ACS USNCO
U.S. National Chemistry Olympiad

2024 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 their 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.

The full examination consists of 60 multiple-choice questions representing a fairly wide range of difficulty. A periodic table and other useful information are provided on page two of this exam booklet for student reference.

Only non-programmable calculators are to be used on the ACS Local Section exam. The use of a programmable calculator, cell phone, or any other device that can access the internet or make copies or photographs during the exam is grounds for disqualification.

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.

EQUATIONS

$$E = E^\circ - \frac{RT}{nF}\ln Q$$

$$\ln K = \left(\frac{-\Delta H^\circ}{R}\right)\left(\frac{1}{T}\right) + \text{constant}$$

$$\ln\left(\frac{k_2}{k_1}\right) = \frac{E_a}{R}\left(\frac{1}{T_1} - \frac{1}{T_2}\right)$$
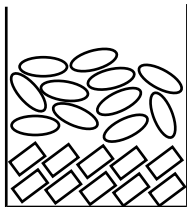
PERIODIC TABLE OF THE ELEMENTS

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** 78.97	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** 95.95	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 **Nh** (286)	114 **Fl** (289)	115 **Mc** (289)	116 **Lv** (293)	117 **Ts** (294)	118 **Og** (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)

- 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. How many moles of ions are in 75.0 mL of a 1.20 M aqueous solution of sodium sulfate?

   (A) 0.090 mol   (B) 0.120 mol

   (C) 0.180 mol   (D) 0.270 mol

2. When 3.00 g of $NH_3(g)$ ($M = 17.03$) reacts with 18.0 g of $HCl(g)$ ($M = 36.46$), what is the theoretical yield of $NH_4Cl(s)$?

   (A) 6.42 g   (B) 8.41 g

   (C) 9.42 g   (D) 21.0 g

3. How many fluorine atoms are in 135 g of CF_2Cl_2?

   (A) 3.36×10^{23} (B) 6.72×10^{23}

   (C) 1.34×10^{24} (D) 4.28×10^{24}

4. A 2024 US penny (which is a mixture of zinc and copper) is dissolved in dilute nitric acid, forming aqueous Cu^{2+} and Zn^{2+} ions. The resulting solution is treated with an excess of iodide ion, causing the Cu^{2+} to react to form $CuI(s)$ and $I_3^-(aq)$. Subsequent titration with thiosulfate reveals that 4.93×10^{-4} mol of $I_3^-(aq)$ was formed. What is the mass of copper in the penny?

   (A) 31.3 mg   (B) 62.7 mg

   (C) 125 mg   (D) 188 mg

5. 1.22 g of benzoic acid ($C_7H_6O_2$, $M = 122.12$) is dissolved in water to a total volume of 150.0 mL. A 10.0 mL sample of this solution is then withdrawn and diluted to 500.0 mL. What is the concentration of benzoic acid in the final solution?

   (A) 0.00133 M   (B) 0.00266 M

   (C) 0.0200 M   (D) 0.122 M

6. A 0.75 m aqueous solution of which substance has the lowest freezing point?

   (A) HF   (B) HI

   (C) H_3PO_4 (D) CH_3COOH

7. Which apparatus would be most suitable for collecting a sample of solid barium sulfate produced through the reaction of aqueous solutions of barium hydroxide and sulfuric acid?

   (A) Barometer   (B) Beaker

   (C) Büchner funnel   (D) Buret

8. A solution is prepared by dissolving 10.00 g of a salt in 90.00 g of water. What additional information is needed to calculate the molarity of this solution?
   I. The molar mass of the salt
   II. The density of the solution

   (A) I alone would allow one to calculate the molarity.

   (B) II alone would allow one to calculate the molarity.

   (C) I and II together would allow one to calculate the molarity.

   (D) The molarity cannot be calculated even if both I and II are known.

