Answers


Chem 112 - Exam 1 - 09/13/2017 - avg=65, med=67, s=16
\[ R = 8.314 \text{ J/K-mol} = 0.0821 \text{ l-atm/K-mol} \]

\[ \ln P = -\frac{\Delta H_{vap}}{RT} + b \quad u = \sqrt{\frac{3RT}{M}} \]

DO NOT OPEN THIS EXAM UNTIL YOU ARE INSTRUCTED TO DO SO

- Please print your name on the scantron
  - Last Name, First Name
  - That’s all that’s needed
- Sit in odd numbered seats.
- Books & Bags in the front of the room.
- No text entry calculators.
- Use the exams as scratch paper.
- Keep the exams when you are done.
- Turn in the scantrons.
100 total points. Questions 1-15 worth 6.5 points each. Question 16 worth 2.5 points.

1. One mole of H₂S gas escapes from a container by effusion in 77 seconds. How long would it take for one mole of NH₃ gas to escape from the same container?
   a) 38.5 sec
   b) 54 sec
   c) 154 sec
   d) 109 sec
   e) 122 sec

2. Air in a sealed container is heated from 25 °C to 36 °C. If the initial pressure is 3.80 atm, what is the final pressure?
   a) 2.64 atm
   b) 5.48 atm
   c) 3.77 atm
   d) 3.94 atm
   e) 3.03 atm

3. A 6.60 g sample of a gaseous compound occupies a volume of 1.20 L at 27 °C and 0.967 atm. What is molecular weight of this compound?
   a) 140 g/mol
   b) 165 g/mol
   c) 152 g/mol
   d) 109 g/mol
   e) 123 g/mol
4. Using the graph below, determine the gas that has the lowest density (mass/vol.) at STP.

![Graph showing molecular speed vs. relative number of particles for gases A, B, C, and D.]

A) A  
B) B  
C) C  
D) D  
E) All of the gases have the same density at STP.

5. A mixture of 10.0 g of Ne and 10.0 g Ar have a total pressure of 1.6 atm. What is the partial pressure of Ne?
   A) 1.1 atm  
   B) 0.80 atm  
   C) 0.54 atm  
   D) 0.40 atm  
   E) 1.3 atm

6. A mixture of 1.0 mol He and 1.0 mol Ne are at STP in a rigid container. Which of the following statements is true?
   A) Both gases have the same average kinetic energy.  
   B) Both gases contribute equally to the density of the mixture under these conditions.  
   C) Both gases have the same molecular speed.  
   D) The mixture has a volume of 22.4 L  
   E) All of the above are true.

7. Which one of these will diffuse the fastest at 25°C?
   A) 2.0 M Ar  
   B) 1.0 M H₂  
   C) 2.0 M N₂  
   D) 0.5 M Ne  
   E) 2.0 M O₂
8. A container holds 3.0 g of hydrogen. If it is evacuated and filled with methane, CH₄, at the same temperature and pressure, what mass of methane does it now hold?

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<tr>
<th>Atomic Molar Masses</th>
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<tbody>
<tr>
<td>C 12.0 g·mol⁻¹</td>
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<tr>
<td>H 1.0 g·mol⁻¹</td>
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(A) 16 g  (B) 19 g  (C) 22.4 g  (D) 24 g  (E) 48 g

9. The STRONGEST intermolecular forces between molecules of NH₃ are
   a. ionic bonds.
   b. hydrogen bonds.
   c. ion–dipole attractions.
   d. London forces.
   e. covalent bonds.

10. The mass of 560 cm³ (STP) of an unknown gas is 1.60 g. This gas could be

<table>
<thead>
<tr>
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<tr>
<td>CO₂ 44. g·mol⁻¹</td>
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<tr>
<td>Cl₂ 71. g·mol⁻¹</td>
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<tr>
<td>O₂ 32. g·mol⁻¹</td>
</tr>
<tr>
<td>SO₂ 64. g·mol⁻¹</td>
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(A) oxygen.  (B) carbon dioxide.  (C) chlorine.  (D) sulfur dioxide.

11. Choose the substance with the lowest surface tension.
   A) CH₃OH
   B) CH₃CH₂CH₂CH₃
   C) CH₃CH₂OH
   D) H₂O
   E) (CH₃)₂CO
12. Place the following substances in order of **increasing** boiling point.
   \[\text{CH}_3\text{CH}_2\text{OH} \quad \text{He} \quad \text{CH}_3\text{OCH}_3\]
   A) \text{He} < \text{CH}_3\text{CH}_2\text{OH} < \text{CH}_3\text{OCH}_3
   B) \text{CH}_3\text{CH}_2\text{OH} < \text{He} < \text{CH}_3\text{OCH}_3
   C) \text{CH}_3\text{CH}_2\text{OH} < \text{CH}_3\text{OCH}_3 < \text{He}
   D) \text{CH}_3\text{OCH}_3 < \text{He} < \text{CH}_3\text{CH}_2\text{OH}
   E) \text{He} < \text{CH}_3\text{OCH}_3 < \text{CH}_3\text{CH}_2\text{OH}

13. Given that the boiling point of liquid is 166 °C which of the following would be of most help for the calculation of its vapor pressure at 133 °C.
   a) The Heat of Fusion
   b) The Heat of Sublimation
   c) The Heat of Ionization
   d) The Heat of Condensation
   e) The Heat of Racemization

14. Identify the compound that has hydrogen bonding.
   A) \((\text{CH}_3)_3\text{N}\)
   B) \(\text{N}_2\)
   C) \(\text{CH}_3\text{CH}_3\)
   D) \(\text{HI}\)
   E) \(\text{NH}_3\)

15. Choose the pair of substances that are most likely to form a homogeneous solution.
   A) \(\text{C}_6\text{H}_{14}\) and \(\text{C}_{10}\text{H}_{20}\)
   B) \(\text{KCl}\) and \(\text{C}_5\text{H}_{12}\)
   C) \(\text{N}_2\text{O}_4\) and \(\text{NH}_4\text{l}\)
   D) \(\text{C}_6\text{H}_{14}\) and \(\text{H}_2\text{O}\)
   E) None of the pairs above will form a homogeneous solution.

16. My recitation meets at
   a) 12:30 pm on Thursdays
   b) 2:30 pm on Thursdays