Ethiopian University Entrance Examination (EUEE)
Chemistry
GINBOT 2011/JUNE 2019

BOOKLET CODE: 27 **SUBJECT CODE: 05**
Number of Items: 80 **Time Allowed: 2 ½ Hours**

DIRECTIONS: Each of the following questions is followed by four possible alternatives. Read each question and carefully **blacken** the letter of your best choice on the separate answer sheet provided.

You may refer to the information given below when you work on some of the questions.

PHYSICAL CONSTANTS

a) Gas constant, R = 8.314 J mol^{-1} K^{-1} = 0.0821 L-atm mol^{-1} K^{-1}
b) Avogadro's number. = 6.023 x 10^{23} mol^{-1}
c) Plank's constant, h = 6.626 x 10^{-34} Js^{-1}
d) Energy; 1 eV= 1.602 x 10^{-18} J
e) Speed of light, c = 2.9979 x 10^{8} ms^{-1}
f) Faraday's Constant (F) = 96500 C mol^{-1}
g) Charge of 1 mol of electrons= 96500 C

SI Units and Conversion Factors

a) 1 ton= 907.185 kg
b) 1 metric ton = 1000 kg
c) 1 Å= 10^{-10}m
d) 1 L-atm = 101.3 J
e) Coulombs = amperes x seconds

ATOMIC NUMBERS (Z) AND ATOMIC WEIGHTS (A)

Element	H	He	Li	B	C	N	O	F	Ne	Na	P	S	Cl	Ca	Cr	Mn	Fe
Z	1	2	3	5	6	7	8	9	10	11	15	16	17	20	24	25	26
A	1.0	4.0	6.9	10.8	12.0	14	16.0	19.0	20.2	22.98	30.97	32.1	35.5	40.1	52.0	54.9	55.9

Element	Co	Ni	Cu	Zn	Sr	Ag	Cd	I	Pt	Au	Hg
Z	27	28	29	30	38	47	48	53	78	79	80
A	58.9	58.7	63.5	65.4	87.62	107.9	112.4	126.90	195.1	197.0	200.6

1. What aspect of the modern view of atomic structure was proved by Rutherford's gold foil experiment?
   (A) The existence of the nucleus.
   (B) The charge on an electron.
   (C) The charge on an α particle.
   (D) The existence of electrons.

2. Which of these compounds is propanoic acid?
   (A) $CH_3CH_2COOCH_3$
   (B) CH_3CH_2COH
   (C) $CH_3CH_2CH_2OH$
   (D) CH_3CH_2COOH

3. Fats and oils can be classified as_____.
   (A) carbohydrates (B) acids (C) esters (D) alcohols

4. What does it mean by ΔH = negative for a given process?
   (A) The process is endothermic
   (B) The process is exothermic
   (C) The process is adiabatic
   (D) The process is equithermic

5. The oxidation state of chlorine in $HClO_4$ is:
   (A) +1 (B) +3 (C) +5 (D) +7

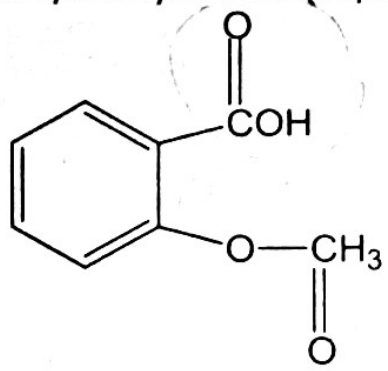
6. Which substance is used to lower the melting point of aluminum oxide ore in the electrolytic extraction of aluminum?
   (A) Cryolite (B) Bauxite (C) Hematite (D) Magnetite

7. The metal extracted from limestone, chalk and marble is_____.
   (A) Sodium (B) Calcium (C) Zinc (D) Chromium

8. Which one of the following is **NOT** a condensation polymer?
   (A) Neoprene (B) Polyamides (C)Polyester (D) Nylon

9. Which of the following compounds does **NOT** contain both ionic and covalent bond?
   (A) NH_4NO_3 (B) CH_3CO_2H (C) NH_4Cl (D) Na_2CO_3

