

NATIONAL EDUCATIONAL ASSESMENT AND EXAMINATIONS AGENCY (NEAEA)  
ETHIOPIAN UNIVERSITY ENTRANCE EXAMINATION (EUEE)  
CHEMISTRY EXAMINATION 2007

BOOKLET CODE: 00

NUMBER OF ITEMS:

SUBJECT CODE: 00

TIME ALLOWED: 00

**PHYSICAL CONSTANTS:**

Gas constant,  $R = 8.314 \text{ J mol}^{-1} \text{ K}^{-1} = 0.0821 \text{ L-atom mol}^{-1} \text{ K}^{-1}$

Avogadro's number =  $6.023 \times 10^{23} \text{ mol}^{-1}$

Plank's constant,  $h = 6.626 \times 10^{-34} \text{ Js}^{-1}$

Speed of light,  $c \approx 3.0 \times 10^8 \text{ ms}^{-1}$

Faraday's constant ( $F$ )  $\approx 96,500 \text{ Cmol}^{-1}$

**SI Units and Conversion Factors**

$1 \text{ \AA} = 10^{-10} \text{ m}$

$1 \text{ L-atm} = 101.3 \text{ J}$

**1. According to valence bond theory. Which orbitals on bromine atoms overlap in the formation of the bond in  $\text{Br}_2$ ?**

- A. 3s
- B. 3P
- C. 4s
- D. 4P

**2. The type of compound that is most likely to contain a covalent bond is one that is**

- A. A solid metal
- B. Composed of only non-metals
- C. Composed of a metal from the far left and a non-metal from far right of the periodic table
- D. Held together by the electrostatic forces between oppositely charged ions.

**3. The first step of the scientific method involves**

- A. Forming a hypothesis
- B. Making observations.
- C. Performing an experiment.
- D. Predicting the result of an experiment

**4. The process of solute particles being surrounded by solvent particles is known as**

- A. Saturation
- B. Agglomeration
- C. Solvation
- D. Dehydration

**5. Which one of the following represents an acceptable possible set of quantum numbers (in the order  $n$ ,  $l$ ,  $m_l$ ,  $m_s$ ) for an electron in an atom?**

- A. 2, 1, 0, 0
- B. 2, 0, 2, +1/2
- C. 2, 1, -1, 1/2
- D. 2, 0, 1, -1/2

**6. Of the three types of radioactivity characterized by Rutherford, which of the following are particles?**

- A.  $\gamma$  - rays
- B.  $\beta$  - rays
- C.  $\alpha$  - rays and  $\beta$  - rays
- D.  $\alpha$  - rays,  $\beta$  - rays, and  $\gamma$  - rays

**7. Which kind of energy is converted in a galvanic cell?**

- A. Chemical energy is converted into electrical energy.
- B. Chemical energy is converted to heat.
- C. Chemical energy is obtained from heat.
- D. Electrical energy is converted into chemical energy.

**8. The conversion of nitrogen gas to nitrates by bacteria is called**

- A. Nitrification
- B. Nitrogen fixation
- C. Excretion
- D. Denitrification

**9. According to the Arrhenius concept, an acid is a substance that**

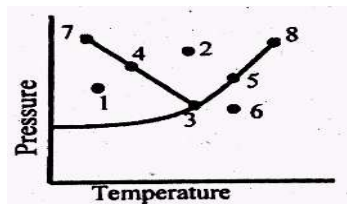
- A. Is capable of donating one or more  $H^+$  to any solvent.
- B. Causes an increase in the concentration of  $H^+$  in aqueous solutions.
- C. Can accept a pair of electrons to form a coordinate covalent bond.
- D. Reacts with the solvent to form the cation formed by auto ionization of that solvent.

**10. A system which can exchange both matter and energy with its surroundings is said to be a/an**

- A. Isolated system
- B. Open system
- C. Ideal system

D. Closed system

11. At which point can only the solid and liquid phases coexist in the phase diagram of water given below?



A. 3

B. 4

C. 5

D. 8

12. What type of solute-solvent interaction should be the most important in a solution of iodine in carbon tetrachloride?

