Module Three Problems & Exercises (Homework)

INSTRUCTOR
Michael Jacobs
Southern New Hampshire University

Print Assignment

Current Score

QUESTION	1	2	3	4	5	6
POINTS	2.85/2.85 ✓	0.71/2.85	−/2.85	−/2.85	−/2.85	−/2.85

TOTAL SCORE: 3.56/40 = 8.9%

Due Date

SUN, MAY 23, 2021
10:59 PM CDT

Request Extension

Assignment Submission & Scoring

Assignment Submission

For this assignment, you submit answers by question parts. The number of submissions remaining for each question part only changes if you submit or change an answer.

Assignment Scoring

Your best submission for each question part is used for your score.

1. [2.85/2.85 Points] DETAILS PREVIOUS ANSWERS OSCOLPHYS1 5.1.001.

MY NOTES ASK YOUR TEACHER PRACTICE ANOTHER

A physics major is cooking breakfast when he notices that the frictional force between the steel spatula and the Dry Steel frying pan is only 0.200 N. Knowing the coefficient of kinetic friction between the two materials (0.3), he quickly calculates the normal force. What is it?

0.67 ✓ N

Additional Materials

Reading

2. [0.71/2.85 Points] DETAILS PREVIOUS ANSWERS OSCOLPHYS1 5.1.005.

MY NOTES ASK YOUR TEACHER PRACTICE ANOTHER

(a) If half of the weight of a flatbed truck is supported by its two drive wheels, what is the maximum acceleration it can achieve on wet concrete where the coefficient of kinetic friction is 0.5 and the coefficient of static friction is 0.7.

4.90 ✗ m/s²

(b) Will a metal cabinet lying on the wooden bed of the truck slip if it accelerates at this rate where the coefficient of kinetic friction is 0.5 and the coefficient of static friction is 0.55?

- No
- Yes ✓

(c) Answer both of these questions for the case that the truck has four-wheel drive, and the cabinet is wooden. maximum acceleration

m/s²Will it slip?

- Yes
- No

Additional Materials

Reading

3. [–/2.85 Points] DETAILS OSCOLPHYS1 5.1.018.

MY NOTES ASK YOUR TEACHER PRACTICE ANOTHER

A contestant in a winter games event pushes a 55.0 kg block of ice across a frozen lake as shown in Figure 4.29(a). The coefficient of static friction is 0.1 and the coefficient of kinetic friction is 0.03.

Figure 4.29

(a) Calculate the minimum force *F* he must exert to get the block moving.

N

(b) What is its acceleration once it starts to move, if that force is maintained?

m/s²

Additional Materials

Reading

4. [–/2.85 Points] DETAILS OSCOLPHYS1 5.1.019.

MY NOTES ASK YOUR TEACHER PRACTICE ANOTHER

A contestant in a winter games event pulls a 52.0 kg block of ice across a frozen lake with a rope over his shoulder as shown in Figure 4.29(b). The coefficient of static friction is 0.1 and the coefficient of kinetic friction is 0.03.

Figure 4.29

(a) Calculate the minimum force *F* he must exert to get the block moving.

N

(b) What is its acceleration once it starts to move, if that force is maintained?

m/s²

Additional Materials

Reading

5. [–/2.85 Points] DETAILS OSCOLPHYS1 5.2.022.

MY NOTES ASK YOUR TEACHER PRACTICE ANOTHER

A 500 g squirrel with a surface area of 855 cm^2 falls from a 4.0-m tree to the ground. Estimate its terminal velocity. (Use the drag coefficient for a horizontal skydiver. Assume that the squirrel can be approximated as a rectangular prism with cross-sectional area of width 11.1 cm and length 22.2 cm. Note, the squirrel may not reach terminal velocity by the time it hits the ground. Give the squirrel's terminal velocity, not it's velocity as it hits the ground.)

m/s

What will be the velocity of a 50.0-kg person hitting the ground, assuming no drag contribution in such a short distance?

m/s

Additional Materials

Reading

6. [–/2.85 Points] DETAILS OSCOLPHYS1 5.3.041.

MY NOTES ASK YOUR TEACHER PRACTICE ANOTHER

A moonshiner makes the error of filling a glass jar to the brim and capping it tightly. The moonshine expands more than the glass when it warms up, in such a way that the volume increases by 6.4% (that is, $\Delta V/V_0 = \alpha \Delta T$) relative to the space available. Calculate the force exerted by the moonshine per square centimeter if the bulk modulus is 1.5×10^9 N/m^2, assuming the jar does not break.

