

SBOA School & Junior College, Chennai

Half – Yearly Examination 2016 – 2017

Chemistry

Code – A

Std: XI

Time: 3hrs

Marks: 70

General Instructions:

Question No. 1 to 5 carry 1 mark each.

Question No. 6 to 10 carry 2 marks each.

Question No. 11 to 22 carry 3 marks each.

Question No. 23 carries 4 marks each.

Question No. 24 to 26 carry 5 marks each.

1. What are Zeolites? Mention one of its application.
2. State Hess's Law.
3. Write the position isomers of the organic compound with molecular formula C_3H_8O .
4. Define mole fraction.
5. Why do real gases deviate from ideal behaviour?
6. How is slaked lime obtained? How does it react with chlorine? (Give equation).
7. Define: a) adiabatic process, b) enthalpy.
8. Account for:
 - a) Dipole moment of PCl_5 is zero.
 - b) Ionisation enthalpy of oxygen is less than nitrogen.
9. Calculate the de Broglie wavelength of an electron moving with 1% the speed of light.

(or)

When electromagnetic radiation of wavelength 3500\AA falls on a metal surface, electrons are emitted with a kinetic energy of $1.91 \times 10^5 \text{ J mol}^{-1}$. Calculate the threshold frequency to remove an electron.

10. (a) State Planck's Quantum theory.
(b) Write the possible n, l and m value for an electron in $3p$ - orbital.
11. Differentiate extensive and intensive properties with example.
State 1st Law of Thermodynamics and mention its limitation.
12. For a reaction $N_{2(g)} + 3H_{2(g)} \longrightarrow 2NH_{3(g)}$ enthalpy of reaction at constant pressure is -93.0 KJ . Calculate the internal energy change at 300K .

(or)

$\Delta_f H^\circ$ of $CO_{2(g)}$, $H_2O_{(l)}$ are -395 and -269.4 KJ / mol respectively.

Calculate $\Delta_f H^\circ$ of glucose if ΔH of combustion of glucose is -2816.6 KJ / mol .

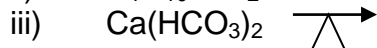
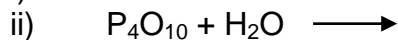
13. a) Account for the following facts.
 - (i) Eclipsed ethane is less stable than staggered ethane.
 - (ii) Isobutane has lower boiling point than n – butane.b) Draw the geometrical isomers of pent – 2 – ene.
14. a) Give the reactions involved during the detection of iodine in an organic compound.
b) How is glycerol purified?
c) Define inductive effect.



15. a) Give IUPAC name for $CH_2=CH-CH_2-CH-CH_3$.
b) Draw the structure of 4 – bromo aniline.
c) Why is $(CH_3)_3C^\circ$ more than CH_3CH° ?
16. Draw the structure of diborane and write the hybrid state of boron in diborane.
How are silicones prepared? (Give Equation).
17. a) 10g of urea (H_2NCONH_2) is dissolved in 0.5kg of water. Calculate the molality.
b) A substance has empirical formula CH . What is its molecular formula if its vapour density is 39 .
c) How many atoms of oxygen is present in 360g of glucose.
18. a) Calculate the bond order of nitrogen molecule and predict its magnetic behaviour.

c) Draw the structure of $\text{H}_2\text{O}_{(g)}$ and predict the hybrid state of the central atom.

19. Complete and balance:



20. a) States Charles Law. Give its mathematical expression.

b) What will be the total pressure of the gaseous mixture when 0.5 l of hydrogen at 0.8 bar and 2 l of oxygen at 0.7 bar are introduced in a 1 l vessel at 27°C ?

21. a) Describe Castner – Kellner process for the manufacture of caustic soda.

b) Name the alkali metal which shows diagonal relationship with magnesium. Why?

22. a) Define electro negativity and explain its trend in the periodic table.

b) Mention any two limitations of Mendeleev's periodic table.

23. Buffer solutions play a important role in many industrial and biological process.

Many biological fluids such as human blood have a definite pH (7.26 – 7.42) which is maintained by buffer action of H_2CO_3 , HCO_3^- and CO_2 . If we take chat and spicy food often it would lead to hyperacidity. Hari is fond of paanipuri and takes it very often. He has problem of acidity. His mother advises him to drink plenty of water and avoid unhealthy food.

a) What is a buffer solution?

b) Can water act as antacid? What are the values not possessed by Hari?

c) What type of buffer is $\text{H}_2\text{CO}_3 / \text{HCO}_3^-$? How does this buffer system help to maintain pH of blood?

24. a) Give balanced equation for the following.

(i) Action of heat on borax.

