2013 U.S. NATIONAL CHEMISTRY OLYMPIAD

LOCAL SECTION EXAM

Prepared by the American Chemical Society Chemistry Olympiad Examinations Task Force

OLYMPIAD EXAMINATIONS TASK FORCE

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DIRECTIONS TO THE EXAMINER

This test is designed to be taken with an answer sheet on which the student records his or her responses. All answers are to be marked on that sheet, not written in the booklet. Each student should be provided with an answer sheet and scratch paper, both of which must be turned in with the test booklet at the end of the examination. Local Sections may use an answer sheet of their own choice.

The full examination consists of 60 multiple-choice questions representing a fairly wide range of difficulty. Students should be permitted to use non-programmable calculators. A periodic table and other useful information are provided on page two of this exam booklet for student reference.

Suggested Time: 60 questions—110 minutes

DIRECTIONS TO THE EXAMINEE

DO NOT TURN THE PAGE UNTIL DIRECTED TO DO SO.

This is a multiple-choice examination with four choices for each question. There is only one correct or best answer to each question. When you select your choice, blacken the corresponding space on the answer sheet with your pencil. Make a heavy full mark, but no stray marks. If you decide to change your answer, be certain to erase your original answer completely.

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ABBREVIATIONS AND SYMBOLS					
amount of substance	n	Faraday constant	F	molar mass	M
ampere	A	free energy	G	mole	mol
atmosphere	atm	frequency	ν	Planck's constant	h
atomic mass unit	u	gas constant	R	pressure	P
Avogadro constant	N_A	gram	g	rate constant	k
Celsius temperature	°C	hour	h	reaction quotient	Q
centi– prefix	c	joule	J	second	s
coulomb	C	kelvin	K	speed of light	c
density	d	kilo– prefix	k	temperature, K	T
electromotive force	E	liter	L	time	t
energy of activation	E_a	measure of pressure	mm Hg	vapor pressure	VP
enthalpy	H	milli– prefix	m	volt	V
entropy	S	molal	m	volume	V
equilibrium constant	K	molar	M		

CONSTANTS
$R = 8.314\ \text{J•mol}^{-1}\text{•K}^{-1}$
$R = 0.0821\ \text{L•atm•mol}^{-1}\text{•K}^{-1}$
$1\ F = 96{,}500\ \text{C•mol}^{-1}$
$1\ F = 96{,}500\ \text{J•V}^{-1}\text{•mol}^{-1}$
$N_A = 6.022 \times 10^{23}\ \text{mol}^{-1}$
$h = 6.626 \times 10^{-34}\ \text{J•s}$
$c = 2.998 \times 10^{8}\ \text{m•s}^{-1}$
0 °C = 273.15 K
1 atm = 760 mm Hg

EQUATIONS

$$E = E^{o} - \frac{RT}{nF}\ln Q \qquad \ln K = \left(\frac{-\Delta H}{R}\right)\left(\frac{1}{T}\right) + \text{constant} \qquad \ln\left(\frac{k_2}{k_1}\right) = \frac{E_a}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$$

PERIODIC TABLE OF THE ELEMENTS

1 1A																	18 8A
1 **H** 1.008	2 2A											13 3A	14 4A	15 5A	16 6A	17 7A	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	3 3B	4 4B	5 5B	6 6B	7 7B	8 8B	9 8B	10 8B	11 1B	12 2B	13 **Al** 26.98	14 **Si** 28.09	15 **P** 30.97	16 **S** 32.07	17 **Cl** 35.45	18 **Ar** 39.95
19 **K** 39.10	20 **Ca** 40.08	21 **Sc** 44.96	22 **Ti** 47.88	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** 65.39	31 **Ga** 69.72	32 **Ge** 72.61	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** (263)	107 **Bh** (262)	108 **Hs** (265)	109 **Mt** (266)	110 **Ds** (281)	111 **Rg** (272)	112 **Cn** (285)	113 (Uut) (284)	114 (Uuq) (289)	115 (Uup) (288)	116 (Uuh) (293)	117 (Uus) (294)	118 (Uuo) (294)

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** 157.3	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
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)

