Using Practice Exams Effectively

This practice exam contains **actual questions** that have been asked on one of my exams in a previous quarter. This can be a useful studying tool if used properly.

Important notes about the practice exam:

- This practice exam should not be the only studying tool you are using, because **the practice exams only show a small subset of the possible questions that could be tested**.
- **Work the recommended book problems** to make sure that you fully understand all of the concepts that might be on the actual exams.
  - You need to be able to **explain why every step is done** in solving all of the recommended book problems (**without looking at the solutions**). Do not memorize the answers – this will not work.
  - Work problems multiple times to build skill and efficiency (but do not memorize).
- **The actual exam will contain questions that differ from the practice exams. They are not necessarily any easier or harder; they are just different.**
  - It would be pointless to give an exam with the exact same questions as the practice, because it would mean the exam is testing your memorization skills instead of your actual understanding of the material.
  - **To prepare for this, make sure you understand how to do all of the recommended book problems as discussed above.**

What this practice exam is intended to do:

- Help you diagnose general areas of strength/weakness and determine what you need to spend more time studying before the exam
- Allow you to check if you are answering questions quickly enough to complete the actual exam within the time limit
- Give you an idea of the general format of a multiple-choice exam

While taking the exam:

- Take this with a **50 minute time limit**, including the time it would take you to fill out a parscore
- **Do not use any outside notes or help**
- Do not look at any of the answers until you have completed the entire exam

After you complete the exam, check your answers against the key. For any problems you miss:

- Go through the worked-out solutions to see how to answer each question correctly
- **Make sure you understand why every step is done** in solving the problems you miss
- **Rework book problems** that are related to the questions you missed. This will help to strengthen your understanding of the topic. Without this, you will not gain a full understanding of the topic and risk missing similar questions on the actual exam.

Instructions: No hats or hoods allowed. No books or notes allowed. No sharing of calculators. Cell phones, iPods, headsets/headphones, and any other electronic devices must be turned off and put away.

There are a total of six pages (18 questions) on the exam. **Not every question is worth the same number of points**-- point values are indicated for each question.

You may work out the problems and write your answers on this exam; however, you must completely fill in the appropriate bubble(s) on your ParSCORE form. Turn in the ParSCORE form only. **Only the answers indicated on your ParSCORE will be graded**, so please be very careful bubbling in your ParSCORE. No credit will be awarded for an incorrectly-bubbled answer. The correct answers to the exam will be posted on our course web page.

1. (5 pts) Consider the hydrogen atom spectrum. The light absorbed in the n=2 to n=4 transition will have
    _____ wavelength than the light absorbed in the n=1 to n=4 transition.

a) shorter
b) longer
c) the same

2. (5 pts) A scientist is trying to eject electrons from a metal surface by shining light on it, but no electrons are coming out. To eject electrons, the scientist should _____

a) increase the wavelength of the light
b) increase the intensity of the light
c) decrease the wavelength of the light
d) decrease the frequency of the light
e) More than one of these will result in the ejection of electrons

3. (5 pts) Consider a sample of N_2 at 25°C and 1 atm. Which is greater, the average speed of the N_2 molecules (u_{av}) or the root-mean-squared speed of the N_2 molecules (u_{rms})?

a) u_{av}
b) u_{rms}
c) u_{av} and u_{rms} are the same

4. (5 pts) Increasing the pressure of a gas at a constant temperature will _____ the number of collisions between gas particles.

a) increase
b) not change
c) decrease

5. (5 pts) As an electron's velocity is increased, its de Broglie wavelength will _____

a) increase
b) remain the same
c) decrease

6. (5 pts) Bond length increases as bond order _____

a) increases
b) decreases
c) bond order and bond length are not related

7. (5 pts) Write the correct ground-state electron configuration for Cd

a) [Kr] $4s^2$ $4d^{10}$
b) [Kr] $5s^2$ $4d^{10}$
c) [Kr] $5s^2$ $5d^{10}$
d) [Kr] $4s^1$ $5d^{10}$
e) [Kr] $5s^1$ $5d^{10}$

8. (5 pts) Which of the following is smallest in radius?