9. Which substance dissolves to give a colorless solution?

   (A) $KClO_4$ (B) K_2CrO_4

   (C) $KMnO_4$ (D) $K_3Fe(CN)_6$

10. Which substance does not give off heat when added to water?

    (A) NaOH   (B) KNO_3

    (C) H_2SO_4 (D) CaO

11. A solution of a nitrate salt does not form a precipitate when treated with dilute sulfuric acid. Which cation is not present in this solution?

    (A) NH_4^+ (B) Al^{3+}

    (C) Fe^{2+} (D) Pb^{2+}

12. Which measurement would be least able to distinguish between a sample of elemental bromine prepared using exclusively the ^{79}Br isotope (^{79}Br$_2$) and one prepared using exclusively the ^{81}Br isotope (^{81}Br$_2$)?

(A) Infrared spectroscopy (B) Liquid density

(C) Mass spectrometry (D) Vapor density

13. A white crystalline solid melts at 400 °C and dissolves in water to give an electrically conducting solution. Which is it?

(A) LiOH (B) $C_{12}H_{22}O_{11}$

(C) SiO_2 (D) Cu

14. A 10.0 L vessel containing 5.0 atm of He and a 3.0 L vessel containing 10.0 atm of Ar are connected by a valve. The valve is opened and the gases are allowed to mix at constant temperature. What is the final pressure in the vessels?

(A) 2.3 atm (B) 3.8 atm

(C) 6.2 atm (D) 7.5 atm

15. A mixture of **A** (whose molecules are represented by rectangles) and **B** (whose molecules are represented by ovals) is represented schematically below. Which is the best description of this mixture?

(A) **A** is dissolved in liquid **B**.

(B) **A** is a crystalline solid in the presence of liquid **B**.

(C) **A** and **B** are crystalline solids with **A** denser than **B**.

(D) **A** and **B** are immiscible liquids with **A** denser than **B**.

16. Which statement best describes a sample of ammonia at equilibrium at its triple point (195.4 K, 0.0606 bar)?

(A) Gaseous ammonia must be present, and solid or liquid ammonia may be present.

(B) Liquid ammonia must be present, and solid or gaseous ammonia may be present.

(C) Solid ammonia must be present, and liquid or gaseous ammonia may be present.

(D) Gaseous, liquid, and solid ammonia must all be present.

17. Which compound's lattice energy is largest in magnitude?

(A) LiF (B) NaCl (C) MgO (D) CaS

18. Tantalum crystallizes in a body-centered cubic structure. How many nearest neighbors does each tantalum atom have?

(A) 4 (B) 6 (C) 8 (D) 12

19. Which statement about phase transitions is correct?

(A) Melting is endothermic and freezing is exothermic.

(B) Vaporization is exothermic and condensation is endothermic.

(C) The enthalpy change for a spontaneous phase transition is always positive.

(D) The entropy change for a spontaneous phase transition is always positive.

20. Based on the given bond dissociation enthalpies (BDEs), what is $\Delta H°_{rxn}$ for the addition of methane to ethyne to give propene?

$$CH_4(g) + HC\equiv CH(g) \rightarrow CH_3CH=CH_2(g) \quad \Delta H°_{rxn} = ???$$

Bond	BDE, kJ mol^{-1}	Bond	BDE, kJ mol^{-1}
C–H	415	C=C	611
C–C	345	C≡C	837

(A) -119 kJ mol^{-1} (B) -196 kJ mol^{-1}

(C) -259 kJ mol^{-1} (D) -296 kJ mol^{-1}

21. Which statements must be true for a nonspontaneous gas-phase chemical reaction at constant temperature and pressure?

I. $\Delta G > 0$ II. $K_p < 1$

(A) I only (B) II only

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

22. Benzene, C_6H_6, has $\Delta H°_{vap} = 30.7$ kJ mol^{-1} at its normal boiling point of 80.1 °C. What is $\Delta S°_{vap}$ at this temperature?

