

DO NOT OPEN THE EXAM UNTIL YOU ARE TOLD TO DO SO.

In the meantime, read this...

You will write all of your answers on the answer sheets, on the next two pages. At the end of the exam, turn in **your entire test booklet, with Answer Sheet, and your Scantron card.**

 Write your name:

-  on the front of the exam,
-  on the "Answer Sheet," and
-  on the Scantron card.

You may use your calculator and a pen or pencil. Please do not use green or red.

Problems marked ** come straight from the assigned homework or from worksheets in class.

Put all notes, books, etc away and out of sight. Turn off the ringers of electronic devices and put them away and out of sight. **Electronic devices (other than calculators) must be silenced and put away. Use of calculator functions on communication devices is not permitted. Sharing calculators is not permitted.** Points will be deducted for electronic devices in view or making noise, and devices will be confiscated.

No outside paper is allowed. If you need more scratch paper, ask one of the proctors.

Strategy hint: take a quick look over the whole exam before you start. If you see something that looks easy for you, go for it! It's good to get a few points in the bag right away.

Strategy hints for multiple choice:

- when you have determined that an option is not correct, mark it off so you don't have to check it again!
- even if you think you have found the right answer, look at the remaining answers to see if any of them are a better match.
- on calculation problems, show your work somewhere on the page. Even if you miss the problem, it certainly will be easier to see later where mistakes were made.

Looking at another student's work, intentionally or accidentally, will not be tolerated. Students who seem to have trouble keeping their eyes on their own papers will be moved to the front of the room. Students who cheat earn a failing grade.

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Check back over your exam and make sure you have completed all parts before turning in your paper!

Periodic Table of the Elements

1A	2A											3A	4A	5A	6A	7A	8A
1 H 1.008																1 H 1.008	2 He 4.003
3 Li 6.941	4 Be 9.012											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 22.99	12 Mg 24.31											13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.87	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.41	31 Ga 69.72	32 Ge 72.64	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc [98]	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3
55 Cs 132.9	56 Ba 137.3	57 La 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.8	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po [209]	85 At [210]	86 Rn [222]
87 Fr [223]	88 Ra [226]	89 Ac [227]	104 Rf [261]	105 Db [262]	106 Sg [266]	107 Bh [264]	108 Hs [277]	109 Mt [268]	110 Ds [281]	111 Rg [272]	112 [285]	113 [284]	114 [289]	115 [288]	116 [292]		

Lanthanides	58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm [145]	62 Sm 150.4	63 Eu 152.0	64 Gd 157.2	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
Actinides	90 Th 232.0	91 Pa 231.0	92 U 238.0	93 Np [237]	94 Pu [244]	95 Am [243]	96 Cm [247]	97 Bk [247]	98 Cf [251]	99 Es [252]	100 Fm [257]	101 Md [258]	102 No [259]	103 Lr [262]

You may remove this page and use it as scratch paper and a cover sheet. If you need more scratch paper, you may get it from the proctor.

Potentially useful information:

$$C_1V_1 = C_2V_2 \quad 1\% \text{ w/v} = 1\text{g}/100 \text{ mL} = 1 \text{ g/dL}$$

$$1 \text{ ppm} = 1 \mu\text{g/mL} \quad 1 \text{ ppb} = 1 \text{ ng/mL}$$

$$6.022 \times 10^{23}$$

$$\text{equivalents} = \text{moles} \times \text{charge}$$

$$\text{pH} = -\log[\text{H}^+] \quad [\text{H}^+] = 10^{-\text{pH}} \quad \text{in water, } [\text{H}^+] \times [\text{OH}^-] = 1.0 \times 10^{-14}$$

Check back over your exam and make sure you have completed all parts before turning in your paper!

ANSWER SHEET (MC score _____ FR score _____ Total raw _____ total % _____)

Part A. Write your answers to the following problems in the spaces provided.1. Give the correct **chemical formula** for each of the following. [2 each]

_____ nitrous oxide
 _____ silicon tetrahydride
 _____ calcium sulfate
 _____ cobalt(II) phosphate
 _____ magnesium nitride
 _____ carbon disulfide

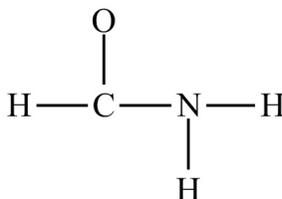
2. Give a **correct systematic name** for each of the following. [2 each]

_____ PCl_5
 _____ S_2F_6
 _____ KNO_3
 _____ Na_2S
 _____ FeCO_3
 _____ NH_3

3. Give a **reasonable** estimate, with **appropriate metric** unit, for each of the following. [2 pts each]

- a. the mass of a grape: _____
 b. the length of your scantron card: _____
 c. the volume of a deck of playing cards: _____

4. [6 pts] **Add lone pair electrons, and/or turn single bonds into double or triple bonds**, to complete the structure so that every atom has its normal electron arrangement. (You may not add new atoms to the molecule.)