A. London forces

B. Ionic bonding

C. Ion-dipole forces

D. Dipole-dipole forces

13. The distance between two carbon atoms in a diamond is 154 pm. What is the distance between the carbon atoms in millimetres?

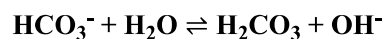
A.  $7.7 \times 10^{-5}$

B.  $7.7 \times 10^{-7}$

C.  $1.54 \times 10^{-7}$

D.  $1.54 \times 10^{-9}$

14. For the acid-base equilibrium.



The Bronsted- Lowry acids are

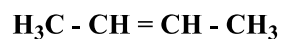
A.  $\text{H}_2\text{O}$  and  $\text{OH}^-$

B.  $\text{HCO}_3^-$  and  $\text{OH}^-$

C.  $\text{H}_2\text{O}$  and  $\text{H}_2\text{CO}_3$

D.  $\text{HCO}_3^-$  and  $\text{H}_2\text{CO}_3$

15. How many sigma and Pi bonds are present in the following molecule?



A.  $8\sigma$  bonds and  $1\pi$  bond

B.  $8\sigma$  bonds and  $2\pi$  bonds

C.  $10\sigma$  bonds and  $2\pi$  bond

D.  $11\sigma$  bonds and  $1\pi$  bond

16. How many orbital are there in an atom with  $n = 4$ ?

- A. 2
- B. 8
- C. 16
- D. 25

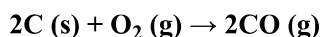
**17. The most abundant metal on the surface of the earth is**

- A. Fe
- B. Al
- C. Ca
- D. Na

**18. Which of the following is correct?**

- A.  $1\text{L} = 1\text{dm}^3$
- B.  $1\text{L} = 10\text{dm}^3$
- C.  $10\text{L} = 1\text{cm}^3$
- D.  $1\text{L} = 0.1\text{dm}^3$

**19. The enthalpy of combustion of solid carbon to form carbon dioxide is  $393.5\text{kJ/mol}$  carbon and the enthalpy of combustion of carbon monoxide to form carbon dioxide is  $-283.3\text{kJ/mol}$  CO. what will be the enthalpy change.  $\Delta H$  for the reaction?**

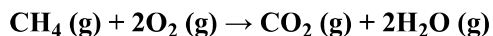


- A.  $-503.7\text{kJ/mol}$
- B.   $-220.8\text{kJ/mol}$
- C.  $+172.9\text{kJ/mol}$
- D.  $+1354.0\text{kJ/mol}$

**20. The decreasing order of electrochemical characteristics of some metals is given as:  $\text{Mg} > \text{Al} > \text{Zn} > \text{Cu} > \text{Ag}$ . What will happen if a copper spoon is used to stir a solution of aluminium nitrate  $(\text{Al}(\text{NO}_3)_3)$  ?**

- A. There is no reaction
- B. The solution becomes blue
- C. The spoon will get coated with aluminium
- D. An alloy of copper and aluminium is formed.

**21. What hybridization change does the carbon atom undergo in the combustion of methane?**



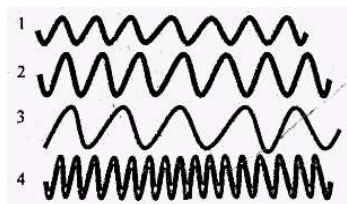
- A.  $\text{Sp} \rightarrow ?\text{sp}^2$
- B.  $\text{Sp}^2 \rightarrow \text{sp}^3$
- C.  $\text{Sp}^3 \rightarrow \text{sp}$
- D.  $\text{Sp}^2 \rightarrow \text{sp}$

**22. Which of the following ionic compounds has the greatest lattice energy?**

- A. LiF

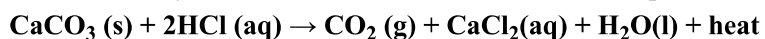
- B. LiCl  
 C. LiBr  
 D. Lil

**23. Consider the three electromagnetic waves shown below**  
**Which of the electromagnetic waves has the highest frequency?**