(A) 10.5 J mol^{-1} K^{-1} (B) 86.9 J mol^{-1} K^{-1}

(C) 255 J mol^{-1} K^{-1} (D) 383 J mol^{-1} K^{-1}

**23.** Which reaction has $\Delta S° < 0$?

(A) $C(s, \text{graphite}) \rightarrow C(s, \text{diamond})$

(B) $N_2O_4(g) \rightarrow 2\ NO_2(g)$

(C) $I_2(s) \rightarrow I_2(g)$

(D) $NH_4^+(aq) + CH_3COO^-(aq) \rightarrow$
$NH_3(aq) + CH_3COOH(aq)$

24. What is the K_{sp} of $PbCl_2$ at 298 K?

Species	$\Delta H°_f$, kJ mol^{-1}	$S°$, J mol^{-1} K^{-1}
$Pb^{2+}(aq)$	–1.7	10.5
$PbCl_2(s)$	–359.4	136.0
$Cl^-(aq)$	–167.2	56.5

(A) 1.2×10^{-11} **(B)** 1.8×10^{-5}

(C) 8.2×10^{-5} **(D)** 3.7×10^{-4}

**25.** Ethanol (C_2H_5OH) is oxidized to acetaldehyde (CH_3CHO) by dichromate ions in acidic solution according to the following equation:

$$3\ C_2H_5OH(aq) + Cr_2O_7^{2-}(aq) + 8\ H^+(aq) \rightarrow$$
$$3\ CH_3CHO(aq) + 2\ Cr^{3+}(aq) + 7\ H_2O(l)$$
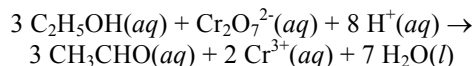
If the concentration of $Cr^{3+}(aq)$ is increasing at a rate of 0.18 M s^{-1}, at what rate is the concentration of $CH_3CHO(aq)$ changing?

(A) Increasing at 0.12 M s^{-1}

(B) Increasing at 0.27 M s^{-1}

(C) Decreasing at 0.12 M s^{-1}

(D) Decreasing at 0.27 M s^{-1}

26. A reaction in the gas phase doubles in rate on increasing the temperature from 10 °C to 20 °C. Which is the best explanation for the increase in reaction rate?

(A) The pressure doubles.

(B) The number of particles above a minimum activation energy doubles.

(C) The average kinetic energy of the molecules doubles.

(D) The number of collisions per unit time doubles.

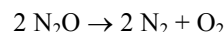**27.** An irreversible reaction occurs as follows:

$$2\ A(g) + B(g) \rightarrow C(g) + D(g)$$
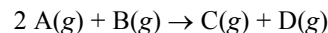
What is the rate law for this reaction?

(A) Rate = $k[A][B]$

(B) Rate = $k[A]^2[B]$

(C) Rate = $k[2A][B]$

(D) It cannot be determined from the information given.

28. The half-life of ^{90}Sr is 28 years. How long is required for the level of radioactivity to drop to 1.5% of its initial value?

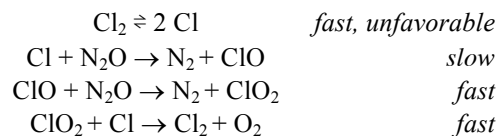**(A)** 0.42 years   **(B)** 40 years

(C) 55 years   **(D)** 170 years

29. An uncatalyzed reaction has an activation energy $E_a = 50$ kJ mol^{-1} and an enthalpy change $\Delta H° = –10$ kJ mol^{-1}. In the presence of a catalyst, what might these values become?

(A) $E_a = 30$ kJ mol^{-1}, $\Delta H° = –10$ kJ mol^{-1}

(B) $E_a = 50$ kJ mol^{-1}, $\Delta H° = –15$ kJ mol^{-1}

(C) $E_a = 60$ kJ mol^{-1}, $\Delta H° = –20$ kJ mol^{-1}

(D) $E_a = –10$ kJ mol^{-1}, $\Delta H° = 50$ kJ mol^{-1}

**30.** Chlorine gas catalyzes the gas-phase decomposition of nitrous oxide according to the equation

$$2\ N_2O \rightarrow 2\ N_2 + O_2$$

The following mechanism is proposed for the catalyzed reaction:

$Cl_2 \rightleftharpoons 2\ Cl$	*fast, unfavorable*
$Cl + N_2O \rightarrow N_2 + ClO$	*slow*
$ClO + N_2O \rightarrow N_2 + ClO_2$	*fast*
$ClO_2 + Cl \rightarrow Cl_2 + O_2$	*fast*

What rate law is predicted by this mechanism?