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DIRECTIONS

- When you have selected your answer to each question, blacken the corresponding space on the answer sheet using a soft, #2 pencil. Make a heavy, full mark, but no stray marks. If you decide to change an answer, erase the unwanted mark very carefully.
- There is only one correct answer to each question. Any questions for which more than one response has been blackened **will not be counted**.
- Your score is based solely on the number of questions you answer correctly. **It is to your advantage to answer every question.**

1. When this equation is balanced using the smallest possible integers, what is the sum of the coefficients?

$$\_\_(NH_4)_3PO_4(aq) + \_\_CaCl_2(aq) \rightarrow \_\_Ca_3(PO_4)_2(s) + \_\_NH_4Cl(aq)$$

(A) 8 **(B)** 9 **(C)** 11 **(D)** 12

2. A solution of KNO_3 in water is prepared for which the following data have been obtained:
masses of solute and solvent
molar masses of solute and solvent
Which of these quantitative descriptions of the solution can be determined?
I. molarity II. molality III. density of solution

(A) I. only **(B)** II. only
(C) I. and II. only **(D)** I., II. and III.

3. What mass of the compound CrO_3 (M = 100.0) contains 4.5×10^{23} oxygen atoms?

(A) 2.25 g **(B)** 12.0 g **(C)** 25.0 g **(D)** 75.0 g

4. An 18.5 g sample of tin (M = 118.7) combines with 10.0 g of sulfur (M = 32.07) to form a compound. What is the empirical formula of this compound?

(A) SnS **(B)** SnS_2 **(C)** Sn_2S **(D)** Sn_2S_3

5. A mixture is prepared by adding 50.0 mL of 0.200 M NaOH to 75.0 mL of 0.100 M NaOH. What is the $[OH^-]$ in the mixture?

(A) 0.0600 M **(B)** 0.0800 M
(C) 0.140 M **(D)** 0.233 M

6. What mass of $NaHCO_3$ (M = 84.0) is required to completely neutralize 25.0 mL of 0.125 M H_2SO_4?

(A) 0.131 g **(B)** 0.262 g
(C) 0.525 g **(D)** 1.05 g

7. A solid can be separated from a liquid by all the following means EXCEPT

(A) decantation **(B)** distillation
(C) filtration **(D)** hydration

8. A student determined the density of a solid to be 2.90, 2.91 and 2.93 $g \cdot cm^{-3}$. If the actual density of this solid is 2.70 $g \cdot cm^{-3}$, how should the student's results be described?

(A) high accuracy and high precision
(B) low accuracy and high precision
(C) high accuracy and low precision
(D) low accuracy and low precision

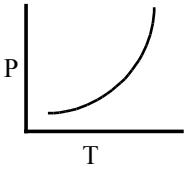
9. Which cation forms an insoluble chloride and an insoluble sulfide?

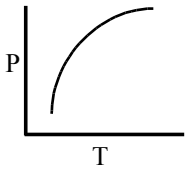
(A) Ba^{2+} **(B)** Cu^{2+} **(C)** Mn^{2+} **(D)** Pb^{2+}

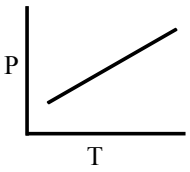
10. Which 0.10 M aqueous solution exhibits the lowest electrical conductivity?

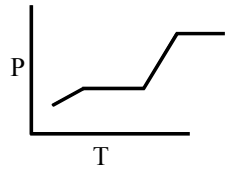
(A) $HC_2H_3O_2(aq)$ **(B)** $HNO_3(aq)$
(C) $NH_4C_2H_3O_2(aq)$ **(D)** $Ca(NO_3)_2(aq)$

11. Which graph best represents the vapor pressure of water as a function of temperature from 0 °C to 100 °C?

(A)


(B)


(C)


(D)


12. The table below shows the data for three titrations to determine the concentration of a NaOH solution with standard 0.200 M HCl solution using phenolphthalein as the indicator.

Trial	Vol HCl, mL	Vol NaOH, mL	M_{NaOH}, calc.
1	21.43	19.26	0.223
2	18.57	16.73	0.222
3	22.20	21.14	0.210

Which explanation best accounts for the lower value of the NaOH M in Trial 3?