10. Acetylsalicylic acid (aspirin) has the structural formula:



Which functional group (groups) is (are) present in aspirin?
   (A) Hydroxyl (C) Carboxyl and acetyl
   (B) hydroxyl and carbonyl (D) Carboxyl and ester

11. Which of the four colligative properties arises in systems where there is an equilibrium between a liquid solution phase and a second liquid phase?
   (A) Vapour pressure lowering (C) Freezing point depression
   (B) Boiling point elevation (D) Osmotic pressure

12. Which of the following can function as both a Brønsted-Lowry acid and Brønsted-Lowry base?
   (A) H_2SO_4 (B) HSO_3^- (C) SO_4^{2-} (D) H^+

13. What makes the phosphorus cycle different from the carbon and nitrogen cycles?
   (A) Phosphorus is found in the atmosphere in the gaseous state.
   (B) Carbon and nitrogen are released at lower rate compared to phosphate salts.
   (C) Phosphorus salts are released at higher rate compared to carbon and nitrogen cycles.
   (D) Carbon and nitrogen are found in the atmosphere in the gaseous state.

14. When Na_2CrO_4 solution is acidified, which of the following is formed?
(A) Cr (metal) (B) Cr_2O_3 (C) CrO_4^{2-} (D) $Cr_2O_7^{2-}$

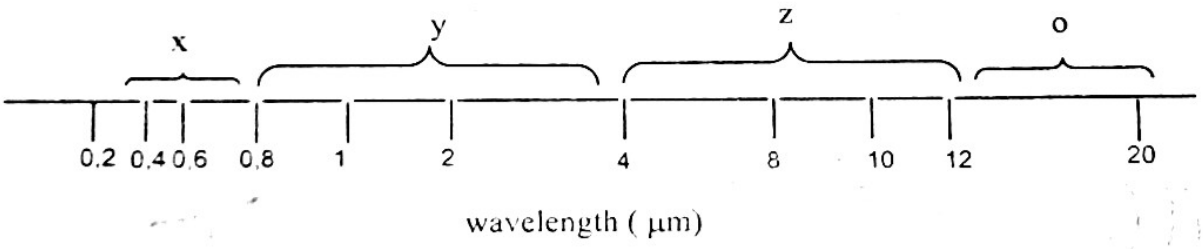
15. Nylon is a/an____?
(A) Amide (B) Peptide (C) Polyamide (D) Polyester

16. Which of the following is **NOT** a component of polysaccharides?
(A) Glucose (B) Sucrose (C) Cellulose (D) Glycogen

17. Which of the following is the SI measurement unit of electric current?
(A) Ampere (B) Watt (C) Volt (D) Coulomb

18. What is the first step in a scientific investigation?
(A) Ask questions (C) Do research
(B) Make observations (D) Draw conclusions

19. In the electromagnetic spectrum with wavelengths shown (in micrometers, μm), which bracketed section of the spectrum represents visible light?



(A) o (B) x (C) y (D) z

20. Which of the orbitals in the figure below has (have) an angular momentum quantum number of $l = 2$?

I II III IV

(A) I (B) I and III (C) II (D) I and IV

21. Which groups in the periodic table form ionic bonds?
(A) Groups 1(1A) & 7(7B), Groups 2(2A) & 6(6B)
(B) Groups 1(1A) & 17(7A), Groups 2 (2A) & 16(6A)
(C) Groups 1(1A) & 18(8A), Groups 4(4B)& 14 (4A)
(D) Groups 3(3B) & 5(5B), Groups 4(4B) & 14 (4A)

22. There is a progressive decrease in the bond angle in the series of molecules CCl_4, PCl_3, and H_2O. According to the VSEPR model, this is best explained by:
(A) Increasing electronegativity of the central atom
(B) Increasing number of lone pair electrons
(C) Decreasing size of the central atom
(D) Decreasing bond strength

23. For the reaction, $N_2 + 3H_2 \rightarrow 2NH_3$, the rate of disappearance of H_2 is 0.01 mol L^{-1} min^{-1}. What is the rate of appearance of NH_3?
(A) 0.01 mol L^{-1} min^{-1}
(B) 0.02 mol L^{-1} min^{-1}
(C) 0.007 mol L^{-1} min^{-1}
(D) 0.002 mol L^{-1} min^{-1}

