Seat No. ☐

King Mongkut' University of Technology Thonburi
Midterm Examination—1/2011
ChE 100:Introduction to Chemical Engineering

Date: Wednesday 27 July 2011, 9:00-11:00

Notes:

1. This exam paper includes 4 problems (70 points) in a total of 6 pages.
2. It is an open-book/notes examination.
3. A calculator and a ditionary are allowed.
4. Students are not allowed to take any exam materials/papers out of the exam room.

Student Name_____**Student ID**_____

Written by Dr. Asawin Meechai

This exam paper has been evaluated and approved by the Department of Chemical Engineering's Committee.

(Assoc. Prof. Dr. Anawat Sungpet)
Departmental Chair

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1. (40 points) Short answers
   (a) What is the mass of an object that weighs 19.6 kN at sea level?

   (b) A rate constant k of a reaction is expressed as $k = A \exp(B/T)$, where k is in mol/s, T is in Kelvin. A and B are constants. What are the units of A and B?

   (c) What is the sum of the following two measured values: 5750 and 10.3?

   (d) What is the kinetic energy of a vehicle with a mass of 300 kg moving at the rate of 5 ft/s in Btu?

   (e) How many lb mol of NaCl are there in 200 lb?

   (f) Benzene has a specific gravity of 0.879 at 20°C, what is the density of benzene in kg/m^3?

Student Name_____ Student ID_____

(g) How many kg of salt must be mixed with 48 kg of sugar so that the final mixture is 30% salt by mass?

(h) The maximum allowable concentration of mercury in water is 2 ppb. How much is this in mg/L?

(i) Is 20 K higher than 20°R?

(j) Interpolate the concentration of O_2 dissolved in water at 22°C from the tabulated data.

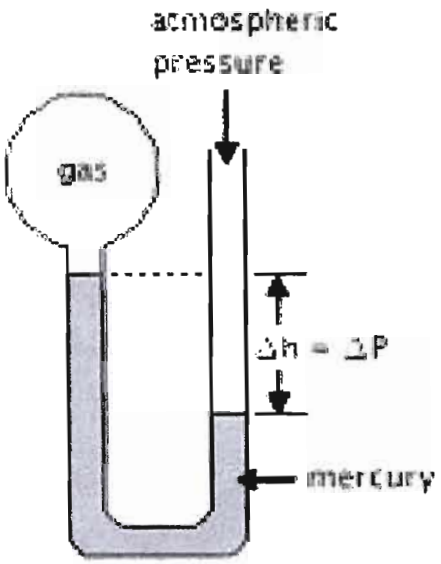
Temperature (°C)	5	10	15	20	25	30
Dissolved O_2 (mg/l)	1.32	1.11	0.85	0.67	0.46	0.23

Student Name_____ Student ID_____

2. (10 points) Fifty gal/min of gasohol E20 having a specific gravity of 0.90 flows into a tank truck with the load limit of 35,000 lb of fuel. How long will it take to fill the tank in the truck?

Student Name_____ Student ID_____

3. (10 points) A mercury manometer is used to measure the gas pressure as shown in the figure below. The level difference (Δh) of the manometer fluid is 5.5 inches. What is the absolute pressure of the gas in cm.Hg, if the atmospheric pressure is 1 atm?



Student Name_____ Student ID_____

4. (10 points) The heat capacity of sodium is $C_p = 20.2 + 2.18T$, where C_p is in J/(g mol)(K) and T is in K. Convert this expression so that C_p is in cal/(g mol)(°F) with T in °F.