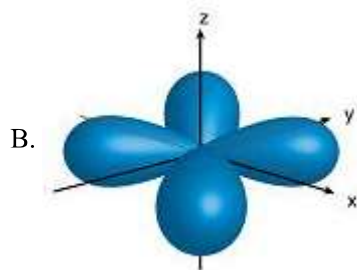
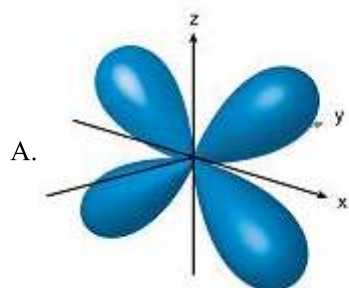
- A. 1  
 B. 2  
 C. 3  
 D. 4

**24. Considering the reaction below, in which of the following will the effect of concentration and temperature simultaneously cause an increase in the rate at which products are formed?**

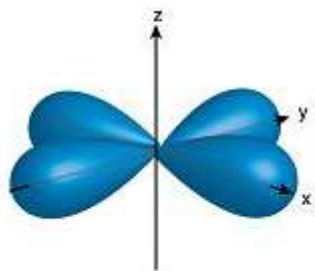


- A. Decrease [HCl] and decrease temperature.  
 B. Increase [HCl] and increase temperature.  
 C. Increase [HCl] and decrease temperature.  
 D. Grind up the CaCO<sub>3</sub> and decrease temperature.

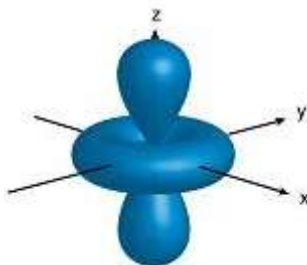
**25. Which of the following diagrams describes the electron density in the d<sub>xy</sub> orbital?**



C.



D.



26. The wave number of an electromagnetic radiation is  $1 \times 10^5 \text{cm}^{-1}$ . The frequency of the radiation would be

- A.  $3 \times 10^8 \text{s}^{-1}$   
 B.  $3 \times 10^6 \text{s}^{-1}$   
 C.  $3 \times 10^{10} \text{s}^{-1}$   
 D.  $3 \times 10^{15} \text{s}^{-1}$

27. For the gas phase reaction

$\text{N}_2 + \text{O}_2 \rightleftharpoons 2\text{NO}$   $\Delta H = +180 \text{KJmol}^{-1}$  the value of K changes with the

- A. Change in pressure  
 B. Introduction of NO  
 C. Change in concentration of  $\text{N}_2$   
 D. Change in temperature.

28. In the reaction ( $2\text{SO}_2 + \text{O}_2 \rightleftharpoons 2\text{SO}_3$ ,  $K_{\text{eq}} = 100$ ). What will be the concentration of  $\text{O}_2$ , if the concentration of  $\text{SO}_2$  is the same as that of  $\text{SO}_3$ ?

- A.  $[\text{O}_2] = [\text{SO}_2]$   
 B.  $[\text{O}_2] = 0.01 \text{M}$   
 C.  $[\text{O}_2] = 100 \text{M}$   
 D.  $[\text{O}_2] = 0.1 \text{M}$

29. The decomposition of nitrosyl chloride was studied as



The following data were obtained where

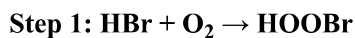
$$\text{Rate} = -\Delta[\text{NOCl}]/\Delta t$$

$[\text{NOCl}]_0$ (molecules/ $\text{cm}^3$ )	Initial Rate (molecules/ $\text{cm}^3 \cdot \text{s}$ )
$3.0 \times 10^{16}$	$5.98 \times 10^4$
$2.0 \times 10^{16}$	$2.66 \times 10^4$
$1.0 \times 10^{16}$	$6.64 \times 10^3$
$4.0 \times 10^{16}$	$1.66 \times 10^5$

What is the rate law in the above decomposition?

