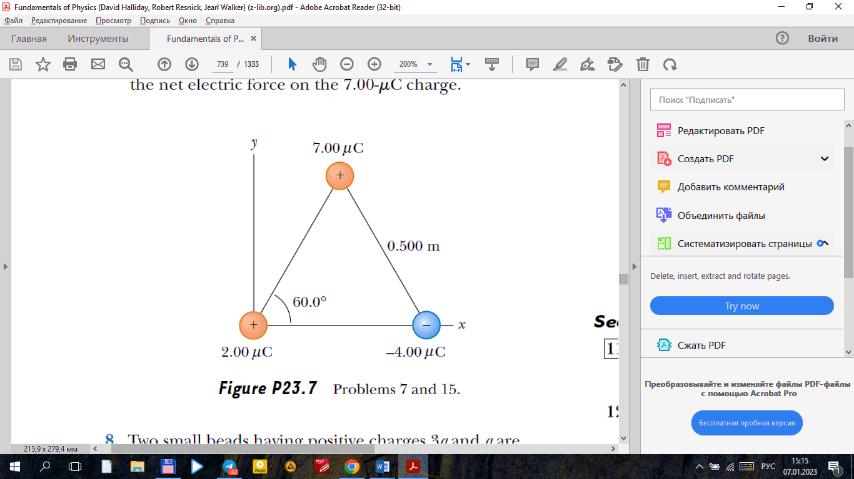
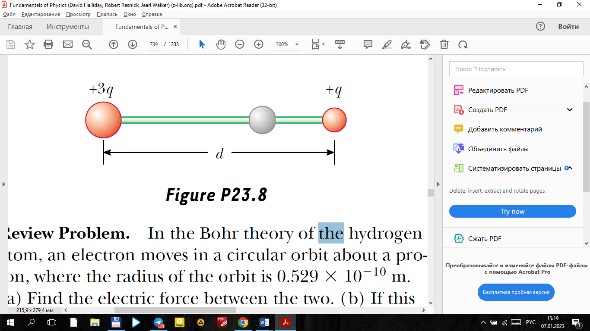
Final review questions

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PROBLEMS

1. A force F applied to an object of mass *m*1 produces an acceleration of 3.00 m/s2. The same force applied to a second object of mass *m*2 produces an acceleration of 1.00 m/s2. (a) What is the value of the ratio *m*1/*m*2 ? (b) If *m*1 and *m*2 are combined, find their acceleration under the action of the force F.
2. A force of 10.0 N acts on a body of mass 2.00 kg. What are (a) the body’s acceleration, (b) its weight in newtons and (c) its acceleration if the force is doubled?
3. A heavy freight train has a mass of 15 000 metric tons. If the locomotive can pull with a force of 750 000 N, how long does it take to increase the speed from 0 to 80.0 km/h?
4. Two objects attract each other with a gravitational force of magnitude 108 N when separated by 20.0 cm. If the total mass of the two objects is 5.00 kg, what is the mass of each?
5. Gas is contained in an 8.00-L vessel at a temperature of 20.0°C and a pressure of 9.00 atm. (a) Determine the number of moles of gas in the vessel. (b) How many molecules of gas are in the vessel?
6. А tank having a volume of 0.100 m3 contains helium gas at 150 atm. How many balloons can the tank blow up if each filled balloon is a sphere 0.300 m in diameter at an absolute pressure of 1.20 atm?
7. An auditorium has dimensions 10.0 m х 20.0 m х 30.0 m. How many molecules of air fill the auditorium at 20.0°C and a pressure of 101 kPa?
8. Nine grams of water are placed in a 2.00-L pressure cooker and heated to 500°C. What is the pressure inside the container if no gas escapes?
9. One mole of oxygen gas is at a pressure of 6.00 atm and a temperature of 27.0°C. (a) If the gas is heated at constant volume until the pressure triples, what is the final temperature?
10. (a) Find the number of moles in 1.00 m3 of an ideal gas at 20.0°C and atmospheric pressure.
11. One mole of an ideal gas is heated slowly so that it goes from *PV* state (*Pi* , *Vi*) to (3*Pi* , 3*Vi*) in such a way that the pressure of the gas is directly proportional to the volume. How much work is done in the process?
12. A sample of helium behaves as an ideal gas as energy is added by heat at constant pressure from 273 K to 373 K. If the gas does 20.0 J of work, what is the mass of helium present?
13. An ideal gas is enclosed in a cylinder with a movable piston on top. The piston has a mass of 8000 g and an area of 5.00 cm2 and is free to slide up and down, keeping the pressure of the gas constant. How much work is done as the temperature of 0.200 mol of the gas is raised from 20.0°C to 300°C?
14. A gas is compressed from 9.00 L to 2.00 L at a constant pressure of 0.800 atm. In the process, 400 J of energy leaves the gas by heat. (a) What is the work done by the gas? (b) What is the change in its internal energy?
15. A thermodynamic system undergoes a process in which its internal energy decreases by 500 J. If, at the same time, 220 J of work is done on the system, what is the energy transferred to or from it by heat?
16. Calculate the change in internal energy of 3.00 mol of helium gas when its temperature is increased by 2.00 K.
17. Suppose that 1.00 g of hydrogen is separated into electrons and protons. Suppose also that the protons are placed at the Earth’s north pole and the electrons are placed at the south pole. What is the resulting compressional force on the Earth?
18. Two identical conducting small spheres are placed with their centers 0.300 m apart. One is given a charge of 12.0 nC, and the other is given a charge of -18.0 nC. (a) Find the electric force exerted on one sphere by the other. (b) The spheres are connected by a conducting wire. Find the electric force between the two after equilibrium has occurred.
19. Three point charges are located at the corners of an equilateral triangle, as shown in Figure P23.7. Calculate the net electric force on the 7.00- μC charge.



