**CHEMISTRY Answer Key (Set -A)**

**Date:** 14/9  
**Class:** XII

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Why is GaAs used to prepare transistor chips? Average valence of 4, act as semiconductors</td>
</tr>
<tr>
<td>2</td>
<td>When acidulated water (dil. H₂SO₄ solution) is electrolysed, will the pH of the solution be affected? Justify. No, H⁺ ions consumed are produced at anode again (0.5+0.5)</td>
</tr>
<tr>
<td>3</td>
<td>Give the monomer of the polymer used to coat utensils rendering them with non-stick property. CF₂=CF₂ tetrafloroethene</td>
</tr>
<tr>
<td>4</td>
<td>Out of Valium and Ranitidine, which drug is to be prescribed to a person suffering from agitation and state of mental disturbance? What are such drugs called. Valium, tranquilizers (0.5+0.5)</td>
</tr>
<tr>
<td>5</td>
<td>Using example describe <strong>Gabriel phthalimide synthesis.</strong></td>
</tr>
</tbody>
</table>
| 6 | Following reaction takes place in one step:-  

\[
2\text{NO}(g) + \text{O}_2(g) \rightarrow 2\text{NO}_2(g)
\]

How will the rate of above reaction change if the volume of the reaction vessel is diminished to 1/3 of its original volume? What will be the change in the order of the reaction.  
Rate = \(k[\text{NO}]^2[\text{O}_2]\) (0.5)  
If \(V=1/3\) \(V_o\) then \(M = 3M_o\) (0.5)  
Rate₂ = \(k[3\text{NO}]^2[3\text{O}_2] = 27 k[\text{NO}]^2[\text{O}_2] = 27\) Rate. (0.5)  
Order remains unaffected (0.5) | 2 |
| 7 | Consider the following molecules:  

a) The rate of reaction of hydrolysis of B with dil. NaOH, is much higher than that of A. Explain  
b) Give the product of reaction when both A and B are subjected to Bromine gas in presence of anhy. FeCl₃  
a) benzyl cation formed is stable due to resonance. (1)  
b) A = no rxn (0.5)  
B = o or p product (0.5)  
| 2 |
| 8 | a) Convert Acetaldehyde to Formaldehyde in minimum number of steps. | 2 |
b) Which reagent is used to distinguish between Formic acid and Benzoic acid? Tolles reagent

9. Aqueous solutions of K₄[Fe(CN)₆] and FeCl₃ mix together to produce a blue colored complex of Iron hexacyanoferrate(II). Both the solutions are separated by a Semi Permeable Membrane as shown in the following diagram:

a) Which side will the formation of blue color take place? Also give reason.
   No side, only solvent particles move not solute

b) What is such a phenomenon known as and why does it occur?
   Osmosis, diff in vapour pressures on both sides

10. A compound C₃H₈O exist in two positional isomers, both of which differ in their acidic properties and reactivity towards a mixture of conc. HCl and anhy. ZnCl₂. Identify both the isomers and explain the observations.
    Propanol and Propan-2-ol (0.5 each)
    Propanol is more acidic (0.5)
    Propan-2-ol gives a white turbidity with conc. HCl and anhy. ZnCl₂ (0.5)

    OR

The manner in which NaOH reacts with Phenol is different from its reaction with Propanol. What does this difference indicate? Also explain the reason for the same.

Phenol is more acidic than Propanol hence it reacts with NaOH (1)

11. Lithium metal is used in the production of synthetic vitamin A and as a reducing agent. It exists with a density of 0.53g/cm³ and edge length of 3.5 Å. Calculate the radius of Lithium atom. [Li=6.94u]

\[
d = \frac{Z \times M}{a^3 \times N_A} \quad \text{OR} \quad Z = \frac{d \times a^3 \times N_A}{M} \quad (0.5)
\]

\[
Z = 0.53 \times (3.5 \times 10^{-8})^3 \times 6.023 \times 10^{23} / 6.94 = 2, \text{ BCC lattice} \quad (0.5 + 1)
\]

\[
r = (\sqrt{3}/4) \times a = 1.48 \text{ Å} \quad (1)
\]

12. a) How are agonists different from antagonists? Mimic the natural messenger, block the messengers (½ + ½)
   b) What is Aspartame? Give any one drawback of using this compound.
artificial sweetener, unstable at cooking temperatures (½ + ½)

(c) Give the compound added to soaps to impart antiseptic properties—Bithional

**OR**

(a) Give the components of Dettol, which provide its antiseptic properties—Chloroxylenol, Terpineol (½+¼)

(b) Give a drug that can act as both analgesic and antipyretic—paracetamol

(c) Differentiate between broad spectrum antibiotics and narrow spectrum antibiotics—Broad spectrum effective against gram positive and gram negative bacteria (½)

Narrow spectrum effective against gram positive/gram negative (½)

