Department of Electrical Engineering
Sessional Assignment
Date: 06/05/2020

Course Details

Course Title: Thermodynamics **Module:** 02
Instructor: **Sir Mujtaba Ehsan** **Total Marks:** 20

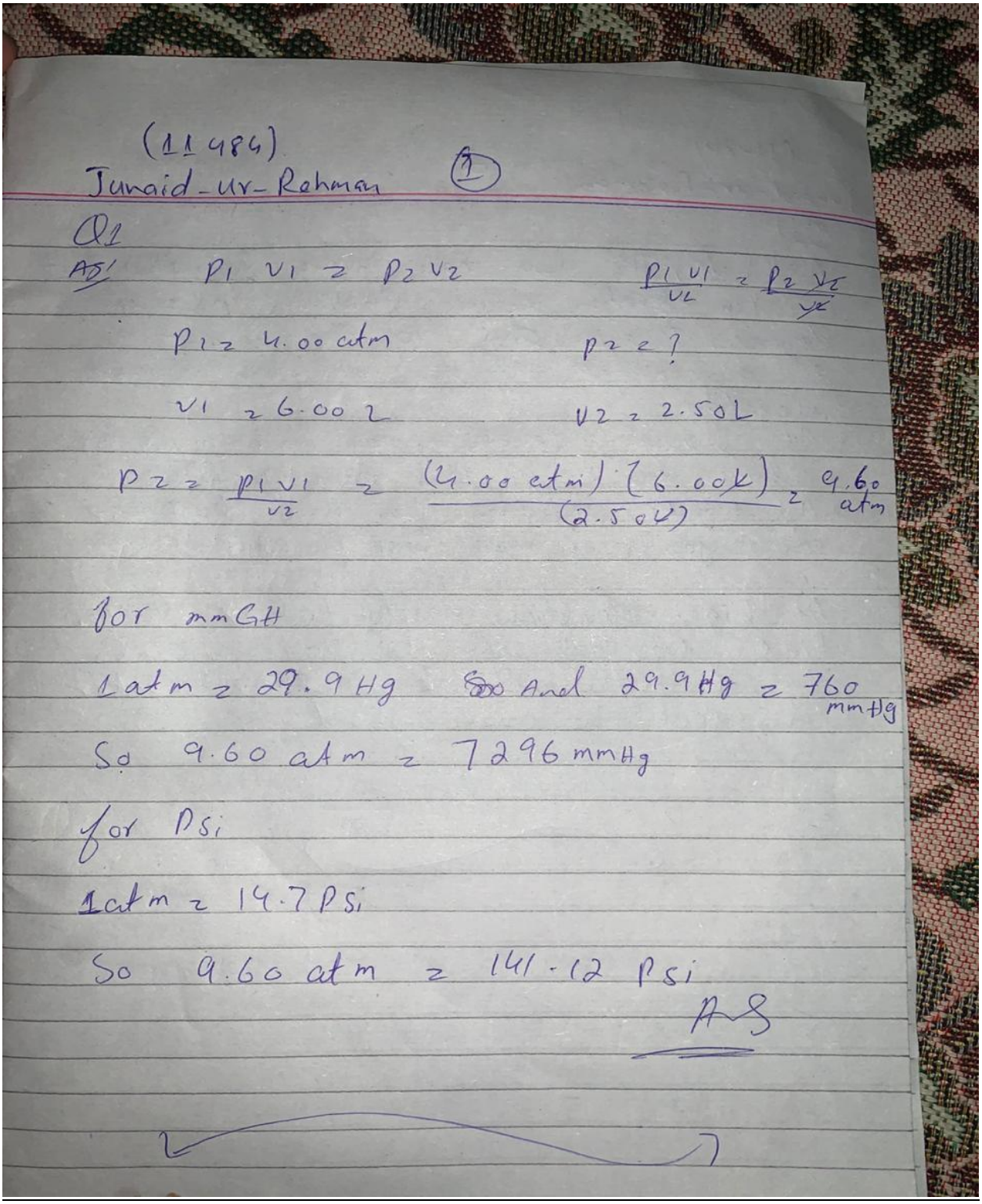
Student Details

Name: **Junaid Ur Rehman** **Student ID:** **11484**

Q1.		Let the initial volume of the gas in a container be 06 liters and the initial pressure be 04 atm. The piston is compressed at a constant temperature to a new final volume of 2.50 L. **Evaluate** the final pressure in units of atm, mmHg and psi.	Marks 06 CLO 2
Q2.		**State** the following statement as **True** or **False** and also give the reason for your answer: "There is a direct relationship between air pressure and altitude".	Marks 03 CLO 2