(A) Rate = $k[N_2O]$ **(B)** Rate = $k[N_2O]^2$

(C) Rate = $k[N_2O][Cl_2]$ **(D)** Rate = $k[N_2O][Cl_2]^{1/2}$

31. The K_a of formic acid is 1.8×10^{-4}. What is the equilibrium constant for the reaction below?

$$HCO_2H + OH^- \rightleftharpoons HCO_2^- + H_2O$$

(A) 5.6×10^{-11} **(B)** 5.6×10^3

(C) 1.8×10^{10} **(D)** 5.6×10^{17}

32. Solid calcium carbonate is in equilibrium as described below:

$Ca^{2+}(aq) + 2HCO_3^- (aq) \rightleftharpoons CaCO_3(s) + CO_2(g) + H_2O(l)$
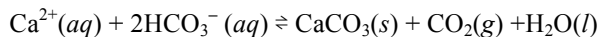
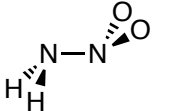If $CO_2(g)$ is added to this system in a rigid container, which changes will take place?
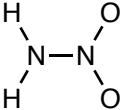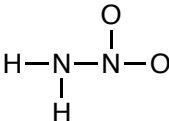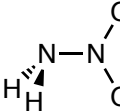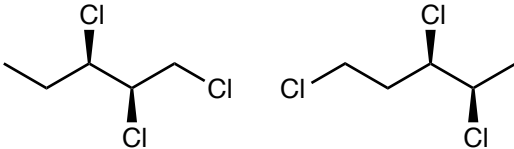
   I. Additional $CaCO_3(s)$ will precipitate.
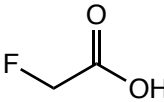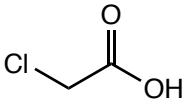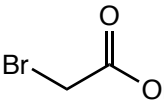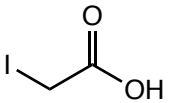   II. The pH will increase.

(A) I only
(B) II only
(C) Both I and II
(D) Neither I nor II

33. Calcium carbonate occurs in two common crystalline forms, calcite ($K_{sp} = 3.4 \times 10^{-9}$) and aragonite ($K_{sp} = 6.0 \times 10^{-9}$). Which of these is most thermodynamically stable?

(A) Calcite

(B) Aragonite

(C) The two forms are equally stable.

(D) The relative stability cannot be determined from the K_{sp} values.

34. What is the pH of a 0.043 M solution of HI?

(A) 0.04
(B) 1.37
(C) 1.67
(D) 3.15

35. At 1200 K, the equilibrium constant for the reaction

$$N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$$

is $K_p = 2.9 \times 10^{-7}$. A mixture of 0.79 bar N_2 and 0.21 bar O_2 is prepared at 300 K and heated to 1200 K while maintaining a constant total pressure of 1.00 bar. What is the equilibrium partial pressure of $NO(g)$ at 1200 K?

(A) 2.4×10^{-8} bar
(B) 1.1×10^{-4} bar
(C) 2.2×10^{-4} bar
(D) 5.4×10^{-4} bar

36. Sodium sulfate is slowly added to 1.00 L of a solution that is 0.10 M in both $Pb^{2+}(aq)$ and $Sr^{2+}(aq)$. How much Na_2SO_4 must be added to induce precipitation of $SrSO_4$? The K_{sp} of $PbSO_4$ is 1.8×10^{-8} and the K_{sp} of $SrSO_4$ is 3.5×10^{-7}.

(A) 3.3×10^{-6} mol
(B) 3.5×10^{-6} mol
(C) 5.9×10^{-4} mol
(D) 9.5×10^{-2} mol

37. What is the oxidation number of carbon in methanol, CH_3OH?

(A) –2
(B) 0
(C) +2
(D) +4

38. A standard galvanic cell is assembled from silver and platinum in 1 *M* solutions of the corresponding metal ions. Which metal would be labeled the cathode, and what is the voltage of the standard galvanic cell?