(A) Some of the neutralized solution from Trial 2 was left in the flask for Trial 3.

(B) The number of drops of phenolphthalein was doubled in Trial 3.

(C) The HCl concentration was used as 0.250 M in the NaOH molarity calculation.

(D) A few drops of NaOH solution were spilled on the desktop in Trial 3.

13. A sample of an ideal gas has a volume of 0.500 L at 25 °C and 1.20 atm pressure. What is its volume at 75 °C and 3.60 atm?

(A) 0.143 L **(B)** 0.195 L

(C) 0.500 L **(D)** 1.75 L

14. In a mixture of N_2 and O_2 gases, the mol fraction of N_2 is found to be 0.700. The total pressure of the mixture is 1.42 atm. What is the partial pressure of O_2 in the mixture?

(A) 0.211 atm **(B)** 0.426 atm

(C) 0.493 atm **(D)** 0.994 atm

15. The substances below have molar masses that are the same within $\pm$ 2 g/mol. Which substance has the lowest boiling point?

(A) $CH_3CH_2CH_3$ **(B)** CH_3OCH_3

(C) CH_3CH_2OH **(D)** CH_3CHO

16. Which statement is correct about the critical point of a phase diagram?

(A) Solid, liquid and gas are present in equilibrium.

(B) Liquid and vapor are indistinguishable from one another.

(C) Liquid can be produced by a change in pressure.

(D) Vapor can be produced by a change in temperature.

17. When equal volumes of the following pairs of liquids are mixed thoroughly and allowed to stand, which pair is most likely to separate into two layers?

(A) ethanol and methanol

(B) carbon tetrachloride and methanol

(C) hexane and pentane

(D) carbon tetrachloride and hexane

18. For the same atoms at the lattice points, which lattice exhibits the lowest density?

(A) body-centered cubic **(B)** face-centered cubic

(C) hexagonal **(D)** simple cubic

19. A sample of NaOH(s) was added to water in a calorimeter. The temperature was monitored as the NaOH dissolved to give the data below. Determine the heat released during the solution process. (Assume the solution specific heat is 4.18 $J \bullet g^{-1} \bullet K^{-1}$)

Mass of water	100.00 g
Mass of NaOH(*s*)	10.00 g
Initial Temperature of water	24.0 °C
Final Temperature of solution	48.2 °C

(A) 1.01×10^3 Joules **(B)** 2.66×10^3 Joules

(C) 1.01×10^4 Joules **(D)** 1.11×10^4 Joules

20. For which of the reactions below is(are) the heat of reaction equal to the heat of formation?

I. $1/2\ N_2(g) + O_2(g) \rightarrow NO_2(g) \quad \Delta H > 0$

II. $SO_2(g) + 1/2\ O_2(g) \rightarrow SO_3(g) \quad \Delta H < 0$

(A) I. only **(B)** II. only

(C) Both I. and II. **(D)** Neither I. nor II.

21. $CH_4(g) + Cl_2(g) \rightarrow CH_2Cl_2(g) + 2\ HCl(g)$

Use the data in the table below to calculate the standard enthalpy, ΔH°, for the reaction above.

Substance	$CH_4(g)$	$CH_2Cl_2(g)$	$HCl(g)$
ΔH_f°, $kJ \bullet mol^{-1}$	–74.6	–95.4	–92.3

(A) $-205\ kJ \bullet mol^{-1}$ **(B)** $-113\ kJ \bullet mol^{-1}$

(C) $113\ kJ \bullet mol^{-1}$ **(D)** $205\ kJ \bullet mol^{-1}$

22. $C_2H_5OH(l) + 3\ O_2(g) \rightarrow 2\ CO_2(g) + 3\ H_2O(g)$

During an experiment 10.00 g of ethanol is completely burned in air to release $CO_2(g)$ and $H_2O(g)$ as shown in the equation above. During the combustion, 296.6 kJ of heat energy is released. What is the molar enthalpy of combustion, ΔH°_{comb}?

