2011 U.S. NATIONAL CHEMISTRY OLYMPIAD

LOCAL SECTION EXAM

Prepared by the American Chemical Society Chemistry 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. Each Local Section may use an answer sheet of its 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

$R = 8.314\ \text{J·mol}^{-1}\text{•K}^{-1}$

$R = 0.0821\ \text{L·atm·mol}^{-1}\text{•K}^{-1}$

$1\ F = 96{,}500\ \text{C•mol}^{-1}$

$1\ F = 96{,}500\ \text{J·V}^{-1}\text{•mol}^{-1}$

$N_A = 6.022 \times 10^{23}\ \text{mol}^{-1}$

$h = 6.626 \times 10^{-34}\ \text{J•s}$

$c = 2.998 \times 10^{8}\ \text{m•s}^{-1}$

$0\ ^\circ\text{C} = 273.15\ \text{K}$

EQUATIONS

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

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** (266)	107 **Bh** (264)	108 **Hs** (277)	109 **Mt** (268)	110 **Ds** (281)	111 **Rg** (272)	112 **Cn** (277)	113 (Uut)	114 (Uuq)	115 (Uup)	116 (Uuh)	117 (Uus)	118 (Uuo)

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. A student is asked to dispense 24.70 mL of a solution with an uncertainty of less than 0.05 mL. Which item should be used for this task?

(A) 50 mL beaker

(B) 50 mL buret

(C) 50 mL Erlenmeyer flask

(D) 50 mL graduated cylinder

2. Oxygen gas can be produced by the decomposition of all of the following substances EXCEPT

(A) calcium oxide. **(B)** hydrogen peroxide.

(C) mercury(II) oxide. **(D)** ozone.

3. Which gaseous product is formed when dilute nitric acid reacts with silver metal in the absence of air?

(A) H_2 **(B)** O_2 **(C)** NH_3 **(D)** NO

4. How many of the following gases are characterized by BOTH color AND a distinctive odor?
Cl_2 CH_4 NO_2

(A) none **(B)** one **(C)** two **(D)** three

5. Which action should be taken immediately if concentrated sulfuric acid is spilled on the skin?

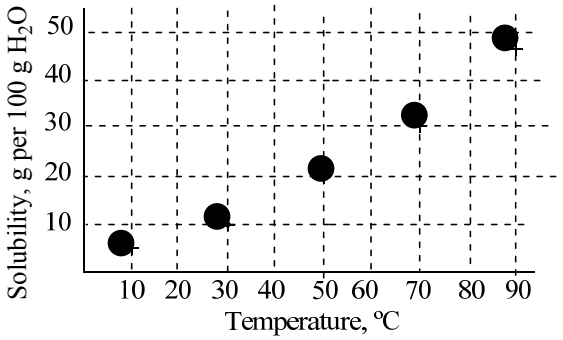
(A) It should be rinsed off with large quantities of running water.

(B) It should be neutralized with solid $CaCO_3$.

(C) It should be neutralized with concentrated NaOH.

(D) The area of the spill should be wrapped tightly with cloth and shown to a health provider.

6. The solubility of $KClO_3$ at several temperatures is shown in the accompanying diagram.



A student mixes 10.0 g of $KClO_3$ with 45.0 g of H_2O and stirs it for a long time at 60 ˚C until the solution is completely clear then allows it to cool slowly to 20 ˚C where it remains clear. Which statement about the final clear mixture at 20 ˚C is correct?

(A) It is a saturated solution.

(B) It is an unsaturated solution and can be made saturated by decreasing the temperature.

(C) It is an unsaturated solution and can be made saturated by increasing the temperature.

(D) It is a supersaturated solution.

7. A 65.25 g sample of $CuSO_4 \cdot 5H_2O$ (M = 249.7) is dissolved in enough water to make 0.800 L of solution. What volume of this solution must be diluted with water to make 1.00 L of 0.100 M $CuSO_4$?

