Master Math for JEE Main & JEE Advanced

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For JEE Main 2020 April

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JEE Mains 2020 Jan Chapter wise Question Bank

Chemical Thermodynamics

Q1

$A_{(\ell)} \longrightarrow 2B_{(g)}$

$\Delta U = 2.1$ kcal, $\Delta S = 20$ cal/k, $T = 300$ K.
Find ΔG (in kcal)

$A_{(\ell)} \longrightarrow 2B_{(g)}$

$\Delta U = 2.1$ kcal, $\Delta S = 20$ cal/k, $T = 300$ K.
ΔG ज्ञात कीजिए। (kcal में)

7th Jan Morning

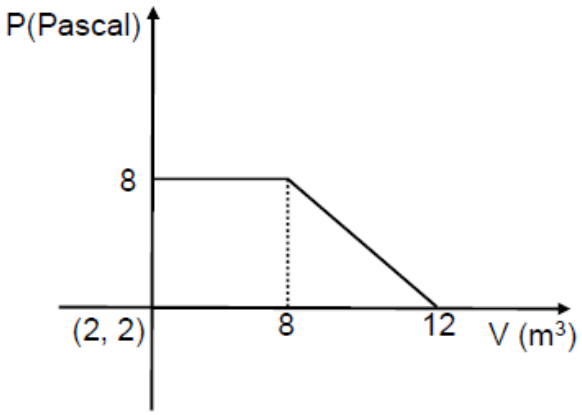
Sol

–02.70 kcal

$\Delta H = \Delta U + \Delta ngRT$
$= 2.1 \times 10^3 + 2(2)\ (300)$
$= 2100 + 1200$
$= 3300$ cal
$\Delta G = \Delta H - T\Delta S$
$= 3300 - (300)\ (20)$
$= 3300 - 6000$
$= -2700$ cals $= -2.7$ kcal

Q2

A gas undergoes expansion according to the following graph. Calculate work done by the gas.
एक गैस, निम्न आरेख के अनुसार प्रसार दर्शाती है। गैस द्वारा किये गये कार्य की गणना कीजिये?



8th Jan Morning

Sol

48.00

$$|W| = \frac{1}{2}(6 + 10) \times 6 = 48 \text{ J}$$

Q3

Temperature of 4 moles of gas increases from 300 K to 500 K find 'C_v' if ΔU = 5000 J.

8th Jan Evening

Sol

06.25

$\Delta U = nC_v\Delta T$

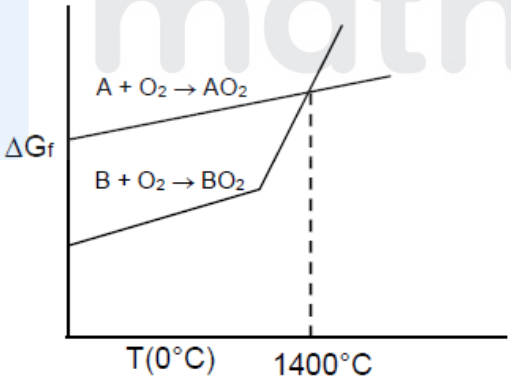
$5000 = 4 \times C_v (500 - 300)$

$C_v = 6.25\ JK^{-1}\ mol^{-1}$

Q4

A can reduce BO_2 under which conditions.

किस परिस्थिति में A, BO_2 को अपचयित कर सकता है



(1) > 1400°C

(2) < 1400°C

(3) > 1200°C and (तथा) < 1400°C

(4) < 1200°C

9th Jan Morning

Sol

(1)

$A + BO_2 \longrightarrow B + AO_2$

ΔG = –ve

Only above **1400°C**

Q5

Select the correct option :

(1) Entropy is function of temperature and also entropy change is function of temperature.

(2) Entropy is a function of temperature & entropy change is not a function of temperature.

(3) Entropy is not a function of temperature & entropy change is a function of temperature.

(4) Both entropy & entropy change are not a function of temperature.

9th Jan Evening

Sol

(1)

$$\Delta S = \int \frac{dq}{T}$$

$$S_T = \int_0^T \frac{ncdT}{T}$$

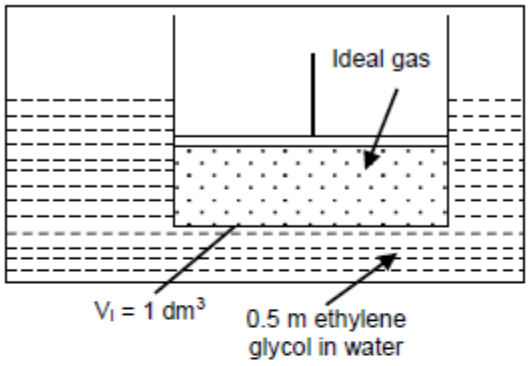
Q6

0.1 ml of an ideal gas has volume 1 dm^3 in a locked box with friction less piston. The gas is in thermal equilibrium with excess of 0.5 m aqueous ethylene glycol at its freezing point. If piston is released all of a sudden at 1 atm then determine the final volume of gas in dm^3 ($R = 0.08$ atm L mol^{-1} K^{-1} $K_f = 2.0$ K $molal^{-1}$).

9th Jan Evening

Sol

(2.176 dm^3, 2.18)



$K_f = 2.0$
$m = 0.5$ m
$\Delta T_f = K_f m$
$= 0.5 \times 2$
$T_{initial} = 272$ K
$n = 0.1$ mol
$V = 1$ dm^3

$$P_{gas} = \frac{nRT}{V} = \frac{0.1 \times 0.08 \times 272}{1}$$

$= 2.176$ atm
After releasing piston $P_1V_1 = P_2V_2$
पिस्टन छोडने के पश्चात् $P_1V_1 = P_2V_2$
$2.176 \times 1 = 1 \times V_2$
$V_2 = 2.176$ dm^3

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