(A) $-2966\ kJ \bullet mol^{-1}$ **(B)** $-1366\ kJ \bullet mol^{-1}$

(C) $-64.36\ kJ \bullet mol^{-1}$ **(D)** $-29.66\ kJ \bullet mol^{-1}$

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23. Which reaction has the greatest positive change in entropy, ΔS?

(A) $2\ Mg(s) + O_2(g) \rightarrow 2\ MgO(s)$

(B) $2\ C_2H_2(g) + 5\ O_2(g) \rightarrow 4\ CO_2(g) + 2\ H_2O(l)$

(C) $2\ KClO_3(s) \rightarrow 2\ KCl(s) + 3\ O_2(g)$

(D) $2\ SO_2(g) + O_2(g) \rightarrow 2\ SO_3(g)$

24. Which statement is correct for the reaction represented below?

$2\ NOCl(g) \rightarrow 2\ NO(g) + Cl_2(g) \quad \Delta H^o_{rxn} > 0$

This reaction is

(A) spontaneous at all temperatures.

(B) spontaneous only at high temperatures.

(C) spontaneous only at low temperatures.

(D) not spontaneous at any temperature.

25. For the reaction:
$2\ A + 3\ B \rightarrow C$, [A] is found to decrease at a rate of $2.0\ M \cdot s^{-1}$. If the rate law is rate = k[A], how fast does [B] decrease under the same conditions?

(A) $0.66\ M \cdot s^{-1}$ **(B)** $1.3\ M \cdot s^{-1}$

(C) $2.0\ M \cdot s^{-1}$ **(D)** $3.0\ M \cdot s^{-1}$

26. What are the units for the rate constant of a second-order reaction?

(A) s^{-1} **(B)** $M^{-1} \cdot s^{-1}$ **(C)** $M^{-2} \cdot s^{-1}$ **(D)** $M^{2} \cdot s^{-1}$

27. A sample containing a radioactive isotope produces 2000 counts per minute in a Geiger counter. After 120 hours, the sample produces 250 counts per minute. What is the half-life of the isotope?

(A) 15 h **(B)** 30 h **(C)** 40 h **(D)** 60 h

28. In the rate-limiting approximation for a two-step reaction, the overall rate of the reaction is always equal to the rate of the _____ step in the reaction mechanism.

(A) first **(B)** second

(C) fastest **(D)** slowest

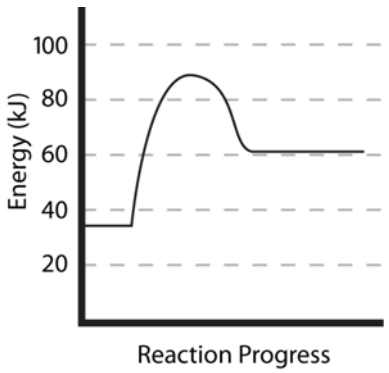
29. Which of the following examples demonstrate homogeneous catalysis?

I. Pt(s) catalyzing the reaction of $O_2(g)$ with CO(g)
II. Cl(g) catalyzing the decomposition of $O_3(g)$
III. $H_2O_2(aq)$ decomposition catalyzed by $Br^-(aq)$

(A) I. only **(B)** II. only

(C) I. and III. only **(D)** II. and III. only

30.



The diagram above represents the energy profile for the reaction: $A + B \rightarrow C + D$. What is the value of the activation energy for the reaction: $C + D \rightarrow A + B$?

(A) 25 kJ **(B)** 55 kJ **(C)** 85 kJ **(D)** –30 kJ

31. What is the equilibrium expression for this reaction?

$2\ HgO(s) \rightleftharpoons 2\ Hg(l) + O_2(g)$

(A) $K = [Hg][O_2]/[HgO]$

(B) $K = [Hg]^2[O_2]/[HgO]^2$

(C) $K = [Hg]^2[O_2]$

(D) $K = [O_2]$

32. For the exothermic reaction

$4\ NH_3(g) + 7\ O_2(g) \rightleftharpoons 4\ NO_2(g) + 6\ H_2O(g)$

which change will increase the quantity of NO_2 in the mixture?