- A.  $r = k[\text{NOCl}]^2$
- B.  $r = K[\text{NOCl}]$
- C.  $r = K[\text{NOCl}][\text{NO}]$
- D.  $r = k[\text{NOCl}][\text{Cl}]$

**30. Considering the mechanism for a reaction below, which of the following statements is correct?**



- A.  $\text{Br}_2$  is a reactant
- B.  $\text{HBr}$  is a product
- C.  $\text{HOBr}$  is a catalyst
- D.  $\text{HOBr}$  is a reaction intermediate

**31. The acid-base indicator bromocresol green is a weak acid. The yellow acid and blue base forms of the indicator are present in equal concentrations in a solution when the PH is 4.68. What is the PKa of bromocresol green?**

- A. 4.48
- B. 4.68
- C. 5.68
- D. 6.68

**32. If  $\text{NaNO}_2$  is added to a solution of  $\text{HNO}_2$ , which of the following statements is true?**

- A. The PH of the solution will increase
- B. The PH of the solution will decrease
- C. The PH will remain the same
- D. The equilibrium will not be affected

**33. A lipid is any substance of biochemical origin that is**

- A. Soluble in both water and non-polar solvents.
- B. Insoluble in both water and non-polar solvents.
- C. Soluble in water but insoluble in non-polar solvents.
- D. Soluble in non-polar solvents and insoluble in water.

**34. A solution in an electrolytic cell contains  $\text{Cu}^{2+}$  ( $E^0 = 0.34\text{V}$ ),  $\text{Ag}^+$  ( $E^0 = 0.80\text{V}$ ), and  $\text{Zn}^{2+}$  ( $E^0 = 0.76\text{V}$ ). If the voltage is initially very low and slowly increased, in which order will the metals be plated out on to the cathode?**

- A.  $\text{Zn}^{2+} > \text{Cu}^{2+} > \text{Ag}^+$
- B.  $\text{Cu}^{2+} > \text{Zn}^{2+} > \text{Ag}^+$
- C.  $\text{Ag}^+ > \text{Zn}^{2+} > \text{Cu}^{2+}$
- D.  $\text{Ag}^+ > \text{Cu}^{2+} > \text{Zn}^{2+}$

**35. What is the concentration of sodium chloride in water needed in order to produce an aqueous solution that has an identical osmotic pressure (Isotonic) with blood ( $\pi = 7.70$  atm at  $25^{\circ}\text{C}$ )?**

- A.  $0.003\text{mol L}^{-1}$
- B.  $0.006\text{mol L}^{-1}$
- C.  $0.1575\text{mol L}^{-1}$
- D.  $0.315\text{mol L}^{-1}$

**36. What is the molality of a 5g hydrogen peroxide ( $\text{H}_2\text{O}_2$ ) in 100mL solution that is used for hair bleaching?**

- A. 0.015M
- B. 0.15M
- C. 1.5M
- D. 3M

**37. The maximum number of electrons in P-orbital with  $n = 6$ ,  $ml = 0$  is**

- A. 2
- B. 6
- C. 16
- D. 14

**38. How many unpaired electrons are there in the Lewis structure of a  $\text{N}^{3-}$  ion?**

- A. 0
- B. 1
- C. 2
- D. 3

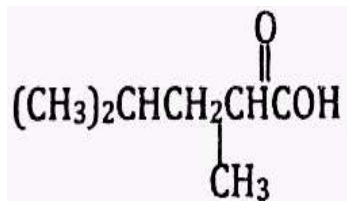
**39. Which one of the following metals is extracted by thermal reduction process?**

- A. Al
- B. Cu
- C. Fe
- D. Mg

**40. Which of the following transitions will emit maximum energy in the hydrogen atom?**

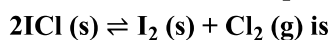
- A.  $n = 4 \rightarrow n = 3$
- B.  $n = 4 \rightarrow n = 2$
- C.  $n = 2 \rightarrow n = 1$
- D.  $n = 3 \rightarrow n = 2$

**41. what is the IUPAC name for the compound**



- A. 2, 4-dimethylpentanoic acid  
 B. 1, 1, 3-trimethylbutanoic acid  
 C. 1-hydroxy-2, 4-dimethyl pentanone  
 D. 2-carboxyisohexane

**42. The connectional equilibrium constant expression ( $K_c$ ) for the system**



- A.  $[\text{I}_2][\text{Cl}_2]/[\text{ICl}]^2$   
 B.  $[\text{I}_2][\text{Cl}_2]/2[\text{ICl}]$   
 C.  $[\text{Cl}_2]$   
 D.  $([\text{I}_2] + [\text{Cl}_2])/2[\text{ICl}]$