24. The appropriate unit for a first order rate constant are?
(A) M/s (B) 1/M s (C) $1/M^2$ s (D) 1/s

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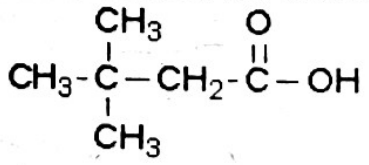
$2X_{(g)} \rightleftharpoons 3Y_{(g)} + Z_{(g)}$ $\Delta H_{(forward\ rxn)} > 0$

25. The molar equilibrium concentrations for the reaction mixture represented above at 298 K are [X] = 4.0 M, [Y] = 5.0 M, and [Z] = 2.0 M. What is the value of the equilibrium constant, K_{eq}, for the reaction at 298 K?

(A) 0.06 (B) 2.50 (C) 16.0 (D) 62.5

26. What is the IUPAC name for the following carboxylic acid?



(A) 3,3-dimethylbutanoic acid
(B) 2-methylpentanoic acid
(C) 2,2-dimethylbutanoic acid
(D) 3-methylpentanoic acid

27. 4 L of 0.02 M of aqueous solution of NaCl is diluted with 1 L of water. What is the **molarity** of the solution?

(A) 0.004 (B) 0.008 (C) 0.012 (D) 0.016

28. How much water, in liters, must be added to 0.50 liter of 6.0 M HCl to make the solution 2.0 M?

(A) 0.50 (B) 1.0 (C) 1.5 (D) 2.0

29. What is the pH of a 0.10 M solution of NH_3, a weak base, whose $K_b = 1.8 \times 10^{-5}$?

(A) 2.89 (B) 4.76 (C) 9.24 (D) 11.11

30. Which of the following is the correct reaction taking place at the electrodes during the electrolysis of dilute sodium chloride solution?

(A) Anode: $2\ Cl^-(aq) \rightarrow Cl_2(l) + 2e$
Cathode: $2\ Na^+(aq) + 2e^- \rightarrow 2\ Na(s)$

(B) Anode: $2\ H_2O(l) \rightarrow O_2(g) + 4\ H^+(aq) + 4e^-$
Cathode: $2\ H_2O(l) + 2\ e^- \rightarrow H_2(g) + OH^-(aq)$

(C) Anode: $2\ Cl^-(aq) \rightarrow Cl_2(l) + 2e^-$
Cathode: $2\ H_2O(l) + 2\ e^- \rightarrow H_2(g) + OH^-(aq)$

(D) Anode: $2\ H_2O(l) \rightarrow O_2(g) + 4\ H^+(aq) + 4e^-$
Cathode: $2\ Na^+(aq) + 2e^- \rightarrow 2\ Na(s)$

31. Precision refers to _____.

(A) how close a measured number is to the true value
(B) how close a measured number is to zero
(C) how close a measured number is to other measured numbers
(D) how close a measured number is to the calculated value

32. Consider the following two possibilities for electron transfer in a hydrogen atom, given below:

First: The electron drops from the Bohr orbit n = 3 to the orbit n = 2, followed by the transition from n = 2 to n = 1

Second: The electron drops from the Bohr orbit n = 3 directly to the orbit n = 1

Which of the following is correct about the energy change of these transitions?

(A) The sum of the energies for the first transitions is less than the energy of transition of the second.

(B) The sum of the energies for the first transitions is equal to the energy of transition of the second.

(C) The sum of the energies for the first transitions is greater than the energy of transition of the second.

(D) The energies of transitions of the first and the energy of transition of the second can't be compared.

33. Which of the following elements has the highest fifth ionization energy (IE_5)?
(A) Al (B) Si (C) P (D) S

34. Which one of the following type of bonding exists between atoms with very different electro-negativities?
(A) Metallic bonding
(B) Hydrogen bonding
(C) Network covalent bonding
(D) Ionic bonding

35. Considering only resonance structures that are major contributors to the overall bonding in PF_5, which of the following statements is correct?
(A) There are no resonance structures that involve ionic contributions.
(B) Only three resonance structures can be drawn for PF_5
(C) In each resonance structure, the P atom carries a positive charge.
(D) One resonance structure contains five P-F bonds.