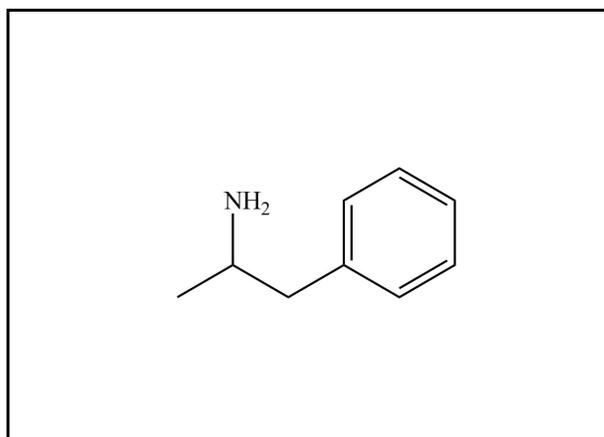
5. Fill in the blank for each of the following. [2 each]

the **name** of the element **Ag** _____
 the **symbol** for the element **lead** _____
 the abbreviation for **milliliter** _____
 the Period 4 noble gas _____

6. [9 pts] In the box below, **give the structure of 2,2,5-trimethyl-3-hexyne**.

(Line structure preferred. There is partial credit—get as many parts of the molecule right as you can!)

7. [Bonus—4 pts] In the structure below, circle and clearly label the functional groups.



Part B. Multiple Choice [3 points each]. Choose the **best** answer and mark the answer on the Scantron card.

1 Mark A on the Scantron card. (This item is a form identifier and will not be scored.)

The next few questions refer to the following five options. You may use each option once, more than once, or not at all.

A Ca B Cl C C D Co E Cu

- 2 Which of the elements is a main-group metal?
- 3 Which element has four valence electrons?
- 4 Which element forms a +2 ion and does not form ions of any other charge?
- 5 Which element is in Period 2?
- 6 Which element is an alkaline earth metal?
- 7 Which element could be X in the compound MgX_2 ?
- 8 Which element is copper?
- 9 Which element is a halogen?
- 10 Atoms of which element typically form 4 covalent bonds?
- 11 Atoms of which element commonly form anions in ionic compounds?

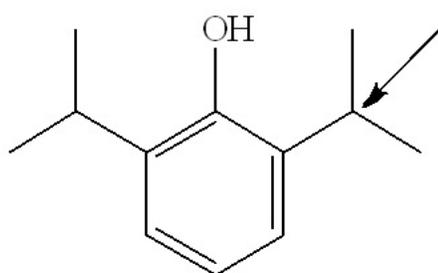
These questions refer to the following options. You may use each option once, more than once, or not at all. (Hint: draw structures or write formulas for the compounds, as appropriate!)

A ethyne B pentane C ammonia D iron(II) oxide

- 12 Contains ionic bonds.
- 13 A saturated hydrocarbon.
- 14 Has a Lewis structure with one lone pair on one of the atoms.
- 15 Contains a transition element.
- 16 A molecular compound that is not organic.
- 17 Contains a triple covalent bond.

Part B. Multiple Choice (continued). Choose the **best** answer and record it in the appropriate space on the answer sheet.

- 18 Elliot, the dog who lives next door to Dr. Hoyt, weighs 39 kg. What is his mass in g?
 A 0.039 g B 39 g C 390 g D 3,900 g E 39,000 g
- 19 Which prefix stands for 1/100 of the base unit?
 A μ B m C c D d E k
- 20 Which of the following substances is **covalent/molecular**?
 A CuZn B Na C NaCl D HF E more than one of these



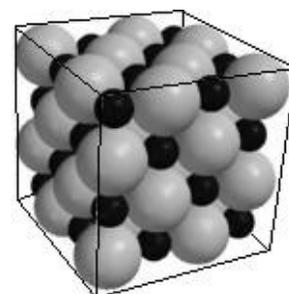
propofol

The anesthetic that was ruled to have killed Michael Jackson (although, in addition, at least six other medical drugs were also found in his system) is propofol, shown at right.

- 21 One carbon atom in propofol is marked with an arrow. **How many hydrogen atoms** are attached to this carbon atom?
 A 0 B 1 C 2 D 3 E 4
- 22 How many **carbon atoms** are in the molecular formula for propofol?
 A 6 B 8 C 10 D 12 E 13
- 23 The most common mass number for atoms of the element Fe is 56, but there are other isotopes. What is the average mass of all atoms in a large sample of Fe?
 A 26 B 30 C 55 D 55.85 E 56

24 What is the best classification for the sample shown at right?

- A nonmetal element B metal element
 C compound D homogeneous mixture
 E heterogeneous mixture



- 25 Which of the following is a property of **nonmetals**?
 A grouped in the right side of the periodic table
 B malleable and shiny
 C usually form cations in compounds
 D combine with other nonmetals to form ionic compounds
 E most are solid at room temperature

- 26 Which subatomic particle has mass = 1 amu and charge = 0?
 A proton B neutron C electron D more than one of these E none of these

The numbers in the chart describe a certain ion. Fill in the chart and use it to answer following questions.

Nuclear symbol	number of protons	number of neutrons	number of electrons	atomic number	mass number	charge
				16	33	-2

- 27 How many neutrons are in the nucleus of this ion?
 A 14 B 16 C 17 D 18 E 33
- 28 How many electrons does this ion have?
 A 2 B 14 C 16 D 18 E 31
- 29 What element does this atom belong to?
 A He B Si C S D Ar E As
- 30 Which vocabulary word best applies to the ion in the chart?
 A polyatomic ion B cation C anion D scallion
- 31 What is the mass of 1.0 mole of sodium metal?
 A 22.99 amu B 23 amu C 1 g D 22.99 g E 6.02×10^{23} g

The next several questions refer to these five substances:

- A ZnBr_2 B O_2 C H_2O D $\text{CH}_3\text{CH}_2\text{OH}$ E NH_4NO_3

- 32 Which substance is a **binary molecular compound**?
- 33 Which substance is a **diatomic element**?
- 34 Which formula represents an **organic** compound?
- 35 Which substance includes ions with +2 charge?