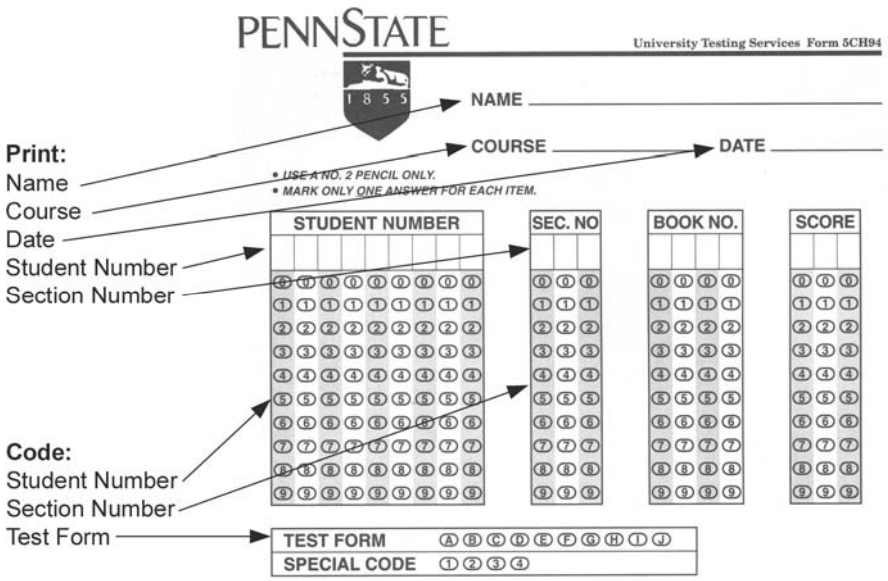
Chemistry 12 **Name** _____

Exam II Form A **Section** _____

July 21, 2005 **Student No.**_____

IMPORTANT: On the scantron (answer sheet), you **MUST** clearly fill your **name**, your **student number**, **section number**, and **test form** (white cover = test form A; yellow cover = test form B). Use a #2 pencil.



There are 25 questions on this exam. Check that you have done all of the problems and filled in the first 25 bubbles on the scantron. Your score will be reported in percents (max 100%).

Exam policy

- Calculators with text-programmable memory **are not** allowed.
- Relevant data and formulas, including the periodic table, are attached at the end of this exam.
- Your grade will be based only on what is on the scantron form.
- The answer key will be posted on the web after the exam (under "News").

Hints

- As you read the question, underline or circle key words to highlight them for yourself. Avoid errors from "mis-reading" the question.
- Pay attention to units and magnitudes (decimal places) of numbers obtained from calculations.
- There is no penalty for guessing.

Chemistry 12 Exam 2

1-5. The following gases are placed in a flask under the conditions given in the table below. Use the information to answer the next 5 questions.

Gas	Mole fraction	
N_2	???	T = 110 °C
H_2	0.156	P_{TOT} = 4.76atm
CO_2	0.221	V_{TOT} = 6.50L
CH_4	0.459	