(A) 3.27 mL **(B)** 81.6 mL

(C) 209 mL **(D)** 306 mL

8. How many moles of O_2 are required for the complete combustion of 2.2 g of C_3H_8 to form CO_2 and H_2O?

(A) 0.050 **(B)** 0.15 **(C)** 0.25 **(D)** 0.50

9. A typical polyethylene bag from a grocery store weighs 12.4 g. How many molecules of ethylene, C_2H_4, must be polymerized to make such a bag?

(A) 1.36×10^{24} **(B)** 6.02×10^{23}

(C) 5.33×10^{23} **(D)** 2.67×10^{23}

10. In the titration of a monoprotic acid with a solution of sodium hydroxide of known concentration, what quantities are equal at the equivalence point?

(A) the concentrations of hydroxide and hydronium ions

(B) the number of moles of hydroxide ion added and the number of moles of hydronium ion initially present

(C) the volume of sodium hydroxide solution added and the volume of acid solution initially present

(D) the number of moles of hydroxide ion added and the number of moles of monoprotic acid initially present

11. When a nonvolatile solute is dissolved in a volatile solvent, which characteristic is greater for the solution than for the solvent?

(A) boiling point **(B)** freezing point

(C) rate of evaporation **(D)** vapor pressure

12. What is the concentration of nitrate ion in a solution made by mixing 100 mL of a 0.200 M HNO_3 solution with 200 mL of a 0.100 M solution of $Mg(NO_3)_2$?

(A) 0.133 M **(B)** 0.150 M

(C) 0.167 M **(D)** 0.200 M

13. The phase transition from gas to solid is called

(A) condensation. **(B)** evaporation.

(C) polymerization. **(D)** sublimation.

14. A sample of gas occupies a volume of 9.23 L at 345 K and 1.40 atm. What is its volume at 525 K and 3.20 atm?

(A) 2.65 L **(B)** 6.14 L **(C)** 13.9 L **(D)** 32.1 L

15. Which substance has the strongest London dispersion forces?

(A) H_2O **(B)** H_2S **(C)** H_2Se **(D)** H_2Te

16. When the substances Si, KCl, CH_3OH, and C_2H_6 are arranged in order of increasing melting point, what is the correct order?

(A) Si, KCl, CH_3OH, C_2H_6

(B) CH_3OH, C_2H_6, Si, KCl

(C) KCl, Si, C_2H_6, CH_3OH

(D) C_2H_6, CH_3OH, KCl, Si

17. According to the following information, in what physical state(s) does bromine exist at –7.4 ˚C and 400 mm Hg?
[Triple point –7.3 ˚C, 44 mm Hg
Liquid density 3.1 g•cm^{-3}, Solid density 3.4 g•cm^{-3}]

(A) solid only **(B)** liquid only

(C) liquid and solid only **(D)** gas, liquid, and solid

18. A gas mixture at 27 ˚C and 1 atm contains equal masses of He, H_2, CO_2, and CH_4. How do their molecular velocities compare?

(A) $He = H_2 = CO_2 = CH_4$ **(B)** $He < H_2 < CO_2 < CH_4$

(C) $H_2 < He < CH_4 < CO_2$ **(D)** $CO_2 < CH_4 < He < H_2$

19. The energies of the bonds broken in a certain reaction are greater than the energies of the bonds formed. Which one of the following statements about this reaction must be true?

(A) The reaction is endothermic.

(B) The reaction is exothermic.

(C) The reaction is spontaneous.

(D) The reaction is non-spontaneous.

20. How much heat is required to convert 5.0 g of ice at –10.0 ˚C to liquid water at 15.0 ˚C? (Assume heat capacities are independent of temperature.)