36. Which one of the following reactions at equilibrium would be unaffected by an increase in pressure?
(I) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$
(II) $2H_2(g) + O_2(g) \rightleftharpoons 2H_2O(g)$
(III) $N_2(g) + O_2(g) \rightleftharpoons 2NO(g)$
(IV) $2CO(g) + O_2(g) \rightleftharpoons 2CO_2(g)$

(A) I (B) II (C) III (D) IV

37. A sealed isothermal container initially contained 2 moles of CO gas and 3 moles of H_2 gas. The following reversible reaction occurred:

$$CO(g) + 2\,H_2(g) \rightleftharpoons CH_3OH(g)$$

At equilibrium, there was 1 mole of CH_3OH in the container. What was the total number of moles of gas present in the container at equilibrium?
(A) 1 (B) 2 (C) 4 (D) 3

38. Hydrolysis of ester leads to the formation of which of the following products in basic medium?
(A) Ether and alcohol
(B) Aldehyde and alcohol
(C) Alcohol and sodium carboxylate
(D) Sodium carboxylate

39. When a saturated solution of sodium chloride is heated, it becomes ___.
(A) Unsaturated
(B) Remains saturated
(C) Supersaturated
(D) Attains equilibrium conditions

40. The pH of a solution prepared by the addition of 100 mL 0.002 M HCl to 100-mL distilled water is closest to:
(A) 1.0 (B) 1.5 (C) 2.0 (D) 3.0

41. A chemist creates a buffer solution by mixing equal volumes of a 0.2-molar HOCl solution and a 0.2-molar KOCl solution. Which of the following will occur when a small amount of KOH is added to the solution?

I. The concentration of undissociated HOCl will increase.
II. The concentration of OCl^- ions will increase.
III. The concentration of H^+ ions will increase.

(A) I only (B) II only (C) III only (D) I and III only

42. Based on the information given in the table below, what is the enthalpy change for the reaction:

$$2\ H_2O_2(g) + S(s) \rightarrow SO_2(g) + 2\ H_2O(g)$$

Substance	ΔH°_f (kJ/mol)
$H_2O_2(g)$	−150
$SO_2(g)$	−300
$H_2O(g)$	−250
S(s)	0

(A) −500 kJ (B) −200 kJ (C) 200 kJ (D) 400 kJ

43. Features common to both galvanic and electrolytic cells include which of the following?
I. Oxidation at the anode
II. Can perform electrolysis
III. Spontaneous
(A) I only (B) II only (C) III only (D) I and II only

44. Which of the following reactions is **NOT** involved in the contact process, during the production of sulfuric acid?
(A) $SO_2 + O_2 \rightarrow 2\,SO_3$
(B) $SO_3 + H_2O \rightarrow H_2SO_4$
(C) $SO_3 + H_2SO_4 \rightarrow H_2S_2O_7$
(D) $H_2S_2O_7 + H_2O \rightarrow H_2SO_4$

45. Two types of polymer are shown below. Which of the following statements concerning these polymers is correct?

(A) X and Y are thermosetting
(B) X is thermosetting and Y is thermoplastic
(C) X is thermoplastic whereas Y is thermosetting
(D) X and Y are thermoplastic

46. The energy of an electron in the first Bohr orbit of hydrogen atom is -13.6 eV. The possible value of the excited state for electron in Bohr orbits of hydrogen is_____.
(A) -1.51 eV (C) -4.21 eV
(B) -6.8 eV (D) +6.8 eV

47. The sublevel that can be occupied by a maximum of 10 electrons is identified by the letter_____.
(A) *d* (B) *f* (C) *p* (D) *s*

48. What is the molecular shape of ICl_4^-?
(A) Octahedral
(B) T-shaped
(C) Square planar
(D) Trigonal bipyramidal

49. What hybridization change, if any, occurs at the underlined atom in the following reaction?

$$CO_2 + H_2O \rightarrow H_2CO_3$$

(A) $sp \rightarrow sp^2$
(B) $sp^3 \rightarrow sp^3d$
(C) $sp^2 \rightarrow sp^3$
(D) No hybridization change observed