1. What is the partial pressure of N_2 in the vessel?

   A. 0.743 atm

   B. 1.05 atm

   C. 2.18 atm

   D. 0.781 atm

   E. 4.76 atm

2. What is the volume occupied by the CO_2?

   A. 1.014 L

   B. 1.44 L

   C. 2.98 L

   D. 1.07 L

   E. 6.50 L

3. The diagram below shows the molecular speed of the 4 gases in the vessel. Which curve corresponds to CH_4?

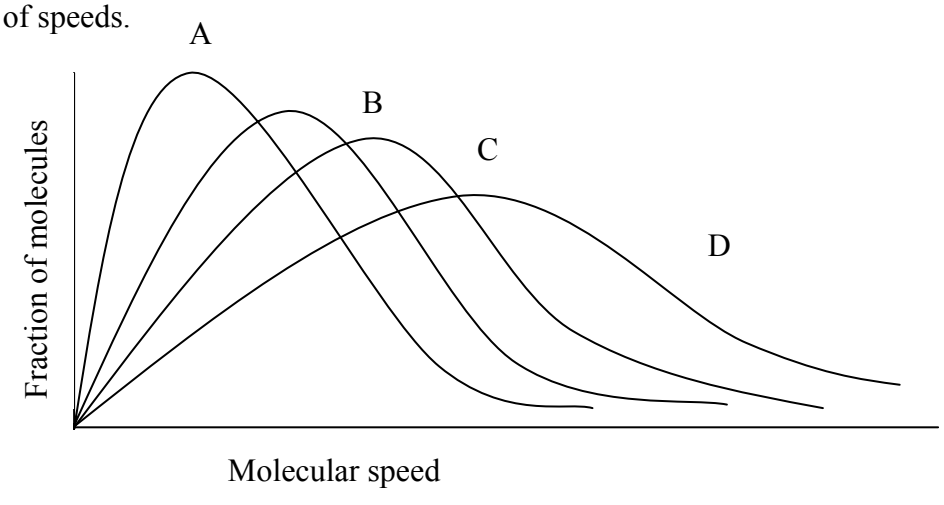
   A. A

   B. B

   C. C

   D. D

   E. None of these curves: the gases are at the same temperature so they all have the same distribution of speeds.



Use the table on the top of the previous page to answer the next two questions.

4. When the temperature of the mixture is lowered to below 0°C, which of the 4 gases is most likely to behave like a non-ideal gas?

   A. N_2

   B. H_2

   C. CO_2

   D. CH_4

   E. The gases will behave non-ideally only if the temperature is increased.

5. If the temperature of the mixture is raised to 220°C, what will the final pressure in the container be? (Assume that all of the gases behave ideally at both temperatures.)

   A. 9.52 atm

   B. 6.13 atm

   C. 2.38 atm

   D. 3.70 atm

   E. There is insufficient information to answer this question.

End of Table Questions

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6. A sulfur oxide is 50.0% sulfur by mass. This molecular formula could be _____ .

   i) SO ii) SO_2 iii) S_2O iv) S_2O_4

   A. i only

   B. ii only

   C. iii only

   D. iv only

   E. ii or iv

7. How many carbon atoms are there in 52.06g of carbon dioxide?

   A. 5.206×10^{24}

   B. 3.134×10^{25}

   C. 7.122×10^{23}

   D. 8.648×10^{-23}

   E. 1.424×10^{24}

8. Which hydrocarbon pair below has an identical mass percentage of C?

A. C_3H_4 andC_3H_6

B. C_2H_4 and C_3H_4

C. C_2H_4 and C_4H_{12}

D. C_2H_4 and C_3H_6

E. None of the above

9. What are the electron-domain and molecular geometries of iodine trichloride?

	Electron Domain	**Molecular Geometry**
A.	trigonal bipyramidal	trigonal planar
B.	tetrahedral	trigonal pyramidal
C.	trigonal bipyramidal	T-shaped
D.	octahedral	trigonal planar
E.	T-shaped	trigonal planar

10. How many σ and π bonds are in the H—C≡C—H molecule?

A. 3 σ and 2 π

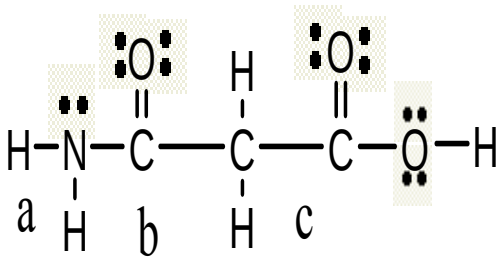
B. 3 σ and 4 π

C. 4 σ and 3 π

D. 2 σ and 3 π

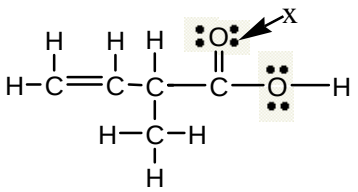
E. 5 σ and 0 π

11. What are the bond angles marked a, b, and c in the molecule below?



	a	**b**	**c**
A.	90°	90°	90°
B.	120°	120°	90°
C.	120°	120°	109.5°
D.	109.5°	120°	109.5°
E.	109.5°	90°	120°

12. What is the hybridization of the oxygen labeled x in the structure below?



A. sp

B. sp^2

C. sp^3

D. sp^3d

E. sp^3d^2

13. The molecular geometry of the CH_3Cl molecule is _____, and the molecule is _____.

A. trigonal pyramidal, polar

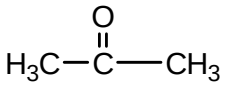
B. tetrahedral, nonpolar

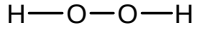
C. seesaw, nonpolar

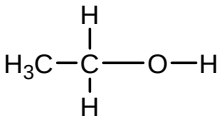
D. tetrahedral, polar

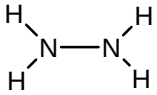
E. seesaw, polar

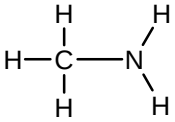
14. Which one of the following substances will not have hydrogen bonding as one of its intermolecular forces?