13

**a)** In the given graph of \( \lambda_m \) Vs \( \sqrt{c} \), identify the nature of electrolyte B. Give an example strong electrolyte, any one example (0.5+0.5)

**b)** The curve for A shows a steep rise with dilution, while that of B shows a gradual increase. Explain dilution increases the dissociation, interionic associations decrease (0.5+0.5)

**c)** In which case it is not possible to obtain value of limiting molar conductance directly.

A(1)

14

**a)** Arrange the compounds in increasing order of reactivity towards nucleophilic addition reactions:

Benzaldehyde, 4-Methylbenzaldehyde, Acetophenone, 4-Nitrobenzaldehyde

A B C D

C < B < A < D (1)

**b)** What happens when Ethanal reacts with Phenylmagnesiumchloride, followed by hydrolysis?

**c)** Why does ethanol give positive iodoform test although it does not contain methyl ketone group?

Ethanol oxidises to ethanal with NaOI, which has a methyl ketone group. (1)

15

Give reasons for the statements:

a) Aryl diazonium salts are more stable than their alkyl counterparts.

Aryl diazonium shows resonance (1)

b) Aniline does not undergo Friedal Craft’s reaction.

Salt formation takes place between aniline and lewis acid used. (1)

**c)** Dimethylamine is more basic than Trimethylamine in aqueous medium.

Inductive effect and hydration stabilisation of cation formed, these factors are balanced in case of dimethylamine.

16

29.25g of NaCl is added to 250g of water to prepare an aqueous solution. It causes an elevation in boiling point of water by 1.88 K. \([K_b \text{water} = 0.52 \text{ K Kg mol}^{-1}] \). Calculate its Van’t Hoff factor.

What does it indicate? Also calculate \( \alpha \)

\[
\Delta T_b = i \times K_b \times \text{molality (0.5)}
\]

\[
i = 1.8 > 1, \text{ hence dissociation takes place (0.5)}
\]

\[
\alpha = i^{-1/n-1} = 1.8^{-1/2-1} = 0.8 = 80% \quad (1)
\]
17. a) 0.3605g of a metal is deposited on the electrode by passing 1.2 amp of current for 15 minutes through its salt solution. The atomic weight of the metal is 96u. What is the valency of the metal?

\[
\text{Weight of metal deposited} = M \times I \times t / n \times 96500
\]

\[
n = \frac{96 \times 1.2 \times 15 \times 60}{0.3605 \times 96500}
\]

\[= 3\]

b) Give the relationship between conc of ions \([\text{M}^{n+}]\) and variation in electrode potential \(E^\circ\) red.

Nernst equation \(\text{(1)}\)

18. Compounds P and Q react as per the equation: \(2P + 2Q \rightarrow R\)

The following data was obtained practically by varying the concentrations of reactants and studying the formation of products:

<table>
<thead>
<tr>
<th>EXPERIMENT</th>
<th>Initial conc. of [P] mol/L</th>
<th>Initial conc. of [Q] mol/L</th>
<th>Initial rate of formation of [R] mol/L/sec</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.30</td>
<td>0.30</td>
<td>0.10</td>
</tr>
<tr>
<td>2</td>
<td>0.30</td>
<td>0.60</td>
<td>0.40</td>
</tr>
<tr>
<td>3</td>
<td>0.60</td>
<td>0.30</td>
<td>0.20</td>
</tr>
</tbody>
</table>

Calculate Rate constant \(K\) and give the Rate Law expression.

Exp 1 \(\text{Rate} = k[0.3]^x[0.3]^y = 0.1\)

Exp 2 \(\text{Rate} = k[0.3]^x[0.6]^y = 0.4\) \(\text{(0.5)}\)

Exp 3 \(\text{Rate} = k[0.6]^x[0.3]^y = 0.2\)

Exp 2/Exp 1 \(\text{[2]}^y = 4\) hence \(y = 2\) \(\text{(0.5)}\)

Exp 3/Exp 1 \(\text{[2]}^x = 2\) hence \(x = 1\) \(\text{(0.5)}\)

Hence Rate expression \(\text{Rate} = k [P]^x[Q]^y\) \(\text{(0.5)}\)

Rate constant \(k = 0.1/0.3 \times (0.3)^2\) \(\text{(0.5)}\)

\(K = 3.7\) \(\text{(0.5)}\)

19. a) In the process of anaerobic fermentation of sucrose, using zymase carbon dioxide, energy and \(X\) are produced. Give the steps of the mechanism when \(X\) is heated with conc. Sulphuric acid at 700K.