50. The proposed reaction mechanism between nitrogen monoxide and bromine is give below.

$$NO + Br_2 \rightleftharpoons NOBr_2 \text{ (fast)}$$
$$NOBr_2 + NO \rightarrow 2NOBr \text{ (slow)}$$

Which of the following rate equations is consistent with the proposed mechanism?
(A) Rate = $k[NO]^2$
(B) Rate = $k[NO][Br_2]^2$
(C) Rate = $k[NO][Br_2]$
(D) Rate = $k[NO]^2[Br_2]$

51. Which one of the following statements regarding a dynamic equilibrium is **FALSE**?
(A) At equilibrium, there is no net change in the system.
(B) At equilibrium, the forward and reverse reactions cease to occur.
(C) At equilibrium, the rates of the forward and back reactions are identical.
(D) At equilibrium, the concentration of reactants and products stays the same.

52. In which of the following cases will the dissolution of sugar be the most rapid?
(A) Sugar crystals in hot water.
(B) Powdered sugar in hot water.
(C) Sugar crystals in cold water
(D) Powdered sugar in cold water.

53. How many grams of iodine, I_2, must be dissolved in 225.0 mL of carbon disulfide, CS_2 (density = 1.261 g/cm^3), to produce a 0.116 m solution?
(A) 4.84 g (B) 6.32 g (C) 4.17 g (D) 11.71 g

54. If a solution of acetic acid (CH_3COOH) has a pH of 3.00, what is its concentration? Ka of acetic acid = 1.74×10^{-5}
(A) 0.0057 M (B) 0.057 M (C) 0.57 M (D) 5.70 M

55. The indicator methyl red is red in a solution of NaH_2PO_4. Which of the following equations is consistent with this observation?

(A) $H_2PO_4^- + H_2O \rightleftharpoons H_3PO_4 + OH^-$
(B) $H_2PO_4^- + H_2O \rightleftharpoons HPO_4^{2-} + H_3O^+$
(C) $HPO_4^{2-} + H_2O \rightleftharpoons PO_4^{3-} + H_3O^+$
(D) $HPO_4^{2-} + H_2O \rightleftharpoons H_2PO_4^- + OH^-$

56. A nickel electrode can undergo oxidation to Ni^{2+} ion as follows:

$Ni\ (s) \rightarrow Ni^{2+}\ (aq) + 2e^-\quad E^0_{red} = -0.28$ V

$2H_2O(l) \rightarrow 4H^+\ (aq) + O_2(g) + 4e^-\quad E^0_{red} = 1.23$ V

What will happen during the electrolysis of concentrated aqueous solution of $NiSO_4$ using Ni electrodes?

(I)Nickel will deposit at the cathode.
(II)Nickel will dissolve at the anode.
(III)Oxygen will be released at the anode.
(IV)Nickel will deposit at the anode.
(A) I only (B) I,II (C) I,III (D) II, IV

57. Which of the following is **NOT** true about the photoelectric effect?
(A) Most metals require ultraviolet light to emit electrons.
(B) A bright light causes more electrons to be emitted than a weak light.
(C) Higher frequency light emits electrons with higher kinetic energy
(D) A bright light causes less electrons to be emitted than a weak light.

58. Which of the following statements is correct about nitrosyl chloride (NOCl)?
(A) It has a bent or angular geometry with N a central atom.
(B) It has a bent or angular geometry with O a central atom.
(C) It has a trigonal planar geometry with N a central atom.
(D) It has a trigonal planar geometry with O a central atom.

59. The minimum energy required for an effective collision is called_____.
(A) potential energy
(B) activation energy
(C) free energy
(D) kinetic energy

60. A sample of solid ammonium carbamate is heated in a closed container at 298 K and allowed to reach equilibrium.

$$NH_4CO_2NH_2\ (s) \rightleftharpoons 2\ NH_3\ (g) + CO_2\ (g)$$

If the total pressure of the system is 0.114 atm, what is the value of equilibrium constant, Kp?
(A) 1.29×10^{-3}
(B) 3.80×10^{-4}
(C) 7.60×10^{-3}
(D) 2.19×10^{-4}