A. 

B. 

C. 

D. 

E. 

15. The dominant forces holding $C_{12}H_{26}$ molecules together in the liquid phase are _____.

A. ion-ion interactions

B. hydrogen bonding

C. ion-dipole interactions

D. dipole-dipole forces

E. London dispersion forces

16. A sample of gas (24.3 g) initially at 4.00 atm was compressed from 8.00 L to 2.00 L at constant temperature. What is the gas pressure after the compression?.

A. 4.00 atm

B. 2.00 atm

C. 1.00 atm

D. 8.00 atm

E. 16.0 atm

17. What is the density of ammonia (NH_3) gas in a 4.32 L container at 837 torr and 45 °C?

A. 3.86 g/L

B. 0.717 g/L

C. 0.432 g/L

D. 0.194 g/L

E. 4.22×10^{-2} g/L

18. A sample of N_2 gas (2.0 mmol) effused through a pinhole in 5.5 s. How long will it take for the same amount of CH_4 to effuse under the same conditions?

A. 7.3 s

B. 5.5 s

C. 3.1 s

D. 4.2 s

E. 9.6 s

19. In a gas mixture of He, Ne, and Ar with a total pressure of 8.40 atm, what is the mole fraction of Ar if the partial pressures of He and Ne are 1.50 and 2.00 respectively.

A. 0.179

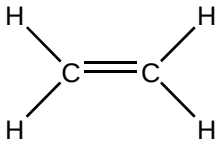
B. 0.238

C. 0.357

D. 0.583

E. 0.417

20. Consider the H-X-H bond angle for each of the following molecules. Put the following in order of increasing bond angle.

1. PH_3
2. H_2S
3. SiH_4
4. 

A. $2 < 1 < 3 < 4$

B. $4 < 3 < 2 < 1$

C. $1 < 2 < 3 < 4$

D. $1 < 2 < 3 = 4$

E. $3 < 1 < 3 = 4$

21. Which one of the following statements is false?

A. A typical double bond consists of one σ and one π bond.

B. Benzene exhibits added stability due to delocalized bonding in the ring.

C. The π bond in ethylene (CH_2=CH_2) results from the overlap of p-atomic orbitals.

D. There is no free rotation about double bonds due to the presence of the π bond.

E. In order to exhibit delocalized π bonding, a molecule must have at least three σ bonds.

22. Which of the following molecules or ions will exhibit delocalized bonding?

NO_2^- NH_4^+ NO_3^-

A. NH_4^+ and NO_3^-

B. NO_2^- only

C. NO_3^- only

D. NO_2^-, NH_4^+ and NO_3^-

E. NO_2^- and NO_3^-

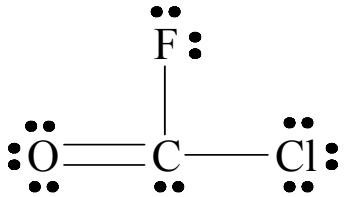
Proceed to last page ⟶

Basic Skills

23. How many valence electrons are there in ClO_3^-?

A. 24
B. 25
C. 26
D. 27
E. 32

24. Identify the reasons why this is an improper Lewis Structure:



A. The C, Cl and O atoms have too many electrons, while F has too few.
B. The C and Cl atoms have too many electrons, while F has too few.
C. The F and O atoms have too many electrons, while Cl has too few.
D. The Cl and O atoms have too many electrons, while C and F have too few.
E. The C and O atoms have too many electrons, while F has too few.

25. Which choice represents the correct formula name assignment for K_2SO_4?

A. krypton sulfide
B. krypton sulfate
C. dipotassium sulfate
D. potassium sulfide
E. potassium sulfate

Form A

1. D
2. E
3. C
4. C
5. B
6. E
7. C
8. D
9. C
10. A
11. D
12. B
13. D
14. A
15. E
16. E
17. B
18. D
19. D
20. A
21. E
22. E
23. C
24. E
25. E