(ii) Diborane is hydrolysed by water.

(iii) Steam is passed over hot coke.

b) Give reason:

(i) Atomic radii of Ga is lesser than Al.

(ii) CO_2 is a gas whereas SiO_2 is a solid.

(or)

a) Give balanced equation for the following:

(i) Action of heat on boric acid.

(ii) Sodium borohydride is oxidized by iodine.

(iii) Silica is treated with HF.

b) Give reason:

(i) CO is poisonous.

(ii) B – F bond length in BF_3 is shorter (130pm) than in BF_4^- (143pm).

25. a) Calculate the pH of 0.02M formic acid.

b) The solubility product of calcium sulphate is 9.1×10^{-6} . Find the solubility of Calcium sulphate.

c) Define common ion effect and illustrate with an example.

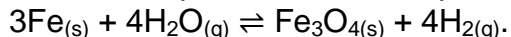
(or)

a) Calculate the degree of dissociation of 0.05M solution of acetic acid if K_a is 1.8×10^{-5} . Also calculate the hydronium ion concentration.

b) State Lechatlier's Principle.

c) For the reaction $2\text{NH}_3(g) \rightleftharpoons \text{N}_2(g) + 3\text{H}_2(g)$, K_P at 400K is 41. Calculate K_P for the formation of 1 mole of ammonia.

d) Write the expression for the equilibrium constant for the following reaction



26. a) Write short notes on:

(i) Kharasch effect

(ii) Friedel crafts acylation

(iii) Cyclic polymerization

b) How will you convert

(i) Propanoic acid to butane.

(ii) Phenol to Chloro benzene.

(or)

a) Illustrate the following with example.

(i) Decarboxylation

(ii) Addition reaction

(iii) Wurtz reaction

b) How will you convert

(i) But – 2 – ene to ethanol.

(ii) Ethyl bromide to ethylene glycol.

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Answer all the questions.

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1. Define the term molarity.
2. What are dipole induced dipole forces? Give an example.
3. What happens when boric acid is heated? (write only the equation).
4. Write the structural formula of 2 – Chloro 4 – Methyl anisole.
5. Define enthalpy. Give its mathematical expression.
6. If Water Vapour is assumed to be perfect gas, molar enthalpy change at 1 bar and 100°C is 41 KJ / mol. Calculate the internal energy when 1 mole of water is vapourised at 1 bar pressure and 100°C.
7. What happens when:
 - a) Lithium nitrate is heated.
 - b) Quick lime reacts with phosphorus pent oxide.
8. a) Find the energy of each photon which has a wavelength of 0.5 \AA .
b) If the velocity of the electron in Bohr's orbit is $2.19 \times 10^6 \text{ ms}^{-1}$.
Calculate the de-Broglie wavelength associated with it.
(or)
 - a) Define: Work Function.
 - b) Write the electronic configuration of Fe^{2+} . ($z = 26$).
9. Explain why?
 - (i) 'O' has lower Δ_{H} than N and F.
 - (ii) BeH_2 molecule has a zero dipole moment although Be – H bonds are polar.
10. a) State Heisenberg uncertainty principle.
b) Using s, p, d, f notations describe the orbital with the following quantum numbers. (i) $n = 4, \ell = 1$; (ii) $n = 2, \ell = 2$.
11. a) Define electron gain enthalpy. How do they vary in a group?
b) Which of the following species will have the largest and smallest size?
 $\text{Mg}, \text{Mg}^{2+}, \text{Al}^{3+}, \text{Al}$.
c) Write the general electronic configuration of d – block elements.
12. Calculate:
 - a) The mass of CO_2 produced when 2 moles of carbon are burnt in 16g of oxygen.
 - b) Predict the shape of (i) NH_4^+ , (ii) AsF_5 .

c) Use MO Theory, to explain why Be_2 molecule does not exist.

13. a) Calculate the number of atoms present in 64g of Sulphur (S_8).

b) Calculate the molarity of NaOH solution prepared by dissolving 4g of it in enough water to form 250ml of the solution.

c) Distinguish between a sigma and a pi bond?

14. a) Define: (i) Isobaric Process, (ii) Standard Enthalpy of Formation.

b) Given: $\text{N}_{2(g)} + 3\text{H}_{2(g)} \longrightarrow 2\text{NH}_{3(g)}$, $\Delta_r H^\circ = -92.4 \text{ KJ / mole}$. What is the standard enthalpy of formation of NH_3 gas.

15. a) Write the electrodic reactions in the manufacture of caustic soda.

b) Be and Mg do not impart colour to the flame. Why?

16. Give reason:

a) Boric acid is considered as a weak acid.