**43. Which of the following compound does NOT follow the octet rule?**

- A.  $\text{CS}_2$   
 B.  $\text{PBr}_3$   
 C.  $\text{IBr}$   
 D.  $\text{BrF}_5$

**44. Chemically, fats and oils are**

- A. Acids  
 B. Alcohols  
 C. Esters  
 D. Alkenes

**45. The reaction  $\text{A} + 3\text{B} = 2\text{C} + \text{D}$  is first order with respect to reactant A and second order with respect to reactant B. if the concentration of A is doubled and the concentration of B is halved, the rate of the reaction would by a factor of .**

- A. Increases, 2  
 B. Decreases, 2  
 C. Increases, 4  
 D. Decreases, 4

**46. The molecular geometry of  $\text{H}_3\text{O}^+$  ion is**

- A. Linear  
 B. Tetrahedral  
 C. Bent  
 D. Trigonal pyramidal

**47. If a student wishes to prepare approximately 100 milliliters of an aqueous solution of 6M HCl using 12M HCl, which procedure is correct?**

- A. Adding 50mL of 12M HCl to 50ml of water while stirring the mixture steadily.
- B. Adding 25ml of 12M HCl to 50ml of water while stirring the mixture steadily.
- C. Adding 50ml of water to 50ml of 12M HCl while stirring the mixture steadily.
- D. Adding 25ml of water to 50ml of 12M HCl while stirring the mixture steadily.

**48. What is the final concentration of  $\text{Cl}^-$  ion when 250ml of 0.20M  $\text{CaCl}_2$  solution is mixed with 250ml of 0.4M KCl solution? (Assume additive volumes)**

- A. 1.6M
- B. 0.4M
- C. 0.20M
- D. 0.60M

**49. Which of the following is used in the reaction called saponification?**

- A. Strong base
- B. Strong acid
- C. Hydrogen
- D. Nickel

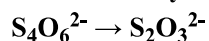
**50. The concentration of nitrate ion in a solution that contains 0.900M aluminium nitrate is**

- A. 0.9
- B. 0.45
- C. 0.3
- D. 2.7

**51. Electrolysis of dilute aqueous NaCl solution was carried out by passing 10 milliampere current. The time required to liberate 0.01 mol of  $\text{H}_2$  gas at the cathode is**

- A.  $9.65 \times 10^4 \text{s}$
- B.  $19.3 \times 10^4 \text{s}$
- C.  $28.95 \times 10^4 \text{s}$
- D.  $38.6 \times 10^4 \text{s}$

**52. How many electrons will appear when the following half-reaction is balanced?**



- A. 3
- B. 2
- C. 4
- D. 1

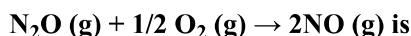
**53.  $\text{PK}_a$  values of three acids x, y and z are 4.5, 3.5 and 6.5, respectively. Which of the following represents the correct order of acid strength?**

- A.  $x > y > z$
- B.  $z > x > y$
- C.  $y > x > z$
- D.  $z > y > x$

**54. Standard electrode potential for  $\text{Sn}^{4+}/\text{Sn}^{2+}$  couple is +0.15V and that for the  $\text{Cr}^{3+}/\text{Cr}$  couple is -0.74V. These two couples in their standard state are connected to make a spontaneous reaction. The cell potential will be**

- A. +1.83V
- B. +1.19V
- C. +0.89V
- D. +0.18V

**55. The enthalpies of formation of gaseous  $\text{N}_2\text{O}$  and  $\text{NO}$  at 298K are 82 and 90KJ/mol, respectively. The enthalpy change for the reaction**



- A. -8KJ
- B. 98KJ
- C. -74KJ
- D. 8KJ

**56. The following data were collected at the end point of a titration performed to find the molarity of an HCl solution.**

**Volume of acid (HCl) used = 14.4ml**

**Volume of base (NaOH) used = 22.4ml**

**Molarity of standard base (NaOH) = 0.20M**

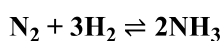
**On the basis of the above data, what is the molarity of the acid solution?**