Q3.		A volume of 8 ft^3 of steam at a pressure of 100 lb-f/in^2 is expanded hyperbolically to a pressure of 18.3 lb-f/in^2 **Calculate** the work done by steam.	Marks 06 CLO 1
Q4.	i. ii.	**Outline** the differences between work and heat. **Describe** the meaning of the term $\Delta Q = \Delta W$	Marks 03+02 CLO 1

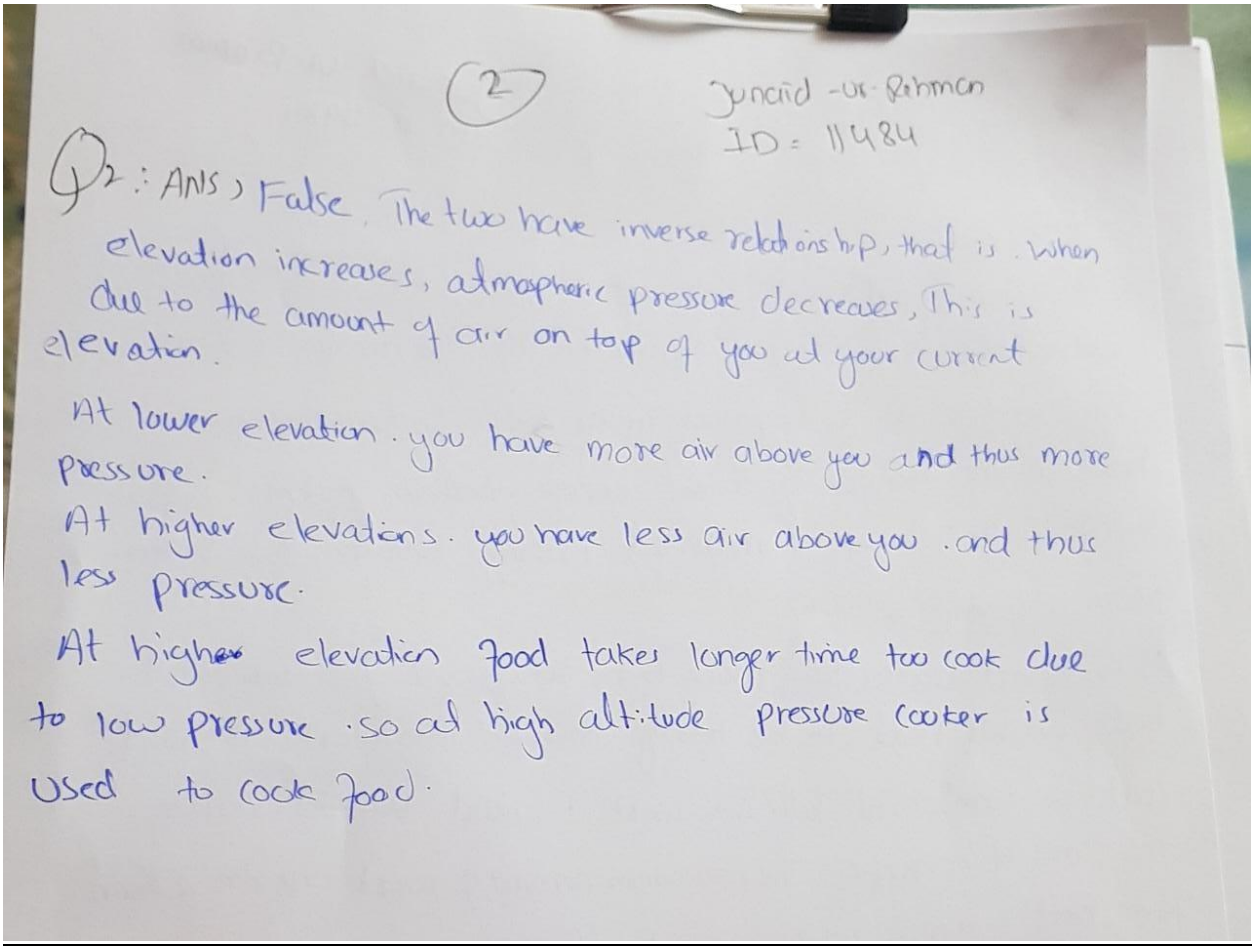
Q1.		Let the initial volume of the gas in a container be 06 liters and the initial pressure be 04 atm. The piston is compressed at a constant temperature to a new final volume of 2.50 L. **Evaluate** the final pressure in units of atm, mmHg and psi.

