A foam cup is filled with hot water and allowed to cool. While being stirred by a paddlewheel. Initially the water has an internal energy of 200 KJ and while cooling it loses

150 KJ of heat . The paddlewheel does 25 KJ of work on the water. Calculate the change in internal energy of the water and the final internal energy.

U
i
= 200 KJ , Q = - 150 KJ  W = + 25 KJ

Q is given –ve sign because heat is given out from the system

9ER Ò ² r Ò Ó S ² #R Ò Ó #R ´

9ER Ò P
f
– U
i

U
f
= Del U + U
i
= -125 + 200 = 75 KJ

2 A pump full of compressed gas is allowed to expand and 80 Kj work is done by the gas on an object in the lab. At the same time, the gas is warmed by the radiation of 100 KJ of heat energy . The initial internal energy of the gas is 500 KJ . Calculate the final internal energy.

Ans..Del U 20 KJ  Final internal + 520 KJ

3.0.5 mole of an ideal gas at a temperature of 300 K expands isothermally from an initial volume of 2L to 6 L . a) what is the work done by the gas ? b) estimate the heat added to the gas C) what is the final pressure of the gas ?

R + 8.314 J mol-1 K-1

Workdone w = nRT ln ( V
f
/ V
i
) = 0.5 x 8.314 x 300 x ln ( 6 /2) = 1369 KJ

From I law of thermodynamics for iso thermal expansion Del U = q-w = 0

So q = w, heat added to the system is equal to work done , so q = 1369 KJ , Heat flows into the system

P
i
V
i
= P
f
V
f
= nRT

P
f
= nRT / V
f

= 0.5 x 8.314 x 300 / 6 x 10

-3

= 207. 75 KPa

V

f

= 6 lit = 6 x10

-3

m

3

Conversion factor

4. One mole of an ideal gas is heated at constant pressure from O dec Centigrade to 200 deg Centigrade . Calculate the work done

T

1

= O Deg C = 273 K , T

2

= 200 Deg C = 473 K

W = - P Del V = -P {V

2

– V

1

) = -P ( nRT

2

/ P - nRT

1

/P)

Ans 397 .4 Cal 1662.8 j

5. 0.5 mole of an ideal gas expands isothermally and reversibly rom 10 lit to 20 lit at a temperature of 30 deg C. Determine q, w, Del U for the process .Express in Joules

Since it is iso thermal expansion, Del U = 0,  q = --w

W = - nRT ln ( V
f
/ V
i
) = - 0.5 x  8.314 x 303.2 x ln ( 20 /10)  =  - 873.6 J

q= -w = 873,6 J

6. Calculate the work done during isothermal reversible expansion of one mole of an ideal gas from 10 atm to 1 atm at 300 K

Ans 1388.8 cal