Enthalpy of fusion	6.00 kJ•mol^{-1}
Specific heat capacity of ice	37.8 J•mol^{-1}•˚C^{-1}
Specific heat capacity of water	76.0 J•mol^{-1}•˚C^{-1}

(A) 4.2×10^2 J **(B)** 2.1×10^3 J

(C) 9.3×10^3 J **(D)** 3.8×10^4 J

21. What is the standard enthalpy of formation of ethylene, C_2H_4, if its standard enthalpy of combustion is –1411 kJ•mol^{-1}?

substance	ΔH_f°, kJ•mol^{-1}
$CO_2(g)$	–394
$H_2O(l)$	–286

(A) 1411 kJ•mol^{-1} **(B)** 51 kJ•mol^{-1}

(C) –337 kJ•mol^{-1} **(D)** –445 kJ•mol^{-1}

22. At the triple point of water how do the entropies of solid, liquid, and gas compare?

(A) $S^\circ_{solid} < S^\circ_{liquid} < S^\circ_{gas}$ **(B)** $S^\circ_{solid} = S^\circ_{liquid} < S^\circ_{gas}$

(C) $S^\circ_{gas} < S^\circ_{solid} < S^\circ_{liquid}$ **(D)** $S^\circ_{solid} = S^\circ_{liquid} = S^\circ_{gas}$

23. "A perfect crystalline substance has an entropy of zero at absolute zero" is a statement of

(A) Hess's Law.

(B) The First Law of Thermodynamics.

(C) The Second Law of Thermodynamics.

(D) The Third Law of Thermodynamics.

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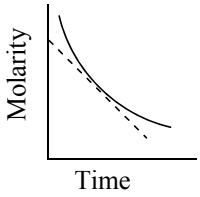
24. Which one of the following sets of conditions would result in a reaction that is spontaneous at high temperatures but non-spontaneous at low temperatures?

(A) $\Delta H > 0, \Delta S > 0$ **(B)** $\Delta H > 0, \Delta S < 0$

(C) $\Delta H < 0, \Delta S < 0$ **(D)** $\Delta H < 0, \Delta S > 0$

25. What quantity is represented by the slope of the dashed line in the accompanying diagram for the concentration change in a reaction?



(A) instantaneous reaction rate

(B) rate constant

(C) reaction order for that reactant

(D) activation energy

26. Changes in which factors affect both the rate and the rate constant of a first order reaction?
I temperature II concentration

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

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

27. Consider the hypothetical reaction:
$A + 2B \rightarrow C$
The rate remains constant when the concentration of A is doubled and the concentration of B is held constant. The reaction rate doubles when the concentration of B is doubled and the concentration of A is held constant. What are the orders of A and B in this reaction?

(A) A = 0, B = 1 **(B)** A = 0, B = 2

(C) A = 1, B = 2 **(D)** A = 1, B = 0

28. Which statement is true about a reactant that appears in the balanced equation for a reaction but does not appear in the rate equation?

(A) It is an inhibitor.

(B) It is not part of the reaction.

(C) Its concentration is too low to be important.

(D) It takes part in the reaction after the rate-determining step.

29. Introduction of two drops of concentrated sulfuric acid, H_2SO_4, speeds up an esterification reaction. Introduction of a piece of platinum metal, Pt, speeds up the reaction of H_2 and O_2 gas. Which of the following statements is true?

(A) Pt is a homogeneous catalyst; H_2SO_4 is a heterogeneous catalyst.

(B) Pt is a heterogeneous catalyst; H_2SO_4 is a homogeneous catalyst.

(C) Pt and H_2SO_4 are both heterogeneous catalysts.

(D) Pt and H_2SO_4 are both homogeneous catalysts.

