8. Which of the figures describes a situation in which $\Delta U > 0$, $Q > 0$, and $W = 0$?

F. (a)
G. (b)
H. (c)
J. (d)

9. A power plant has a power output of 1055 MW and operates with an efficiency of 0.330. Excess energy is carried away as heat from the plant to a nearby river. How much energy is transferred away from the power plant as heat?

A. 0.348×10^9 J/s
B. 0.520×10^9 J/s
C. 0.707×10^9 J/s
D. 2.14×10^9 J/s

10. How much work must be done by air pumped into a tire if the tire's volume increases from 0.031 m^3 to 0.041 m^3 and the net, constant pressure of the air is 300.0 kPa?

F. 3.0×10^2 J
G. 3.0×10^3 J
H. 3.0×10^4 J
J. 3.0×10^5 J

SHORT RESPONSE

Use the passage below to answer questions 11–12.

An air conditioner is left running on a table in the middle of the room, so none of the air that passes through the air conditioner is transferred to outside the room.

11. Does passing air through the air conditioner affect the temperature of the room? (Ignore the thermal effects of the motor running the compressor.)

12. Taking the compressor motor into account, what would happen to the temperature of the room?

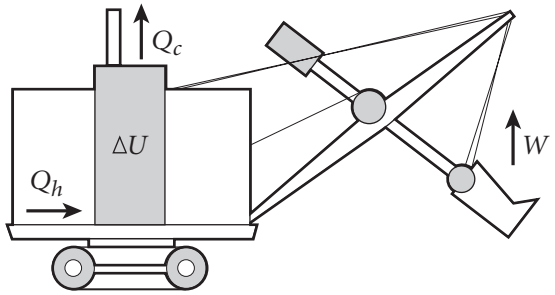
13. If 1600 J of energy are transferred as heat to an engine and 1200 J are transferred as heat away from the engine to the surrounding air, what is the efficiency of the engine?

EXTENDED RESPONSE

14. How do the temperature of combustion and the temperatures of coolant and exhaust affect the efficiency of automobile engines?

Base your answers to questions 15–18 on the information below. In each problem, show all of your work.

A steam shovel raises 450.0 kg of dirt a vertical distance of 8.6 m. The steam shovel's engine provides 2.00×10^5 J of energy as heat for the steam shovel to lift the dirt.



15. How much work is done by the steam shovel in lifting the dirt?

16. What is the efficiency of the steam shovel?

17. Assuming there is no change in the internal energy of the steam shovel's engine, how much energy is given up by the shovel as waste heat?

18. Suppose the internal energy of the steam shovel's engine increases by 5.0×10^3 J. How much energy is given up now as waste heat?

19. One way to look at heat and work is to think of energy transferred as heat as a "disorganized" form of energy and energy transferred as work as an "organized" form. Use this interpretation to show that the increased order obtained by freezing water is less than the total disorder that results from the freezer used to form the ice.

Test TIP Identify each of the quantities given in each problem; then write down the necessary equations for solving the problem, making sure that you have values for each term in each equation.