(A) increasing temperature

(B) decreasing container volume

(C) adding Ne(g)

(D) adding $H_2O(g)$

33. Weak acids include which of the following?

I. HF(aq) II. HI(aq) III. $HNO_2(aq)$

(A) I. only **(B)** II. only

(C) III. only **(D)** I. and III. only

34. $H_2CO_3(aq) + H_2O(l) \rightleftharpoons HCO_3^-(aq) + H_3O^+(aq)$
$HCO_3^-(aq) + H_2O(l) \rightleftharpoons CO_3^{2-}(aq) + H_3O^+(aq)$
According to the equations above, what is the conjugate base of HCO_3^-?

(A) $H_2CO_3(aq)$ **(B)** $H_2O(l)$

(C) $H_3O^+(aq)$ **(D)** $CO_3^{2-}(aq)$

35. A saturated solution of which salt will have the highest $[Ag^+]$?

(A) AgCl ($K_{sp} = 1.8 \times 10^{-10}$)

(B) Ag_2CrO_4 ($K_{sp} = 1.1 \times 10^{-12}$)

(C) Ag_3PO_4 ($K_{sp} = 1.8 \times 10^{-18}$)

(D) Ag_2S ($K_{sp} = 6.0 \times 10^{-51}$)

36. A saturated solution of manganese(II) carbonate (M = 114.95) contains 5.44×10^{-5} g of $MnCO_3$ per100 mL at 25 ˚C. What is its K_{sp} at this temperature?

(A) 4.7×10^{-6} **(B)** 3.0×10^{-9}

(C) 2.2×10^{-11} **(D)** 2.2×10^{-13}

37. Three metals, A, B and C, with solutions of their respective cations are tested in a voltaic cell with the following results;

A and B: A is the cathode
B and C: C is the cathode
A and C: A is the anode

What is the order of the reduction potentials from highest to lowest for the cations of these metals?

(A) A > B > C **(B)** B > C > A

(C) C > A > B **(D)** B > A > C

38. In which pair of substances do the nitrogen atoms have the same oxidation state?

(A) HNO_3 and N_2O_5 **(B)** NO and HNO_2

(C) N_2 and N_2O **(D)** HNO_2 and HNO_3

39. In the equation below, which species acts as the oxidizing agent? $Pb(s) + PbO_2(s) + 2\ H^+(aq) + 2\ HSO_4^-(aq) \rightarrow 2\ PbSO_4(s) + 2\ H_2O(l)$

(A) Pb(s) **(B)** $PbO_2(s)$

(C) $H^+(aq)$ **(D)** $HSO_4^-(aq)$

40. A standard voltaic cell is constructed using Cu metal in 1.0 M $Cu(NO_3)_2(aq)$ and an unknown metal in a 1.0 M solution of its nitrate salt. The cell voltage is 0.47 V when the Cu half-cell is the cathode. What is the standard reduction potential of the unknown metal? [$E°_{Cu} = 0.34$ V]

(A) –0.81 V **(B)** –0.13 V **(C)** 0.13 V **(D)** 0.81 V

41. A voltaic cell is constructed with the overall reaction:

$Sn^{2+}(aq) + 2\ Ag^+(aq) \rightleftharpoons Sn^{4+}(aq) + 2\ Ag(s)$.

Which change will increase the voltage of the cell?

(A) increasing $[Sn^{2+}]$ **(B)** increasing $[Sn^{4+}]$

(C) decreasing $[Ag^+]$ **(D)** reducing the size of the Ag electrode

42. Use the standard reduction potentials to determine what is observed at the cathode during the electrolysis of a 1.0 M solution of KBr that contains phenolphthalein. What observation(s) is(are) made?

$O_2(g) + 4\ H^+(aq) + 4\ e^- \rightarrow 2\ H_2O(l)$ E° = 1.23 V
$Br_2(l) + 2e^- \rightarrow 2\ Br^-(aq)$ E° = 1.07 V
$2\ H_2O(l) + 2\ e^- \rightarrow H_2(g) + 2\ OH^-$ E° = –0.80 V
$K^+(aq) + e^- \rightarrow K(s)$ E° = –2.92 V

(A) Solid metal forms.

