國立中央大學101學年度碩士班考試入學試題卷

所別：大氣科學學系大氣物理碩士班 不分組(一般生)　科目：普通化學　共 2 頁 第 1 頁
大氣科學學系大氣物理碩士班 不分組(在職生)

本科考試禁用計算器　＊請在試卷答案卷（卡）內作答

1. (1) In chemistry, it is common to express pressures in units of atmospheric pressure: 1atm=101325 Pa. So, in a column of 1 cm^2 cross-section of Hg (density 13.6 g/cm^3), what is the height needed to counter 1 atm? (5%)
(2) What if water were used in place of mercury? (5%)

2. Describe following terms (16%)
(1) Boyle's Law (4%)
(2) Charles' Law (4%)
(3) Avogadro's Law (4%)
(4) The ideal gas equation of state (4%)

3. (1) In an industrial process, a gas confined to a volume of 1 L at a pressure of 20 atm is allowed to flow into a 12-L container by opening the valve that connects the two containers. What will be the final pressure of the gas? (5%)
(2) The air pressure in a car tire is 30 psi (pounds per square inch) at 10°C. What will be pressure be after driving has raised its temperature to 45°C? (Assume that volume remains unchanged.) (5%)

4. A biscuit made with baking powder has a volume of 20 mL, of which one-fourth consists of empty space created by gas bubbles produced when the baking powder decomposed to CO_2. What weight of $NaHCO_3$ was present in the baking powder in the biscuit? Assume that the gas reached its final volume during the baking process when the temperature was 400°C. (Hint: Baking powder consists of sodium bicarbonate mixed with some other solid that produces an acidic solution on addition of water, initiating the reaction $NaHCO_3(s) + H^+ \rightarrow Na^+ + H_2O + CO_2$.) (10%)

5. Compute number density of air at 1 atm and 0°C. (10%)

6. (1) Compute total molecular mass of air. (5%)
(2) Compute air density at 1 atm and 0°C. (5%)

7. Describe following terms (20%)
(1) unimolecular reaction (4%)
(2) bimolecular reaction (4%)
(3) termolecular reaction (4%)
(4) reaction rate constant (4%)
(5) reaction mechanism (4%)

注意：背面有試題

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8. Describe following terms (14%)

(1) greenhouse gases (2%)

(2) isotopes (2%)

(3) hygroscopic (2%)

(4) isomers (2%)

(5) heterogeneous reaction (2%)

(6) the atmosphere (4%)

Useful data:

- Universal gas constant R_u = 0.0821 liter·atm/mol·K

注意：背面有試題