1. Two small beads having positive charges 3*q* and *q* are fixed at the opposite ends of a horizontal insulating rod extending from the origin to the point *x=d*. As shown in Figure P23.8, a third small charged bead is free to slide on the rod. At what position is the third bead in equilibrium? Can it be in stable equilibrium?
2. A lightbulb marked “75 W [at] 120 V” is screwed into a socket at one end of a long extension cord in which each of the two conductors has a resistance of 0.800 Om.The other end of the extension cord is plugged into a 120-V outlet. Draw a circuit diagram, and find the actual power delivered to the bulb in this circuit.
3. Four copper wires of equal length are connected in series.Their cross-sectional areas are 1.00 cm2, 2.00 cm2, 3.00 cm2, and 5.00 cm2. If a voltage of 120 V is applied to the arrangement, what is the voltage across the 2.00-cm2 wire?
4. A force of 8.0 N acts on a body of mass 4.00 kg. What are (a) the body’s acceleration, (b) its weight in newtons and (c) its acceleration if the force is doubled?
5. A heavy freight train has a mass of 5 000 metric tons. If the locomotive can pull with a force of 50 000 N, how long does it take to increase the speed from 0 to 40.0 km/h?
6. Two objects attract each other with a gravitational force of magnitude 108 N when separated by 10.0 cm. If the total mass of the two objects is 2.00 kg, what is the mass of each?
7. Gas is contained in an 4.00-L vessel at a temperature of 40.0°C and a pressure of 9.00 atm. (a) Determine the number of moles of gas in the vessel. (b) How many molecules of gas are in the vessel?
8. А tank having a volume of 0.200 m3 contains helium gas at 300 atm. How many balloons can the tank blow up if each filled balloon is a sphere 0.600 m in diameter at an absolute pressure of 1.20 atm?
9. An auditorium has dimensions 10.0 m х 30.0 m х 20.0 m. How many molecules of air fill the auditorium at 40.0°C and a pressure of 100 kPa?
10. Nine grams of water are placed in a 4.00-L pressure cooker and heated to 400°C. What is the pressure inside the container if no gas escapes?
11. One mole of oxygen gas is at a pressure of 3.00 atm and a temperature of 27.0°C. (a) If the gas is heated at constant volume until the pressure triples, what is the final temperature?
12. (a) Find the number of moles in 2.00 m3 of an ideal gas at 40.0°C and atmospheric pressure.