a) Ca^+
b) Ca
c) Ca^-
d) All are equal in size

9. (5 pts) What is the maximum number of electrons in an atom that can have quantum numbers $n = 5$, $\ell = 2$?

a) 0
b) 2
c) 5
d) 10
e) 25

10. (6 pts) Which of the following molecules contains exactly one double bond?

a) CO_2
b) H_2O
c) CH_4
d) C_2H_4
e) None of these contain exactly one double bond

11. (6 pts) The molecule XBr_3 is trigonal pyramidal. To which group of the periodic table does X belong?

a) Group 3A (IIIA)
b) Group 7A (VIIA)
c) Group 4A (IVA)
d) Group 5A (VA)
e) None of these

12. (6 pts) Consider the following Lewis structure. (note: lone pairs have not been shown in this structure).
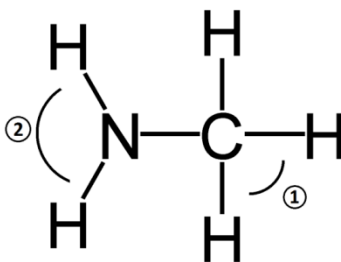
Which bond angle is smaller?

a) Bond angle ①
b) Bond angle ②
c) Bond angles ① and ② are equal

13. (6 pts) A mixture containing 4.2 moles of O_2 and 1.8 moles of N_2 is added to a sealed container. If the partial pressure of O_2 in the mixture is 2.6 atm, what is the total pressure of the mixture?

a) 1.11 atm
b) 1.82 atm
c) 8.54 atm
d) 4.98 atm
e) 3.71 atm

14. (6 pts) Both of the following molecules can be assumed to contain polar bonds. Which of the following molecules is/are polar?

a) NH_3
b) CO_2
c) Both NH_3 and CO_2
d) Neither NH_3 nor CO_2

15. (6 pts) Use the Bohr model to calculate the ground-state ionization energy of Be^{3+} (in units of kJ/mol).

a) 3.5×10^{-20} kJ/mol
b) 2.1×10^{4} kJ/mol
c) 2.0×10^{-20} kJ/mol
d) 1.2×10^{4} kJ/mol
e) 1.3×10^{3} kJ/mol

16. (6 pts) 3.5 moles of C_2H_5OH reacts with 5.8 moles of O_2 at constant temperature of 500K and volume of 50 L according to the following equation:

$$C_2H_5OH \text{ (g)} + 3 O_2 \text{ (g)} \text{ ---> } 2 CO_2 \text{ (g)} + 3 H_2O \text{ (g)}$$
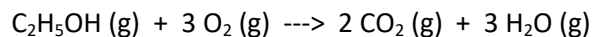
Calculate the pressure of C_2H_5OH after the reaction goes to completion.

a) 1.3 atm
b) 9.2 atm
c) 1.9 atm
d) 2.9 atm
e) 0.0 atm

17. (6 pts) A bicycle tire is filled with air to a pressure of 3900 torr at a temperature of 22°C. Riding the bike on a hot day increases the temperature of the tire to 58°C. The volume of the tire increases by 3.7%. What is the new pressure in the tire?

a) 118268 torr
b) 4220 torr
c) 277887 torr
d) 9915 torr
e) 4044 torr

B

$$\frac{3900 \times 100}{22 + 273} = \frac{P \times 103.7}{58 + 273}$$

$$P \cong 4219.8$$

$$\cong 4220$$

18. (6 pts) Calculate the de Broglie wavelength of a cobalt atom traveling at 250 m/s.

a) 2.71×10^{-14} m
b) 2.71×10^{-11} m
c) 7.47×10^{-59} m
d) 4.50×10^{-38} m
e) 4.50×10^{-35} m

B

$$\lambda = \frac{h}{mv}$$

$$\lambda = \frac{6.626 \times 10^{-34}}{\frac{58.93}{1000} \times 250} \times 6.02 \times 10^{23}$$

$$= 2.71 \times 10^{-11}$$

Answers: 1) B   2) C   3) B   4) A   5) C   6) B
              7) B   8) A   9) D   10) D   11) D   12) B
              13) E   14) A   15) B   16) A   17) B   18) B

For more practice, work the assigned problems from the textbook! Lists of problems and solutions are on Gauchospace.