Answer:



Q2.		**State** the following statement as **True** or **False** and also give the reason for your answer: "There is a direct relationship between air pressure and altitude".

Answer:



(2)

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Q2.: ANS) False. The two have inverse relationship, that is. When elevation increases, atmospheric pressure decreases, This is due to the amount of air on top of you at your current elevation.

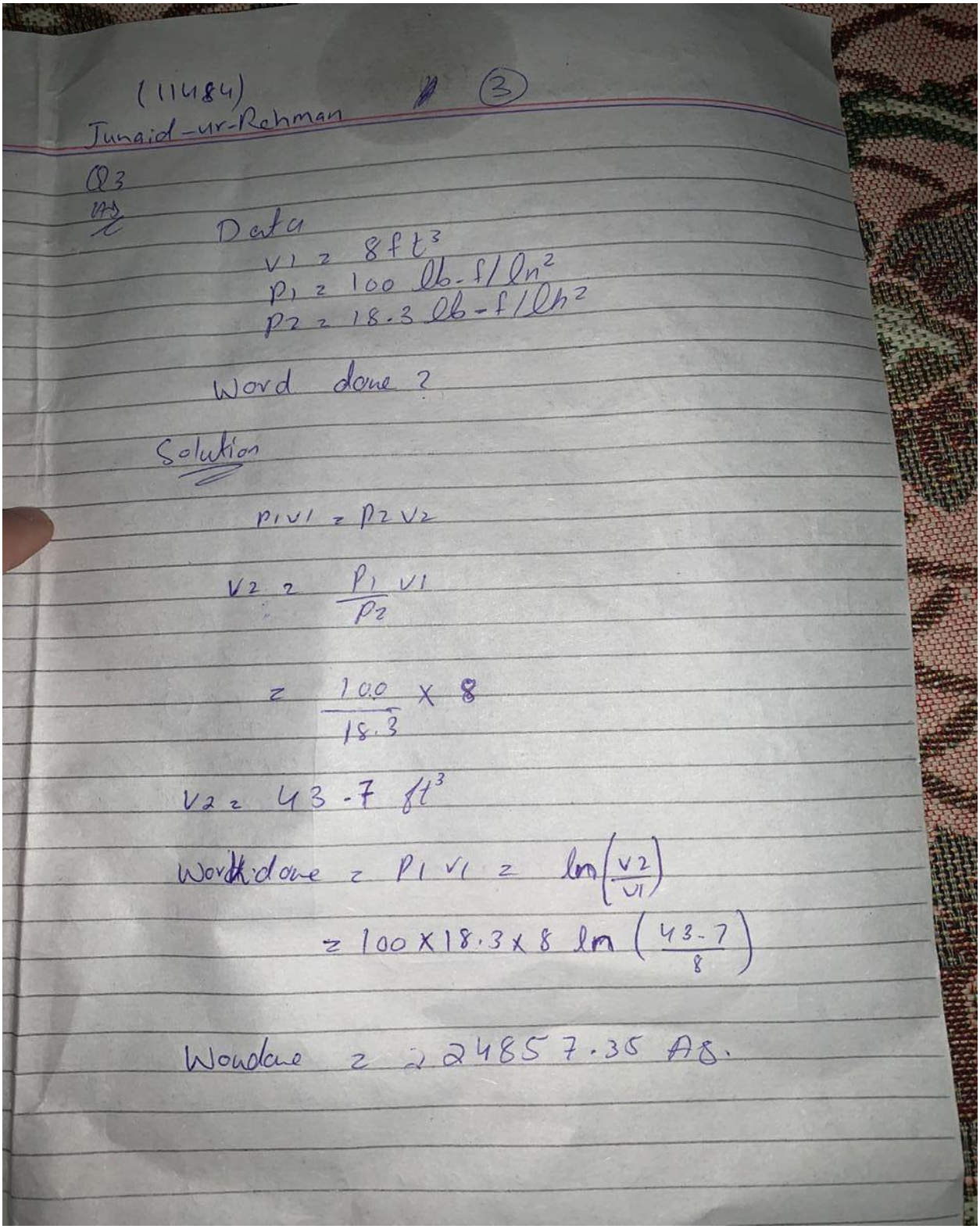
At lower elevation. you have more air above you and thus more pressure.