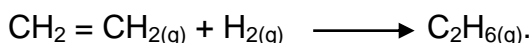
b) Diamond is covalent, yet it has high melting point.

c) BCl_3 is more stable than TlCl_3 .

17. Calculate the enthalpy of formation of ethyl alcohol if enthalpy of combustion of ethyl alcohol is -1380.7 kJ / mol and enthalpy of formation of CO_2 and water are -394.5 kJ / mole and -286.6 KJ / mole respectively.

(or)

Calculate the enthalpy of the following reaction:



The bond energies of C – H, C – C, C = C and H – H are 414, 347, 615 and 435 KJ / mole respectively.

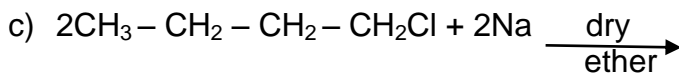
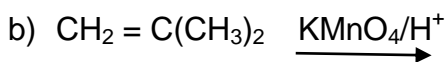
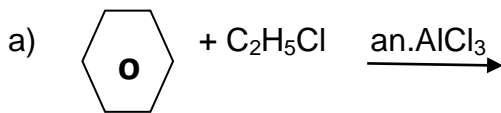
18. a) Drops of a liquid assume spherical shape. Why?

b) State Boyle's Law. How is the law verified graphically.

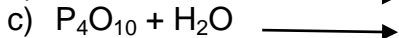
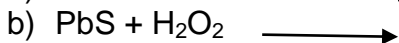
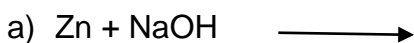
19. a) What are carbocations? Give an example of a 3° carbocation.

b) How will you detect the presence of halogen present in chloro benzene (Give only the equation and observation).

20. Write the structure and IUPAC names of products obtained from following reactions:



21. Complete the following:



22. a) 0.4422g of an organic compound was Kjeldalised and NH_3 evolved was absorbed in 50ml of semimolar H_2SO_4 . The residual acid required 131ml of 0.25M NaOH. Determine the percentage of nitrogen in the compound.

b) Write the IUPAC name of: $\text{CH}_3 - \underset{\text{COOH}}{\text{CH}} - \text{CH}_2 - \text{CH}_3$

23. Our teeth are coated with an enamel of an insoluble substance known as hydroxyapatite, $\text{Ca}_3(\text{PO}_4)_2 \cdot (\text{OH})$. It exists in equilibrium with its ions. If we do not brush our teeth after eating sweets, it causes tooth decay.
- (i) What causes tooth decay? (ii) Name and state the principle involved in it.
- (ii) What values do you learn from this.
24. a) The solubility of $\text{Sr}(\text{OH})_2$ at 298K is 19.23g / l of solution. Calculate the concentration of strontium and hydroxyl ions and the p^{H} of the solution. [Atomic mass of Sr = 87.6].
- b) Write the conjugate acid of (i) CH_3COO^- (ii) $\text{S}_2\text{O}_8^{2-}$
- c) The value of K_{C} for the formation of water vapour at 500K is 2.4×10^{47} . Calculate the K_{C} for the decomposition of water vapour at 500K.
- (or)
- a) 2 moles of PCl_5 were heated to 327°C in a closed 2l vessel and when equilibrium was achieved, PCl_5 was found to be 40% dissociated into PCl_3 and Cl_2 . Calculate the equilibrium constants K_{P} and K_{C} for this reaction.
- b) The concentration of hydrogen ion in a sample of soft drink is $3.8 \times 10^{-3}\text{M}$. What is its p^{H} ?
- c) Write the expression of K_{SP} for calcium phosphate.
25. a) What happens when:
- (i) Borax is heated strongly. (ii) BF_3 is reacted with ammonia.
- (ii) Silicon dioxide is treated with hydrogen fluoride.
- b) Explain the structure of Diborane.
- (or)
- a) Explain the preparation of silicones. Mention its uses.
- b) Write reactions to justify amphoteric nature of aluminium.
- c) Give one method for industrial preparation of carbon monoxide.
26. a) Draw cis and trans structures of 2 – methylpent – 2 ene. Which isomer will have higher boiling point and why?
- b) How would you convert:
- (i) Benzene into Benzene Sulphonic acid. (ii) Phenol to Benzene.
- (iii) But – 1 – yne to Butan – 2 – one.
- (or)
- a) What happens when:
- (i) Sodium benzoate is decarboxylated.
- (ii) 1, 2 – Dibromo butane undergoes dehalogenation.
- (iii) Propene undergoes polymerization.
- b) Give one test to distinguish between ethane and ethyne.
- c) The following system is not aromatic. Why?