30. Which change will decrease the rate of the reaction between $I_2(s)$ and $H_2(g)$?

(A) Increasing the partial pressure of $H_2(g)$

(B) Adding the $I_2(s)$ as one piece rather than as several small ones

(C) Heating the reaction mixture

(D) Adding a catalyst for the reaction

31. For the equilibrium system:
$CO(g) + 2\ H_2(g) \rightleftharpoons CH_3OH(l)$
what is K_c?

(A) $K_c = \dfrac{[CH_3OH]}{2[CO][H_2]}$ **(B)** $K_c = \dfrac{[CH_3OH]}{[CO][H_2]^2}$

(C) $K_c = \dfrac{1}{2[CO][H_2]}$ **(D)** $K_c = \dfrac{1}{[CO][H_2]^2}$

32. Consider the system at equilibrium:
$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$
for which $\Delta H < 0$. Which change(s) will increase the yield of $SO_3(g)$?
I Increasing the temperature
II Increasing the volume of the container

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

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

33. When 0.10 M solutions of HF, HCl, KF, and KCl are arranged in order of increasing pH which order is correct?

(A) HF, HCl, KF, KCl **(B)** HCl, HF, KF, KCl

(C) HCl, HF, KCl, KF **(D)** HF, HCl, KCl, KF

34. Which one of the following mixtures creates a buffer solution?

(A) 10.0 mL 0.10 M NaOH, 10.0 mL 0.10 M HF

(B) 20.0 mL 0.10 M NaOH, 15.0 mL 0.10 M HF

(C) 15.0 mL 0.10 M NaOH, 20.0 mL 0.10 M HF

(D) 10.0 mL 0.10 M NaOH, 5.0 mL 0.20 M HF

35. The solubility of $AgBrO_3$ in aqueous solution depends on the presence of other substances in solution. Relative to its solubility in H_2O the solubility of $AgBrO_3$ is higher in 0.10 M ____ and lower in 0.10 M ____.

(A) NH_3, $KBrO_3$ **(B)** $KBrO_3$, NH_3

(C) HNO_3, NH_3 **(D)** NH_3, HNO_3

36. A 0.015 M solution of a weak acid has a pH of 3.52. What is the value of the K_a for this acid?

(A) 2.0×10^{-2} **(B)** 6.2×10^{-6}

(C) 9.1×10^{-8} **(D)** 1.4×10^{-9}

37. All of the reactions below represent oxidation-reduction processes EXCEPT the

(A) combustion of tin in chlorine gas.

(B) decomposition of potassium chlorate.

(C) neutralization of sodium hydroxide.

(D) reaction of magnesium with hydrochloric acid.

38. Which expression gives the correct value for the standard potential for a gold-rhodium voltaic cell?

Half-reaction	E°, V
$Rh^{3+}(aq) + 3e^- \rightarrow Rh(s)$	0.76
$Au^+(aq) + e^- \rightarrow Au(s)$	1.69

(A) 1.69 + 0.76 **(B)** 1.69 – 0.76

(C) 3(1.69) + 0.76 **(D)** 3(1.69) – 0.76

39. When potassium permanganate, $KMnO_4$, is added to an acidified solution of oxalic acid, $H_2C_2O_4$, the products are CO_2 gas and Mn^{2+} ions. What is the reducing agent in this reaction?

(A) $KMnO_4$ **(B)** $H_2C_2O_4$

(C) H_3O^+ **(D)** CO_2

40. Which term represents the charge on one mole of electrons?

(A) one Ampere **(B)** one Coulomb

(C) one Faraday **(D)** one Volt

41. Consider a voltaic cell in which the reaction below occurs in two half-cells connected by a salt bridge and an external circuit.
$2Cr(s) + 3Sn^{2+}(aq) \rightarrow 3Sn(s) + 2Cr^{3+}(aq)$ $E^\circ = 0.603$ V
Which change will cause the voltage to increase?

(A) Increasing the amount of Sn(s) in its half-cell

(B) Increasing the amount of Cr(s) in its half-cell

(C) Diluting the solution in the anode compartment

(D) Diluting the solution in the cathode compartment

42. How long must a current of 4.00 A be applied to a solution of $Cu^{2+}(aq)$ to produce 2.0 grams of copper metal?

(A) 2.4×10^4 s **(B)** 1.5×10^3 s

(C) 7.6×10^2 s **(D)** 3.8×10^2 s

43. Which element has atoms with exactly four valence electrons in its ground state?

(A) Ca **(B)** Cr **(C)** Si **(D)** S

44. Gas-phase atoms of which element have an occupied 5d orbital in their ground state?

(A) Ag (Z = 47) **(B)** Ba (Z = 56)

(C) Eu (Z = 63) **(D)** Ir (Z = 77)

45. Which gas-phase atom in its ground state could have an electron with the quantum numbers: $n = 3$, $l = 2$, $m_l = 0$, $m_s = -1/2$?

