Name: ______________________________ **Date:** ____________ **Class:** ___________

Cost Efficiency Worksheet Example Answers

The power output of your pump (P_O) can be given by $P_o = \gamma Q H_P$, where γ is the specific weight of water (γ =62.4 lbs/ft^3), Q is the flow of the pump, and H_P is the head the pump must overcome.

To begin, get everything in matching units. To find flow, measure how many gallons of water your pump can move in a given time. Covert the time to seconds, and gallons to ft^3 (Hint: 7.48 gallons = 1 ft^3). Also convert to feet the height difference between the two buckets.

2.1 gallons = 0.28 ft^3 Volume: **0.28** [ft^3]

Time: **120** [s]

H_P= **4** [ft]

Flow is a volume per time. In order to get the flow, divide the volume by the time:

0.28 ft^3/120 s=2.33x10^{-3} ft^3/s Flow, Q=**2.33x10^{-3}** [ft^3/s]

Calculate the power output of your pump using the equation:

$P_o = \gamma Q H_P$ * (1.356 [watts]/ [ft lb/s])

(62.4 lbs/ ft^3)(2.33 x 10^{-3} ft^3/s)(4 ft)=0.58 ft lb / s=0.79 W

P_o=**0.79** [watts]

Finally, we want to know how cost effective your pump is. Divide total cost by your power output. ($/$P_o$)

($21.65)(.79 W)=27.41 $/W e=**27.41 $/W** [$/watts]

Discussion Questions

What factors made your pump a good design?

Possible answers: Our pump was simple to operate, it worked well, it had a good efficiency, was visually appealing, etc.

What was the most expensive aspect of your design? How could you reduce cost in this area?

Possible answers: Our pump used a lot of PVC and was very big. We could make it smaller but still have it work well!

What would you change in future designs?

Possible answers: We could try a longer threaded rod to pump water easier.