N/cm^2

In view of your answer, do you think the jar survives? (Hint: How many atmospheres is this?)

- Yes
- No

Additional Materials

Reading

7. [–/2.85 Points] DETAILS OSCOLPHYS1 6.1.001.

MY NOTES ASK YOUR TEACHER PRACTICE ANOTHER

Semi-trailer trucks have an odometer on one hub of a trailer wheel. The hub is weighted so that it does not rotate, but it contains gears to count the number of wheel revolutions—it then calculates the distance traveled. If the wheel has a 1.03 m diameter and goes through 100,000 rotations, how many kilometers should the odometer read?

km

Additional Materials

Reading

8. [–/2.85 Points] DETAILS OSCOLPHYS1 6.1.003.

MY NOTES ASK YOUR TEACHER PRACTICE ANOTHER

An automobile with 0.200 m radius tires travels 80,000 km before wearing them out. How many revolutions do the tires make, neglecting any backing up and any change in radius due to wear?

revolutions

Additional Materials

Reading

9. [–/2.85 Points] DETAILS OSCOLPHYS1 6.2.010.

MY NOTES ASK YOUR TEACHER PRACTICE ANOTHER

A fairgrounds ride spins its occupants inside a flying saucer-shaped container. If the horizontal circular path the riders follow has a 5.00 m radius, at how many revolutions per minute will the riders be subjected to a centripetal acceleration 2.10 times that of gravity?

rev/min

Additional Materials

Reading

10. [–/2.85 Points] DETAILS OSCOLPHYS1 6.2.012. MY NOTES ASK YOUR TEACHER

Taking the age of the earth to be about 4×10^9 years and assuming its orbital radius of 1.5×10^{11} m has not changed and is circular, calculate the approximate total distance Earth has traveled since its birth (in a frame of reference stationary with respect to the Sun).

m

Additional Materials

Reading

11. [–/2.85 Points] DETAILS OSCOLPHYS1 6.2.020.

MY NOTES ASK YOUR TEACHER PRACTICE ANOTHER

At takeoff a commercial jet has a 75.0 m/s speed. Its tires have a diameter of 0.850 m.

(a) At how many rpm are the tires rotating?

rpm

(b) What is the centripetal acceleration at the edge of the tire?

m/s²

(c) With what force must a determined 10^{-15} kg bacterium cling to the rim?

N

(d) Take the ratio of this force to the bacterium's weight.

force from part (c) / bacterium's weight

Additional Materials

Reading

12. [–/2.85 Points] DETAILS OSCOLPHYS1 6.3.026.

MY NOTES ASK YOUR TEACHER PRACTICE ANOTHER

What is the ideal speed to take a 85 m radius curve banked at a 40.0° angle?

m/s

Additional Materials

Reading

13. [–/2.85 Points] DETAILS OSCOLPHYS1 6.3.030.

MY NOTES ASK YOUR TEACHER PRACTICE ANOTHER

If a car takes a banked curve at less than the ideal speed, friction is needed to keep it from sliding toward the inside of the curve (a real problem on icy mountain roads).

(a) Calculate the ideal speed to take a 115 m radius curve banked at 15°.

m/s

(b) What is the minimum coefficient of friction needed for a frightened driver to take the same curve at 20.0 km/h?

Additional Materials

Reading

14. [–/2.95 Points] DETAILS OSCOLPHYS1 6.5.039.

MY NOTES ASK YOUR TEACHER PRACTICE ANOTHER

Astrology, that unlikely and vague pseudoscience, makes much of the position of the planets at the moment of birth. The only known force a planet exerts on earth is gravitational.

(a) Calculate the gravitational force exerted on a 4.00 kg baby by a 90 kg father 0.150 m away at birth (assuming so he is close).

N

(b) Calculate the force on the baby due to Jupiter if it is at its closest to the earth, some 6.29×10^{11} m away, showing it to be comparable to that of the father. The mass of Jupiter is about 1.90×10^{27} kg. Other objects in the room and the hospital building also exert similar gravitational forces. (Of course, there could be an unknown force acting, but scientists need to be convinced that there is even an effect, much less that an unknown force causes it.)

N

Additional Materials

Reading

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