Half-reaction	$E°$, V
$Pt^{2+}(aq) + 2e^- \rightarrow Pt(s)$	1.20
$Ag^+(aq) + e^- \rightarrow Ag(s)$	0.80

(A) Ag cathode, $E° = 1.60$ V

(B) Pt cathode, $E° = 1.20$ V

(C) Ag cathode, $E° = 0.80$ V

(D) Pt cathode, $E° = 0.40$ V

39. A spoon is electroplated in a solution of 1.0 *M* silver nitrate with a current of 0.10 A. How long does it take to plate 0.10 g of silver on the spoon?

(A) 5.0 min
(B) 10. min
(C) 15. min
(D) 30. min

40. Aqueous sulfuric acid containing 1.0 M NaI is electrolyzed at glassy carbon electrodes. What is produced at the anode?

(A) H_2
(B) O_2
(C) I_2
(D) SO_2

41. A certain galvanic cell has a standard cell potential that increases with increasing temperature. Which best explains this observation?

(A) $\Delta H°_{rxn} > 0$
(B) $\Delta S°_{rxn} > 0$
(C) $\Delta G°_{rxn} > 0$
(D) $E° > 0$

42. What is the standard reduction potential under acidic conditions for the reduction of $PbO_2(s)$ to $Pb(s)$?

$PbO_2(s) + 4 H^+(aq) + 4e^- \rightarrow Pb(s) + 2 H_2O(l) \quad E° = ???$

Half-reaction	$E°$, V
$PbO_2(s) + 4 H^+(aq) + 2e^- \rightarrow$ $Pb^{2+}(aq) + 2 H_2O(l)$	1.468
$Pb^{2+}(aq) + 2e^- \rightarrow Pb(s)$	–0.126

(A) 0.671 V
(B) 0.797 V
(C) 1.342 V
(D) 1.594 V

43. Which element's electronegativity is most similar to that of sulfur (S)?

(A) O
(B) F
(C) As
(D) Se

44. Two atoms of the same element, **A** and **B**, are in identical excited states. Atom **A** emits a photon of red light, while atom **B** emits a photon of blue light. Which statement best describes the energies of the two atoms after the emission of light?

(A) Atom **A** is in a lower-energy state than atom **B**.

(B) Atom **A** is in a higher-energy state than atom **B**.

(C) Atom **A** and atom **B** have the same energy.

(D) The relative energies of **A** and **B** cannot be determined from the information given.

45. Two orbitals in an atom are both spherically symmetric but differ in size. Which statements about the orbitals' quantum numbers must be correct?

I. The two orbitals have different values of n.
II. The two orbitals have the same value of m_l.

(A) I only   (B) II only

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

46. Which is a pair of gas-phase species with the same ground state electron configuration?

(A) V and Cr^+ (B) Mn^+ and Fe^-

(C) Ni and Pd   (D) Zn and Ga^+

47. Which list arranges from highest to lowest the standard reduction potentials $E°$ for reduction of the divalent group 10 metal ions $M^{2+}(aq)$ to $M(s)$?

(A) Ni > Pd > Pt   (B) Pt > Pd > Ni

(C) Pd > Ni > Pt   (D) Pd > Pt > Ni

48. A nucleus absorbs a neutron and undergoes fission to produce $^{103}_{40}Zr$, $^{134}_{54}Xe$, and three additional neutrons. What is the fissile nucleus?

(A) ^{235}U (B) ^{237}U (C) ^{237}Pu (D) ^{239}Pu

49. Which species has the shortest bond to nitrogen?

(A) HCN   (B) N_2O_4 (C) NO_2 (D) NO_2^-

50. How many lone pairs are there in a valid Lewis structure of ozone, O_3?

(A) 6   (B) 7   (C) 8   (D) 9

51. Which species is linear?

(A) H_2F^+ (B) FCO^+ (C) FNO   (D) N_2F_2

52. Anionic NO^- has a longer bond than neutral NO. Which is the best explanation for this difference?

(A) NO^- has two unpaired electrons while NO has only one.