At higher elevations. you have less air above you. and thus less pressure.

At higher elevation food takes longer time too cook due to low pressure. so at high altitude pressure cooker is used to cook food.

Q3.		A volume of 8 ft^3 of steam at a pressure of 100 lb-f/in^2 is expanded hyperbolically to a pressure of 18.3 lb-f/in^2 **Calculate** the work done by steam.

Answer:



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Q3
Ans

Data
$V_1 = 8\ ft^3$
$P_1 = 100\ lb\text{-}f/in^2$
$P_2 = 18.3\ lb\text{-}f/in^2$

Word done ?

Solution

$P_1V_1 = P_2V_2$

$V_2 = \frac{P_1}{P_2} V_1$

$= \frac{100}{18.3} \times 8$

$V_2 = 43.7\ ft^3$

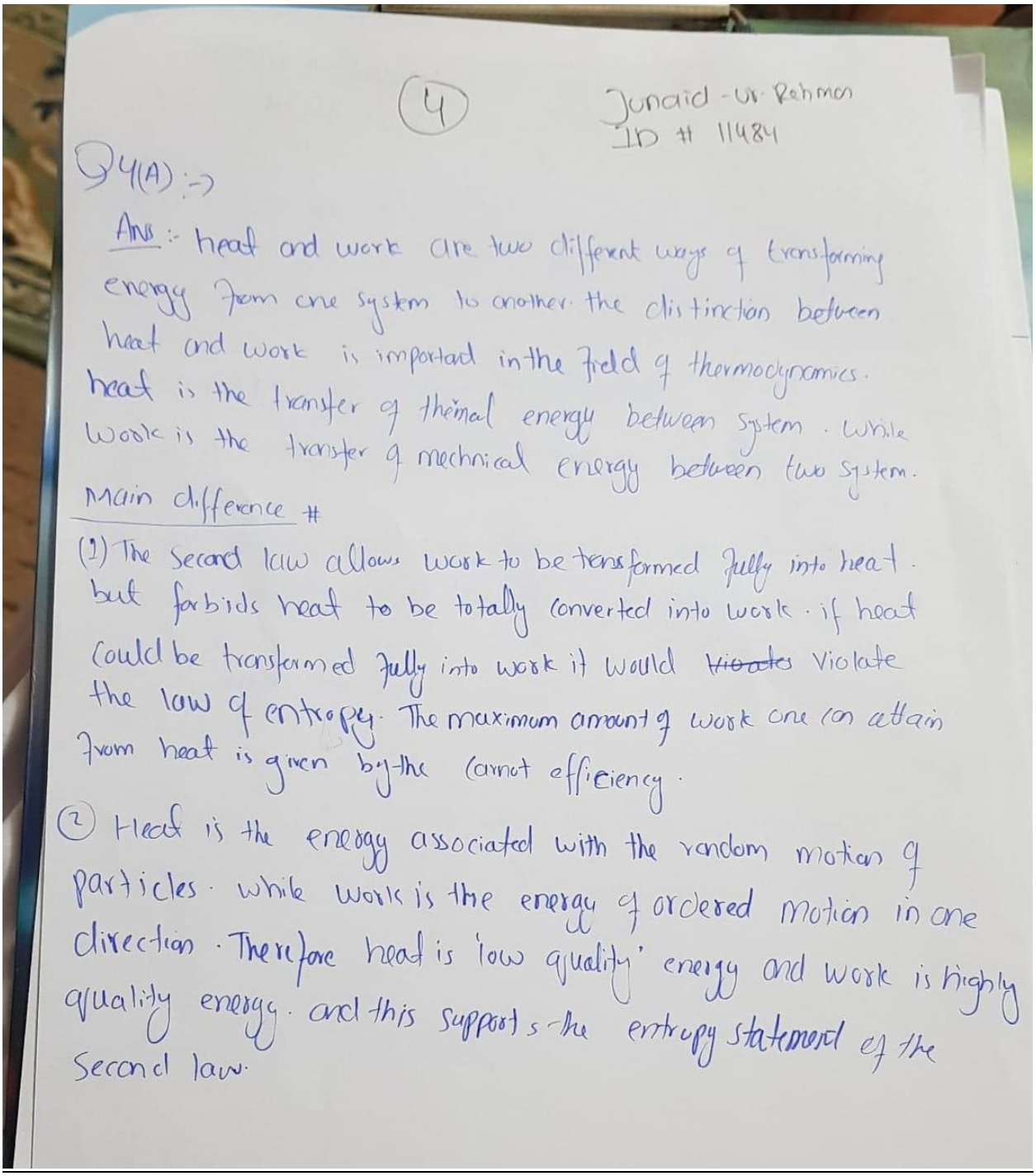
Work done $= P_1V_1 = \ln\left(\frac{V_2}{V_1}\right)$

$= 100 \times 18.3 \times 8 \ln\left(\frac{43.7}{8}\right)$

Wordone $= 24857.35$ Ans.

Q4.	i. ii.	**Outline** the differences between work and heat. **Describe** the meaning of the term ΔQ = ΔW

Answer:



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Q4(A) :->

Ans :- Heat and work are two different ways of transforming energy from one system to another. the distinction between heat and work is important in the field of thermodynamics. heat is the transfer of thermal energy between system. while work is the transfer of mechnical energy between two system.

Main difference #

(1) The second law allows work to be transformed fully into heat. but forbids heat to be totally converted into work. if heat could be transformed fully into work it would ~~violates~~ violate the law of entropy. The maximum amount of work one can attain from heat is given by the carnot efficiency.

(2) Heat is the energy associated with the random motion of particles. while work is the energy of ordered motion in one direction. Therefore heat is 'low quality' energy and work is highly quality energy. and this supports the entropy statement of the second law.

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D/W heat and work

	Mechanical	thermal
(1) interacting		
(2) requires	force and displacement	Temperature difference
(3) Process	macroscopic pushes and pulls	microscopic collisions
(4) positive values	W > 0 when a gas is compressed energy is transferred into system	Q > 0 when the environment is at a higher temperature than the system. energy is transferred into system.
(5) negative values	W < 0 when a gas expands energy is transferred out of system	Q < 0 when the system is at a higher temperature than the environment. energy is transferred out of the system.
(6) Equilibrium	A system is in mechanical equilibrium when there is no net force or torque on it	A system is in thermal equilibrium when it is at the same temperature as the environment.

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Q4(b):-

Ans # delta Q is the net heat ~~heat~~ transferred into the system - that is Q is the sum of all heat transfer into the and out of the system. Where delta W is the net work done by the system that is W is the sum of all work done on or by the system.

delta Q	delta W (work done on gas)
is + if heat enter gas	is + if gas is compressed
is − if heat exits gas	is − if gas expands
is 0 if no heat exchanged	is 0 if volume is constant