Circular Motion

360o of FUN!

1. A 61 kg skateboarder is moving down a ramp with a 7.0 m radius of curvature. At the bottom of this ramp he reaches a speed of 7.8 m s.



What upward force acts on the skateboarder at the bottom of the ramp?

A. 7.0x101 N

B. 5.3x102 N

C. 6.0x102 N

D. 1.1x103 N

E. 1.3x103N

2. Hans, whose mass is 50 kg, rides on a Ferris-wheel in a circular path at constant speed. When he is at the top of the wheel, the seat exerts an upward force of 420 N on Hans.



a. What is the centripetal force on Hans at the top of the wheel?

A. 70 N

B. 420 N

C. 490 N

D. 910 N

E. 560N

b. What is the net force on Hans at the top of the wheel?

A. 70 N

B. 420 N

C. 490 N

D. 910 N

E. 560N

c. What is the centripetal force on Hans at the bottom of the wheel?

A. 70 N

B. 420 N

C. 490 N

D. 910 N

E. 560N

d. What is the net force on Hans at the bottom of the wheel?

A. 70 N

B. 420 N

C. 490 N

D. 910 N

E. 560N

e. What is the normal force on Hans at the top of the wheel?

A. 70 N

B. 420 N

C. 490 N

D. 910 N

E. 560N

f. What is the normal force on Hans at the bottom of the wheel?

A. 70 N

B. 420 N

C. 490 N

D. 910 N

E. 560N

3. A satellite orbits the Earth with a speed of 5.2 x 103 m/s. What is the satellite’s distance from the centre of the Earth?

 A. 2.8 x 106 m B. 1.5 x 107 m C. 3.0 x 107 m D. 7.2 x 107 m

4. Which of the following statements best applies to an object moving with uniform circular motion?

 A. Acceleration is zero. B. Acceleration is directed outward.

 C. Acceleration is tangent to the path. D. Magnitude of acceleration is constant.

5. A satellite orbits the Sun with a period of 220 days. An asteroid orbits the Sun with twice the orbital radius of the satellite. What is the asteroid’s period?

 A. 110 days B. 220 days C. 440 days D. 620 days

6. A 1.2 kg mass on the end of a string is rotated in a vertical circle of radius 0.85m.



If the speed of the mass at the top of the circle is 3.6 m/s, what is the tension in the string at this location?

A. 6.5 N

B. 12 N

C. 18 N

D. 30 N

7. A 3.5 kg object is suspended by a string and moves in a horizontal circle of radius 0.60m. The tension in the string is 36N.

string

18o

3.5kg

0.60m

 a) What is the magnitude of the net force on the object?

 b) What is the period of revolution of the object?

8. The space shuttle orbits the Earth in a circular path where the gravitational field strength is 8.68 N/kg (same as acceleration due to gravity). What is the shuttle’s orbital radius?

9. A 4.2 x 103 kg spacecraft orbits a 5.6 x 1026 kg planet. If it takes the spacecraft 8.9 x 104 s to complete one orbit, how far is it from the planet’s centre?

10. A planet of radius 7.0 x 107 m has a gravitational field strength (acceleration due to gravity) of 68 N/kg at its surface. What is the period of a satellite orbiting this planet at a radius of 1.4 x 108 m (twice the planet’s radius)?

 A. 9.0 x 103 s B. 1.3 x 104 s C. 1.8 x 104 s D. 2.4 x 104 s

11. A ball moves at a constant speed in a **vertical** circle when the string breaks at the position shown. The ball would then move along which of the indicated paths?

A. P

B. Q

C. R

D. S

12. A car is travelling in uniform circular motion. Which of the following correctly describes the speed, velocity and acceleration of the car?

SPEED VELOCITY ACCELERATION

A. Constant Constant Constant

B. Constant Changing Changing

C. Changing Constant Constant

D. Changing Changing Changing

E. Constant Changing Constant

13. A 45 kg child stands on the rim of a merry-go-round of radius 2.3 m. The child completes 5 rotations in 72 s. What is the centripetal force acting on the child?

A. 0.44 N B. 0.79 N C. 20 N D. 280 N

14. Which of the following represents the graph of gravitational field strength *g* as a function of the distance *d* from the centre of a planet?

 **A B**

 **C D**

15. A toy airplane, suspended by a light thread, is moving in a circular path at a constant speed as shown.



Which of the following is the correct free body diagram for the toy airplane?

 A. B. C. D.

16. In an amusement park, a 2.8 m radius drum rotates such that a person does not fall when the floor drops away.



If the coefficient of friction between the person and the wall is 0.35, what is the maximum period of the rotation so that a person will not fall?

A. 2.0 s

B. 3.4 s

C. 5.7 s

D. 18 s

E. 24s

17. A 1400 kg car is travelling at 25 m s on a circular hill of radius 210 m. What is the normal force on this car at the top of the hill?



A. 4.2x102 N B. 9.6x103 N C. 1.4x104 N D. 2.3x104 N E. 3.1x104 N

18. Given that the force between two charged objects is given by $F\_{e}=\frac{k\left|Qq\right|}{d^{2}}$, where k is a constant, k=9.00x109Nm2/C2, Q and q represent the charge on each object in Coulombs and d is the distance between the centres of the objects, and given that the charge on a proton is 1.60x10-19C , the charge on an electron is -1.60x10-19C, the mass of an electron is 9.11x10-31kg and the diameter of a hydrogen atom is 1.1x10-10m, find the orbital speed of an electron in a hydrogen atom.

19. Two masses are on the same rotating horizontal platform. Mass 1 is 12cm from the centre and has a speed of 28cm/s. Mass 2 is 18cm from the centre, find its speed.

20. A 1650kg car travels around a banked turn. The radius of the turn is 64.0m and the angle of banking is 12.0o. The car has a frictional force of 2962N pulling toward the inner edge of the corner. Find the car’s speed.

21. A planet named Richcorinthianleather has two moons. One is called Ricardo the other is called Montalban. The orbital speed od Ricardo is 9436m/s. The orbital speed of Montalban is 6221m/s. Determine the ratio of Ricardo’s orbital radius to Montalban’s orbital radius.