212. A 1250 kg car on a curve with a 35.0 m radius has a centripetal force from friction and gravity of 8.07×10^3 N. What is the car's tangential speed?

213. Two wrestlers, 2.50×10^{-2} m apart, exert a 2.77×10^{-3} N gravitational force on each other. One has a mass of 157 kg. What is the other's mass?

214. A 1.81×10^5 kg blue whale is 1.5 m from a 2.04×10^4 kg whale shark. What is the gravitational force between them?

215. Triton's orbit around Neptune has a radius of 3.56×10^5 km. Neptune's mass is 1.03×10^{26} kg. What is Triton's period?

216. Find the tangential speed in problem 215.

217. A moon orbits a 1.0×10^{26} kg planet in 365 days. What is the radius of the moon's orbit?

218. What force is required to produce a 1.4 N•m torque when applied to a door at a 60.0° angle and 0.40 m from the hinge?

219. What is the maximum torque that the force in problem 218 can exert?

220. A worker hanging 65.0° from the vane of a windmill exerts an 8.25×10^3 N•m torque. If the worker weighs 587 N, what is the vane's length?

Chapter 8 Fluid Mechanics

221. A cube of volume 1.00 m^3 floats in gasoline, which has a density of 675 kg/m^3. How large a buoyant force acts on the cube?

222. A cube 10.0 cm on each side has a density of 2.053×10^4 kg/m^3. Its apparent weight in fresh water is 192 N. Find the buoyant force.

223. A 1.47×10^6 kg steel hull has a base that is 2.50×10^3 m^2 in area. If it is placed in sea water ($\rho = 1.025 \times 10^3$ kg/m^3), how deep does the hull sink?

224. What size force will open a door of area 1.54 m^2 if the net pressure on the door is 1.013×10^3 Pa?

225. Gas at a pressure of 1.50×10^6 Pa exerts a force of 1.22×10^4 N on the upper surface of a piston. What is the piston's upper surface area?

226. In a barometer, the mercury column's weight equals the force from air pressure on the mercury's surface. Mercury's density is 13.6×10^3 kg/m^3. What is the air's pressure if the column is 760 mm high?

227. A cube of osmium with a volume of 166 cm^3 is placed in fresh water. The cube's apparent weight is 35.0 N. What is the density of osmium?

228. A block of ebony with a volume of 2.5×10^{-3} m^3 is placed in fresh water. If the apparent weight of the block is 7.4 N, what is the density of ebony?

229. One piston of a hydraulic lift holds 1.40×10^3 kg. The other holds an ice block ($\rho = 917$ kg/m^3) that is 0.076 m thick. Find the first piston's area.

230. A hydraulic-lift piston raises a 4.45×10^4 N weight by 448 m. How large is the force on the other piston if it is pushed 8.00 m downward?

231. A platinum flute with a density of 21.5 g/cm^3 is submerged in fresh water. If its apparent weight is 40.2 N, what is the flute's mass?

Chapter 9 Heat

232. Surface temperature on Mercury ranges from 463 K during the day to 93 K at night. Express this temperature range in degrees Celsius.

233. Solve problem 233 for degrees Fahrenheit.

234. The temperature in Fort Assiniboine, Montana, went from −5°F to +37°F on January 19, 1892. Calculate this change in temperature in kelvins.

235. An acorn falls 9.5 m, absorbing 0.85 of its initial potential energy. If 1200 J/kg will raise the acorn's temperature 1.0°C, what is its temperature increase?

236. A bicyclist on level ground brakes from 13.4 m/s to 0 m/s. What is the cyclist's and bicycle's mass if the increase in internal energy is 5836 J?

237. A 61.4 kg roller skater on level ground brakes from 20.5 m/s to 0 m/s. What is the total change in the internal energy of the system?

238. A 0.225 kg tin can ($c_p = 2.2 \times 10^3$ J/kg•°C) is cooled in water, to which it transfers 3.9×10^4 J of energy. By how much does the can's temperature change?

239. What mass of bismuth ($c_p = 121$ J/kg•°C) increases temperature by 5.0°C when 25 J are added by heat?

240. Placing a 0.250 kg pot in 1.00 kg of water raises the water's temperature 1.00°C. The pot's temperature drops 17.5°C. Find the pot's specific heat capacity.

241. Lavas at Kilauea in Hawaii have temperatures of 2192°F. Express this quantity in degrees Celsius.

242. The present temperature of the background radiation in the universe is 2.7 K. What is this temperature in degrees Celsius?