(A) Na **(B)** Mg **(C)** P **(D)** Ti

46. Properties of the alkaline earth metals that increase from Be to Ba include which of the following?
I Atomic radius II Ionization energy III Nuclear charge

(A) I and II only **(B)** I and III only

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

47. In which list are the ions arranged in order of decreasing size?

(A) S^{2-}, Br^-, K^+, Ca^{2+} **(B)** Br^-, S^{2-}, K^+, Ca^{2+}

(C) K^+, Ca^{2+}, S^{2-}, Br^- **(D)** Ca^{2+}, K^+, S^{2-}, Br^-

48. The element Lawrencium was first synthesized by the reaction: ${}^{252}_{98}Cf + {}^{11}_{5}B \rightarrow {}^{258}_{103}Lr + $ ___
What products are needed to balance this equation?

(A) ${}^{4}_{2}\alpha + {}^{1}_{0}n$ **(B)** $5\ {}^{0}_{-1}e$

(C) $5\ {}^{0}_{1}e$ **(D)** $5\ {}^{1}_{0}n$

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49. What is the oxidation number of rhenium in $Ca(ReO_4)_2$?

(A) +1 **(B)** +3 **(C)** +6 **(D)** +7

50. Which species has the largest bond angle?

(A) NO_2^+ **(B)** NO_2 **(C)** NO_2^- **(D)** NO_3^-

51. Which species is planar?

(A) CO_3^{2-} **(B)** SO_3^{2-} **(C)** ClO_3^- **(D)** BF_4^-

52. Given the reactions
$CH_4(g) \rightarrow C(g) + 4H(g)$ $\Delta H^\circ = 1656$ kJ•mol^{-1}
$HC{\equiv}CH(g) \rightarrow 2C(g) + 2H(g)$ $\Delta H^\circ = 1648$ kJ•mol^{-1}
what is the estimated C$\equiv$C bond energy in kJ•mol^{-1}?

(A) 414 **(B)** 820 **(C)** 1234 **(D)** 1664

53. Which bonds are formed by a carbon atom with sp^2 hybridization?

(A) 4 π bonds

(B) 2 π bonds and 2 σ bonds

(C) 1 π bond and 3 σ bonds

(D) 4 σ bonds

54. How many resonance forms can be written for the nitrate ion, NO_3^-?

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

55. The boiling points of CH_3COCH_3, $CH_3COC_2H_5$, and $CH_3COC_3H_7$ are 56 ˚C, 80 ˚C, and 102 ˚C, respectively. This increase is best attributed to an increase in which of the following?

I dipole-dipole interactions
II dispersion forces
III hydrogen bonding

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

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

56. How many isomeric compounds have the formula C_3H_8O?

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

57. How many sigma bonds does propyne, C_3H_4, have?

(A) 2 **(B)** 4 **(C)** 6 **(D)** 8

58. Which of the compounds below will react readily with chlorine by addition?
I C_2H_2 (ethyne) II C_2H_4 (ethene) III C_6H_6 (benzene)

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

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

59. The smell of rancid butter is due to the presence of butyric (butanoic) acid. What is the formula for this compound?

(A) $C_4H_8O_2$ **(B)** $C_4H_{10}O$

(C) $C_5H_{10}O_2$ **(D)** $C_5H_{12}O$

60. In a double helix of DNA, adenine is paired with

(A) adenine. **(B)** cytosine.

(C) guanine. **(D)** thymine.

END OF TEST

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KEY

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

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