Page Ref: Sec. 6-8

35) Assuming that the gravitational acceleration is constant and equal, in magnitude, to the acceleration of gravity at the surface of the earth, how far would light deflect from a straight line path as it travels one Earth diameter, 1.28×10^7 m?

A) 25.4 cm B) 8.94 mm C) 3.14 m D) 1.77 cm E) 12.7 cm

Answer: B
Diff: 1 Page Ref: Sec. 6-8