- A. 1.6M
- B. 0.64M
- C. 0.31M
- D. 0.13M

**57. The hybridization of the central atom in the  $\text{XeF}_4$  molecule is**

- A.  $\text{Sp}^2$
- B.  $\text{Sp}^3$
- C.  $\text{Sp}^3\text{d}$
- D.  $\text{Sp}^3\text{d}^2$

**58. For the reaction.**



**The rate of disappearance of  $\text{H}_2$  is  $0.01 \text{ mol L}^{-1} \text{ min}^{-1}$ . The rate of appearance of  $\text{NH}_3$  would be**

- A.  $0.01 \text{ mol L}^{-1} \text{ min}^{-1}$
- B.  $0.02 \text{ mol L}^{-1} \text{ min}^{-1}$

- C.  $0.007 \text{ mol L}^{-1} \text{ min}^{-1}$   
 D.  $0.002 \text{ mol L}^{-1} \text{ min}^{-1}$

**59. Bakelite is obtained from phenol by reacting with**

- A. HCHO  
 B.  $(\text{CH}_2\text{OH})_2$   
 C.  $\text{CH}_3\text{CHO}$   
 D.  $\text{CH}_3\text{COCH}_3$

**60. In which one of the following numbers are all of the zeros significant?**

- A. 100.09009  
 B. 0.14329  
 C. 0.1  
 D. 0.003002

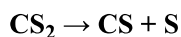
**61. An aqueous solution contains 0.100M NaOH at  $25.0^\circ\text{C}$ . The PH of the solution is?**

- A. 0.1  
 B. 1  
 C. 7  
 D. 13

**62. The solubility of oxygen gas in water at  $25^\circ\text{C}$  and 1.0 atm pressure of oxygen is 0.41g/L. the solubility of oxygen in water at 3.0 atm and  $25^\circ\text{C}$  is g/L.**

- A. 0.014  
 B. 0.31  
 C. 0.041  
 D. 0.123

**63. The decomposition of carbon disulphide,  $\text{CS}_2$ , to carbon mono sulphide, CS, and sulphur is first order with  $K = 2.8 \times 10^{-7} \text{ s}^{-1}$  at  $1000^\circ\text{C}$ . What is the half-life of the reaction below at  $1000^\circ\text{C}$ ?**



- A.  $5.0 \times 10^7 \text{ s}$   
 B.  $4.7 \times 10^{-6} \text{ s}$   
 C.  $3.8 \times 10^5 \text{ s}$   
 D.  $2.5 \times 10^6$

**64. The  $\text{PK}_a$  of a weak monoprotic acid is 4.8. What should be the ratio of [Acid]/[Salt] of a buffer, if PH = 5.8 is required?**

- A. 0.1  
 B. 1  
 C. 2  
 D. 10

**65. The dissolution of water in octane (C<sub>8</sub>H<sub>18</sub>) is prevented by**

- A. Dipole-dipole attraction between octane molecules.
- B. Hydrogen bonding between water molecules.
- C. London dispersion forces between octane molecules.
- D. Repulsion between like charged water and octane molecules.

**66. At 445<sup>0</sup>C, K<sub>c</sub> for the following reaction is 0.020.**



**A mixture of H<sub>2</sub>, I<sub>2</sub>, and HI in a vessel at 445<sup>0</sup>C has the following concentrations: [HI] = 2.0M, [H<sub>2</sub>] = 0.5M and [I<sub>2</sub>] = 0.10M, which one of the following statements concerning the reaction quotient, Q<sub>c</sub>, is true for the above system?**

- A. Q<sub>c</sub> is less than K<sub>c</sub>; more HI will be produced.
- B. Q<sub>c</sub> is greater than K<sub>c</sub>; more HI will be produced.
- C. Q<sub>c</sub> is less than K<sub>c</sub>; more H<sub>2</sub> and I<sub>2</sub> will be produced.
- D. Q<sub>c</sub> is greater than K<sub>c</sub>; more H<sub>2</sub> and I<sub>2</sub> will be produced.

