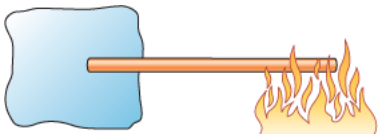
Name _____
Mods _____ Due: _____ *Mr. Forrest: AP Physics 2 – 2019*

Chapter 11 (Using Energy) Conceptual Questions

9) When a spacecraft returns to earth, its surfaces reach a very high temperature during its high-speed reentry into the atmosphere. Is this temperature rise due to the transfer of energy as heat? Explain.

11) One end of a short aluminum rod was left outside on a winter's night and is in a frozen block of ice. The other end is placed in a campfire, as shown. If the temperature at every point in the rod has reached a steady value, and 100 J of energy are transferred from the fire to the rod, how much energy goes from the rod into the ice? (> 100 J, exactly 100 J, < 100 J) Explain your reasoning.



20) A fire piston – an impressive physics demonstration! – ignites a fire without matches. The operation is shown in the figure. A wad of cotton is placed at the bottom of a sealed syringe with a tight-fitting plunger. When the plunger is rapidly depressed, the air temperature in the syringe rises enough to ignite the cotton. Explain why the air temperature rises, and why the plunger must be pushed in very quickly. *NOTE: This is similar to how diesel engines work!*

12) Two blocks of copper, one of mass 1 kg and the second of mass 3 kg, are at the same temperature.
a) Which block has more thermal energy? Explain.

b) If the blocks are placed in contact with each other, will the thermal energy of the blocks change? If so, how? As always, explain your reasoning.

23) Your car's engine is a heat engine; it converts thermal energy from burning fuel into energy to move your car and power its systems. On a cold winter day, you needn't feel guilty about cranking up the heat in your car as running the heater doesn't cost any additional energy beyond the small amount needed to run the fan. Explain why this is so. (This is NOT true for cooling your car with A/C in the summer, by the way)

25) You can save money on electricity if you put your refrigerator in the basement, which is usually cooler than the rest of your house. Explain.

26) The ground temperature a few meters below the surface is fairly constant throughout the year and is near the average value of the air temperature. In areas where the air temperature drops very low in the winter, the exterior unit of a heat pump designed for heating is sometimes buried underground in order to use the earth as a thermal reservoir. Why is it worthwhile to bury the heat exchanger, even if the underground unit costs more to purchase and install than the one above ground?

£) For each of the following processes:
Is the value of the work (W), the heat (Q), and the exchange of thermal energy ΔE_{th} (or ΔU) positive (+), negative (-), or zero (0)? Does the temperature increase (+), decrease (-), or not change (0)? Make sure your answers are consistent with the first law of thermodynamics!

	W	Q	ΔU	ΔT
You hit a nail with a hammer. The system is the nail.				
You hold a nail over a Bunsen burner. The system is the nail				
Expanding high pressure steam spins a turbine. The system is the steam.				
Steam contacts a cold surface and condenses. They system is the steam.				
A piston rapidly compresses gas in a cylinder. The system is the gas.				

¥) For each engine shown supply the missing value and determine the efficiency.