61. During esterfication of carboxylic acid with alcohol which bond of carboxylic acid undergoes cleavage?
(A) C – C
(B) C = O
(C) C – O
(D) O – H

62. If 49 grams of H_2SO_4 react with 80.0 grams of NaOH, how much reactant will be left over after the reaction is complete?
(A) 24.5 g H_2SO_4
(B) 20.0 g NaOH
(C) 40.0 g NaOH
(D) 60.0 g NaOH

63. What is the change in internal energy of a system that releases 12.4 J of heat and does 4.2 J of work on the surroundings
(A) 16.6 J
(B) 8.2 J
(C) -16.6 J
(D) -8.2 J

64. Which one of the following is true?
(A) Entropy increases when a liquid freezes at its melting point.
(B) For spontaneous process $\Delta S > 0$.
(C) For a spontaneous process $\Delta G > 0$.
(D) Entropy of the pure crystalline solid is zero at 0°C.

65. Which of the following has the same number of significant figures as the number 1.00310?
(A) 100 B) 1×10^6 (C) 199.791 (D) 5.119

66. When an electron in a hydrogen atom makes the transition from the n = 4 state to the n = 2 state, blue light with a wavelength of 434 nm is emitted. Which of the following expressions gives the energy released by the transition?

(A) $\frac{(6.63 X 10^{-34})(3.00X10^{8})}{(4.34 X10^{-7})}$ joules (C) $\frac{(6.63 X 10^{-34})(4.34X10^{-7})}{(3.00 X10^{8})}$ joules

(B) $\frac{(6.63 X 10^{-34})}{(4.34 X10^{-7})(3.00X10^{8})}$ joules (D) $\frac{(4.34X10^{-7})}{(6.63 X 10^{-34})(3.00 X10^{8})}$ joules

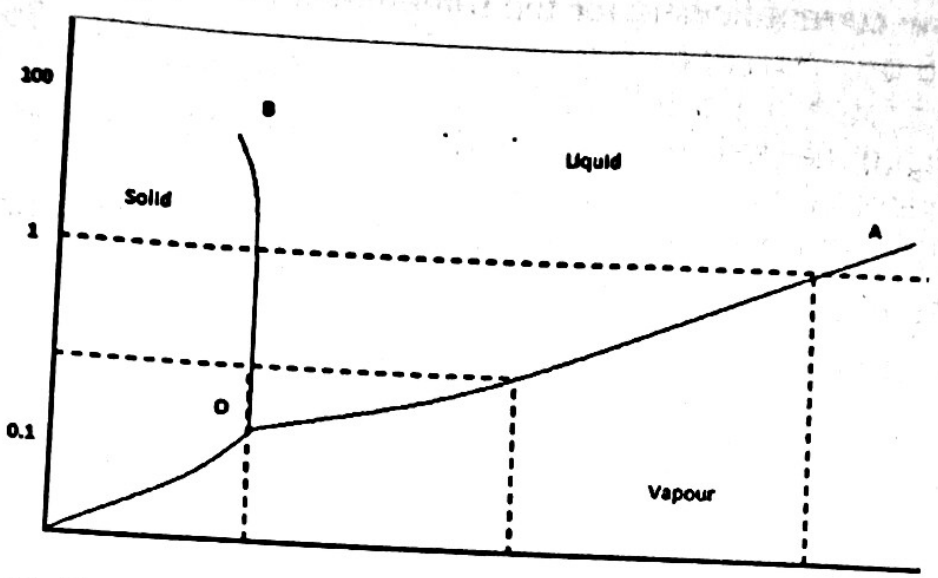
67. Arrange the following molecules in the order of increasing stability.
(A) $N_2^+ < N_2 < N_2^- < N_2^{2-}$ (C) $N_2^{2-} < N_2^- < N_2 < N_2^+$
(B) $N_2^{2-} < N_2^- = N_2^+ < N_2$ (D) $N_2 < N_2^+ = N_2^- < N_2^{2-}$

68. The reaction below takes place with all of the reactants and products in the gaseous phase. Which of the following is true of the relative rates of disappearance the reactants and appearance of the products?

$$2\ NOCl \rightarrow 2\ NO + Cl_2$$

(A) NO appears at twice the rate that NOCl disappears.
(B) Cl_2 appears at the same rate that NOCl disappears.
(C) NO appears at half the rate that NOCl disappears.
(D) NO appears at the same rate that NOCl disappears.