**67. Natural rubber is a polymer of**

- A. Butadiene
- B. Isoprene
- C. Neoprene
- D. Styrene

**68. Which of the following statements is true?**

- A. All forms of electromagnetic radiation are visible.
- B. Radio waves have shorter wavelength than visible light.
- C. Ultraviolet light has longer wavelengths than visible light.
- D. The frequency of radiation increases as the wavelength decreases.

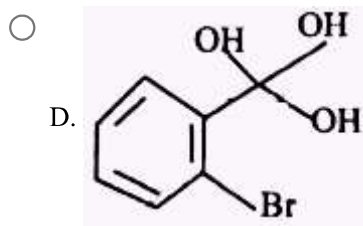
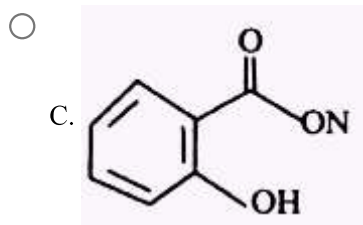
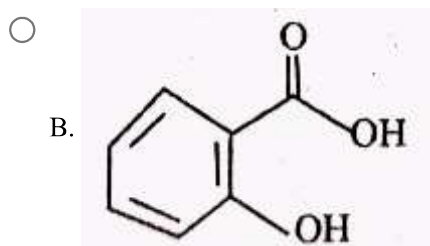
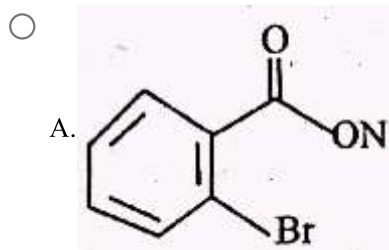
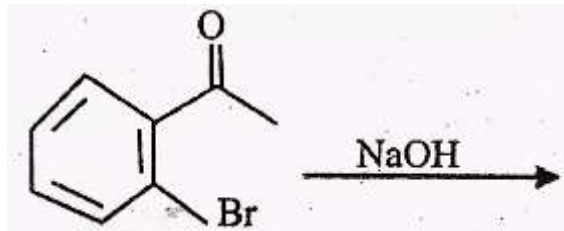
**69. If the enthalpy change for a certain reaction A → B is -2KJ at 300K, what would be the entropy change in the surroundings?**

- A. 6.67J/K
- B. 40J/K
- C. -3.6 x 10<sup>6</sup> J/K
- D. 3.6 x 10<sup>6</sup> J/K

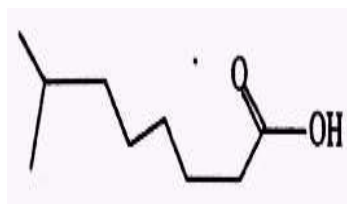
**70. During the electrolysis of an aqueous solution of copper sulphate using platinum electrodes, the reaction takes place at the anode is**

- A. Cu<sup>2+</sup> + 2e<sup>-</sup> → Cu
- B. Cu → Cu<sup>2+</sup> + 2e<sup>-</sup>
- C. 2H<sub>2</sub>O → 4H<sup>+</sup> + O<sub>2</sub> + 4e<sup>-</sup>
- D. 4H<sup>+</sup> + O<sub>2</sub> + 4e<sup>-</sup> → H<sub>2</sub>O

71. What is the major product of the reaction?



72. Which of the following is an acceptable IUPAC name for the organic compound shown below?



- A. Octanoic acid
- B. 7-methyl heptanoic acid
- C.  $\delta$  - methyl heptanoic acid
- D. 7 - methyl octanoic acid

73. Which of the following molecules has a dipole moment?

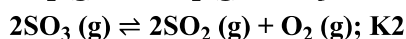
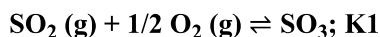
- A. XeF<sub>2</sub>
- B. IF<sub>3</sub>

- C.  $\text{BF}_3$   
 D.  $\text{SF}_5$

74. Which of the following describes the balanced molecular equation when perchloric acids is mixed with solid iron (III) hydroxide?