(B) Bubbles form and a pink color appears.

(C) Dark red $Br_2(aq)$ forms.

(D) Bubbles form and the solution remains colorless.

43. To whom is the discovery of the nuclear atom attributed?

(A) Neils Bohr **(B)** Louis deBroglie

(C) Robert Millikan **(D)** Ernest Rutherford

44. Each of the following atomic orbitals is possible except

(A) 1*s*. **(B)** 2*p*. **(C)** 3*f*. **(D)** 4*d*.

45. The ion $^{55}Mn^{2+}$ contains which combination of protons, neutrons and electrons?

	protons	neutrons	electrons
A	25	30	23
B	25	55	23
C	27	30	25
D	30	25	28

(A) A **(B)** B **(C)** C **(D)** D

46. What is the characteristic color of the flame test for potassium?

(A) yellow **(B)** red **(C)** green **(D)** violet

47. Which atom has the highest electronegativity?

(A) Na **(B)** P **(C)** Cl **(D)** Br

48. In which set are both elements metalloids?

(A) Cr and Mo **(B)** Ge and As

(C) Sn and Pb **(D)** Se and Br

49. The silicon-oxygen bonds in SiO_2 are best described as

(A) coordinate covalent. **(B)** ionic.

(C) nonpolar covalent. **(D)** polar covalent.

50. Which bond is strongest?

(A) C=C **(B)** C=N **(C)** C=O **(D)** C=S

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51. What is the relationship between the two species shown below?

They are

(A) geometric isomers. **(B)** enantiomers.

(C) resonance forms. **(D)** structural isomers.

52. If A represents the central atom, in which molecule is the F-A-F angle the smallest?

(A) BF_3 **(B)** CF_4 **(C)** NF_3 **(D)** OF_2

53. On the basis of VSEPR theory, what geometry is predicted for the central sulfur atom in $SOCl_2$?

(A) bent **(B)** T-shaped

(C) trigonal planar **(D)** trigonal pyramidal

54. How many sigma (σ) and pi (π) bonds are in a molecule of ethyne (acetylene), HCCH?

(A) 1 σ and 1 π **(B)** 2 σ and 1 π

(C) 2 σ and 3 π **(D)** 3 σ and 2 π

55. What is the number of structural isomers with the molecular formula C_6H_{14}?

(A) three **(B)** four **(C)** five **(D)** six

56. All of the following are condensation polymers except

(A) nylon **(B)** polyethylene

(C) protein **(D)** starch

57. Methanol can be gently oxidized with hot copper metal. What is(are) the product(s) of this oxidation?

(A) acetic acid **(B)** carbon dioxide + water

(C) ethanol **(D)** methanal

58. Which statement does not describe benzene, C_6H_6?

(A) It is an aromatic hydrocarbon.

(B) It exists in two isomeric forms.

(C) It undergoes substitution reactions.

(D) It can react to form three different products with the formula $C_6H_4Cl_2$.

59. All of the following atoms comprise part of a peptide functional group except

(A) hydrogen. **(B)** nitrogen.

(C) oxygen. **(D)** phosphorus.

60. Which vitamin is the most soluble in water?

(A) A **(B)** K **(C)** C **(D)** D

END OF TEST

Olympiad 2013
USNCO Local Section Exam
KEY

Number	Answer
1.	D
2.	B
3.	C
4.	B
5.	C
6.	C
7.	D
8.	B
9.	D
10.	A
11.	A
12.	D
13.	B
14.	B
15.	A
16.	B
17.	B
18.	D
19.	D
20.	A
21.	A
22.	B
23.	C
24.	B
25.	D
26.	B
27.	C
28.	D
29.	D
30.	A

Number	Answer
31.	D
32.	B
33.	D
34.	D
35.	B
36.	C
37.	C
38.	A
39.	B
40.	B
41.	A
42.	B
43.	D
44.	C
45.	A
46.	D
47.	C
48.	B
49.	D
50.	C
51.	C
52.	D
53.	D
54.	D
55.	C
56.	B
57.	D
58.	B
59.	D
60.	C