69. In the Figure shown below, what does O denote?



(A) Melting point
(B) Triple point
(C) Boiling point
(D) Vaporization point

70. Given the following unbalanced equation

$KMnO_4 + KI + H_2SO_4 \rightarrow K_2SO_4 + MnSO_4 + I_2 + H_2O$

How many grams of $KMnO_4$ are needed to make 250 mL of 0.20 N solution?

(A) 3.95 g (B) 3.16 g (C) 2.98 g (D) 1.58 g

71. Consider the following equilibria:

(I) $HCO_3^- + H_2O \rightleftharpoons H_2CO_3 + OH^-$

(II) $NH_4^+ + H_2O \rightleftharpoons H_3O^+ + NH_3$

(III) $HSO_3^- + H_3O^+ \rightleftharpoons H_2O + H_2SO_3$

In which of the equilibrium (equilibria) does water act as a Brønsted-Lowry base?

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

72. A certain current produces 0.50 g of hydrogen gas in 2.0 hrs. What is the amount of copper librated from a solution of copper sulfate by the same current flowing for the same time?
(A) 31.8 g (B) 63.6 g (C) 15.9 g (D) 6.36 g

73. For which of the following half-cells is the reduction potential E independent of the pH of the solution?
(A) $[Cr_2O_7]^{2-} + 14H^+ + 6e^- \rightleftharpoons 2Cr^{3+} + 7H_2O$
(B) $H_2O_2 + 2H^+ + 2e^- \rightleftharpoons 2H_2O$
(C) $[NO_3]^- + H_2O + 2e^- \rightleftharpoons [NO_2]^- + 2[OH]^-$
(D) $Co^{2+} + 2e^- \rightleftharpoons Co$

74. What is the basis for the Scientific Method?
(A) To formulate a research problem, test the hypothesis under carefully controlled conditions that challenge the hypothesis
(B) To test hypotheses and if they are disproved, they should be abandoned completely.
(C) To test hypotheses in conditions that are favourable to their success.
(D) To formulate a research problem and disprove the hypothesis.

75. Which of the following molecules has the largest dipole moment?
(A) CO (B) HCN (C) HCl (D) HF

76. In three different experiments the following results were obtained for the reaction A → products: $[A]_o$ = 1.00 M, $t_{1/2}$ = 50 min; $[A]_o$ = 2.00 M, $t_{1/2}$ = 25 min; $[A]_o$ = 0.50 M, $t_{1/2}$ = 100 min. What is the value of the rate constant for this reaction?
(A) 0.010 L mol^{-1} min^{-1} (C) 0.030 L mol^{-1} min^{-1}
(B) 0.020 L mol^{-1} min^{-1} (D) 0.040 L mol^{-1} min^{-1}

77. Which of the following compounds is the *least* soluble in water?
(A) $(NH_4)_2CO_3$ (B) $BaCO_3$ (C) $Fe(NO_3)_3$ D) $Na_3(PO_4)$

78. What is the freezing point of a solution of 250 g of $CaCl_2$ in 1.0 kg of water? (K_f for H_2O = 1.86 kg/mol)
(A) – 1.3 °C (B) – 6.5 °C (C)– 9.0 °C (D)– 13 °C

79. A solution of 10.0 mL of 0.050 M nitrous acid (HNO_2; pK_a = 3.34) is titrated with 0.050 M KOH. What is the pH of the solution after 10 mL KOH has been added ?
(A) 3.34 (B) 6.68 (C) 10.02 (D) 13.36

80. Which of the following metals cannot be electroplated on to the surface of another metal using an aqueous electrolyte?
$E^0 (Ni^{2+}/Ni)$ = -0.28 V; $E^0 (Cu^{2+}/Cu)$ = 0.34 V,
$E^0 (Mg^{2+}/Mg)$ = -2.37 V; $E^0 (Ag^{+}/Ag)$ = 0.80 V

(A) Ni (B) Cu (C) Mg (D) Ag

THE END