- A.  $\text{HCl}_4 (\text{aq}) + \text{Fe}(\text{OH})_3 (\text{s}) \rightarrow \text{H}_2\text{O} (\text{l}) + \text{FeClO}_4 (\text{aq})$   
 B.  $3\text{HClO}_4 (\text{aq}) + \text{Fe}(\text{OH})_3 (\text{s}) \rightarrow 3\text{H}_2\text{O} (\text{l}) + \text{Fe}(\text{ClO}_4)_3 (\text{aq})$   
 C.  $3\text{HOClO}_2 (\text{aq}) + \text{Fe}(\text{OH})_3 (\text{s}) \rightarrow 3\text{H}_2\text{O} (\text{l}) + \text{Fe}(\text{ClO}_3)_3 (\text{aq})$   
 D.  $\text{HOClO}_2 (\text{aq}) + \text{Fe}(\text{OH})_3 (\text{s}) \rightarrow \text{H}_2\text{O} (\text{l}) + \text{Fe}(\text{ClO}_3) (\text{aq})$

75. At 298 K the following two gaseous equilibrium involving  $\text{SO}_2$ ,  $\text{SO}_3$  and  $\text{O}_2$  are established.



Which of the following equilibrium expression is correct?

- A.  $K_1 = K_2$   
 B.  $K_2 = K_1^2$   
 C.  $K_2 = 1/K_1^2$   
 D.  $K_2 = 1/K_1$

76. A compound is formed by the combination of V and X as follows. What is empirical formula for the compound?



- A. VX  
 B.  $\text{V}_2\text{X}$   
 C.  $\text{V}_3\text{X}$   
 D.  $\text{VX}_2$

77.  $\Delta H$  for solid to liquid transitions for compound A is 2.73Kcal/mol and for compound B is 3.0 Kcal/mol. The melting point for compound A is  $0^\circ\text{C}$  and the melting point for compound B is  $30^\circ\text{C}$ . the entropy changes  $\Delta S_A$  and  $\Delta S_B$  at the two transition temperatures are related as

- A.  $\Delta S_A = \Delta S_B$   
 B.  $\Delta S_A < \Delta S_B$   
 C.  $\Delta S_B < \Delta S_A$   
 D.  $\Delta S_A = 300\Delta S_B/273$

78. Which of the following metals forms a volatile compound that is taken as an advantage for its extraction?

- A. CO  
 B. Fe  
 C. Ni  
 D. W

**79. A 0.1M solution of HCl is dissolved in water. What species of ions are present at equilibrium, and what will be their equilibrium concentrations?**

- A.  $[\text{H}_3\text{O}^+] = 0.1\text{M}$   $[\text{OH}^-] = 10^{-13}\text{M}$   $[\text{Cl}^-] = 0.1\text{M}$
- B.  $[\text{H}_3\text{O}^+] = 0.1\text{M}$   $[\text{OH}^-] = 0.1\text{M}$   $[\text{Cl}^-] = 0.1\text{M}$
- C.  $[\text{H}_3\text{O}^+] = 0.1\text{M}$   $[\text{OH}^-] = 10^{-13}\text{M}$   $[\text{Cl}^-] = 0\text{M}$
- D.  $[\text{H}_3\text{O}^+] = 10^{-13}\text{M}$   $[\text{Cl}^-] = 0.1\text{M}$   $[\text{OH}^-] = 0.1\text{M}$

**80 The following bases and their conjugate acids (as the chlorides) are available in the laboratory:  $\text{NH}_3$  ( $K_b = 1.8 \times 10^{-5}$ ),  $\text{C}_6\text{H}_5\text{NCH}_3\text{CH}_2\text{NH}_2$  ( $K_b = 6.4 \times 10^{-4}$ ) and  $\text{CH}_3\text{NH}_2$  ( $K_b = 4.4 \times 10^{-4}$ ). Which of these acid-base pairs are the best to prepare a buffer solution having a PH of about 9?**

- A.  $\text{NH}_3$  + conjugate acid
- B.  $\text{C}_6\text{H}_5\text{N}$  + conjugate acid
- C.  $\text{CH}_3\text{NH}_2$  + conjugate acid
- D.  $\text{CH}_3\text{CH}_2\text{NH}_2$  + conjugate acid

Submit