(B) NO^- has a double bond while NO has a triple bond.

(C) NO^- has one more σ antibonding electron than NO.

(D) NO^- has one more π antibonding electron than NO.

53. Which is the best representation of the three-dimensional arrangement of the atoms in nitramide, H_2NNO_2?

54. How many stereoisomers are possible for the square planar complex $Pt(NH_2CH_2CH_2NH_2)(C_2O_4)$?

(A) 1   (B) 2   (C) 3   (D) 4

55. What is the relationship between these two molecules?

(A) Identical

(B) Enantiomers

(C) Diastereomers

(D) Structural isomers

56. Which is the strongest acid?

57. Which molecule is not aromatic?

(A)

**(B)**

(C)

(D)
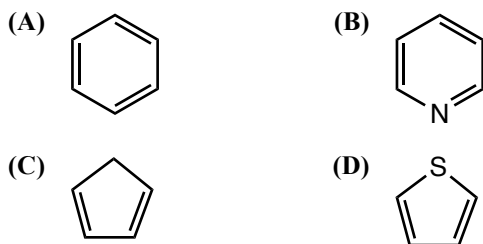
58. Which statement best describes the redox properties of alcohols?

(A) Primary alcohols are oxidized to ketones by acidic dichromate.

(B) Ketones are reduced to primary alcohols by sodium borohydride.

(C) Secondary alcohols are oxidized to ketones by acidic dichromate.

(D) Tertiary alcohols are oxidized to esters by acidic dichromate.

59. Acetic acid reacts with ethanol in the presence of a strong acid catalyst to form ethyl acetate (the Fischer esterification reaction). What is the role of the acid catalyst?

(A) It makes the carboxylic acid more electrophilic by protonating the carbonyl oxygen.

(B) It makes the ethanol more nucleophilic by protonating the hydroxyl oxygen.

(C) It converts the hydroxyl group of ethanol to a better leaving group.

(D) It shifts the equilibrium in the direction of the ester product.

60. Which are products of the acid-catalyzed reaction of β-D-glucose with methanol?

β-D-glucose

I.

II.
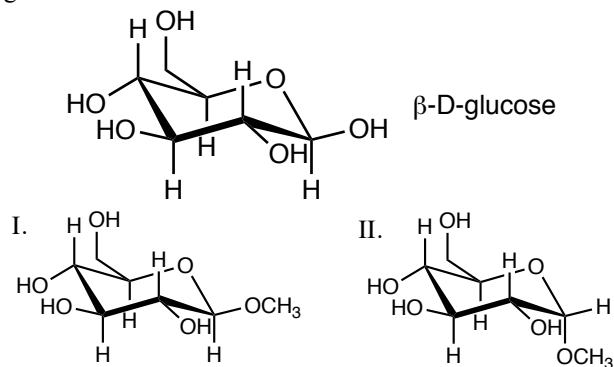
(A) I only

(B) II only

(C) Both I and II

(D) Neither I nor II

END OF TEST

Olympiad 2024
USNCO Local Section Exam
KEY

Number	Answer		Number	Answer
1.	D		31.	C
2.	C		32.	D
3.	C		33.	A
4.	B		34.	B
5.	A		35.	C
6.	B		36.	D
7.	C		37.	A
8.	C		38.	D
9.	A		39.	C
10.	B		40.	C
11.	D		41.	B
12.	A		42.	A
13.	A		43.	D
14.	C		44.	B
15.	B		45.	C
16.	A		46.	D
17.	C		47.	B
18.	C		48.	D
19.	A		49.	A
20.	A		50.	A
21.	A		51.	B
22.	B		52.	D
23.	A		53.	A
24.	B		54.	A
25.	B		55.	D
26.	B		56.	A
27.	D		57.	C
28.	D		58.	C
29.	A		59.	A
30.	D		60.	C