\(X =\) Ethanol \(\text{(0.5)}\)

\[
\text{Step 1: Protonation of the hydroxyl group (fast equilibrium).}
\]

\[
\text{Step 2: Ionization to a carbocation (slow; rate limiting).}
\]

\[
\text{Step 3: Deprotonation to give the alkene (fast).}
\]

\[= \text{Phenol and methyl iodide (0.5 + 0.5)}\]

b) Give the products when Anisole is cleaved with HI.
20 Answer the following-
   a) Describe the type of stoichiometric defect shown by ionic solid if there is a large difference in their sizes? What is the effect of this defect on the density of solid.
   Frenkel defect (0.5) description (1), density is unaffected (0.5)
   b) When does the defect shown in adjoining figure X, occur? Also give its characteristic feature
   alkali metal halide heated in presence of metal vapours (0.5) makes the compound colored (0.5)

21 One half cell in a voltaic cell is constructed from Ag wire dipped in AgNO₃ solution of unknown concentration. The other half cell consists of Zn in 1 M solution of Zn(NO₃)₂. A voltage of 1.48 volts is measured for this cell. Calculate the concentration of silver nitrate solution.  
\[
\frac{E^{\circ}_{\text{Zn}^{2+}/\text{Zn}}}{E^{\circ}_{\text{Ag}^+/\text{Ag}}} = -0.76 \text{V}, \quad \frac{E^{\circ}_{\text{Ag}^+/\text{Ag}}}{E^{\circ}_{\text{Zn}^{2+}/\text{Zn}}} = +0.80 \text{V} \]
\[
\text{Zn} + 2\text{Ag}^+ \rightarrow \text{Zn}^{2+} + 2\text{Ag} \quad (0.5)
\]
\[
E_{\text{cell}} = E_{\text{cell}}^\circ - 0.059/n \log \left( \frac{[\text{Zn}^{2+}]}{[\text{Ag}^+]^2} \right) \quad (0.5)
\]
\[
1.48 = (0.80 + 0.76) - 0.059/2 \log \frac{[\text{Zn}^{2+}]}{[\text{Ag}^+]^2} \quad (0.5)
\]
\[
1.48 = 1.56 - 0.029 \log \frac{[\text{Zn}^{2+}]}{[\text{Ag}^+]^2} \quad (0.5)
\]
\[
\log \frac{[\text{Ag}^+]^2} = 0.08/0.029 \quad (0.5)
\]
\[
\log [\text{Ag}^+] = -1.356 \quad (1)
\]
\[
\text{[Ag}^+] = \text{antilog} (-1.356) = 4.4 \times 10^{-2} \text{M} \quad (1)
\]

22 Give complete reactions for the following when:
   a) n-butyl chloride is treated with alcoholic KOH.
   CH₃CH₂CH₂CH₂Cl + alc KOH \rightarrow CH₃CH₂CH=CH₂

   b) A bromo compound on reaction with KCN followed by full hydrolysis produces propanoic acid.
   CH₃CH₂Br + KCN \rightarrow CH₃CH₂CN \rightarrow CH₃CH₂COOH

   c) Styrene molecule is subjected to reductive ozonolysis.
   C₆H₅CH=CH₂ + O₃ Zn /H₂O \rightarrow C₆H₅CHO + HCHO

23 a) Give the structure of the polymer PLA if its monomer- lactic acid has the structure:
   \[
   \text{H}_2\text{C} \quad \text{O} \quad \text{O} \quad \text{C} \quad \text{C} \quad \text{O} \quad \text{CH}_3
   \]
   \[
   \text{poly(2-hydroxypropanoic acid)} \quad \text{poly(lactic acid), PLA} \quad (1)
   \]
   b) Give any one more example of biodegradable polymer with any one of its use.
   PHBV, orthopedic devices (0.5 each)

   c) What values are shown by companies /Markets who emphasize on use of biodegradable bags? env sensitive, caring (0.5 each)

   d) Give the monomers of Nylon 6,6.
   Hexamethylene diamine and adipic acid (0.5 each)

24 An organic compound A with molecular formula C₇H₈, on oxidation with chromyl chloride in the presence of CCl₄ gives a compound B which gives a positive tollen’s test. The compound B on treatment with NaOH followed by acid hydrolysis gives two products C and D. C on oxidation gives B which on further oxidation gives D. The compound D on distillation with sodalime gives a hydrocarbon E. Below 60° C, conc. nitric acid reacts with E in the presence of conc. sulphuric acid forming F. Give the name and type of reaction shown when B is treated
with Zn-Hg/conc. HCl to give A. Identify all variables and give the reactions involved
Show which type of Resonance effect operates in F, using structures.
A = toluene  B= benzaldehyde  C= benzyl alcohol  D= benzoic acid E=benzene
F= nitrobenzene
Reduction reaction, Clemmensen

OR

An organic compound P (C₈H₈O₂) on reaction with Na metal, evolves hydrogen gas. Also it
gives a yellow precipitate with I₂/NaOH on heating along with formation of salt of Q. Q reacts
with SOCl₂ to give R. P does not show tollen’s test but reacts with hydroxylamine to give an
oxime S. Give the name and type of reaction when P reacts with hydrazine followed by boiling
with KOH in ethylene glycol as solvent, to produce T. Q on reduction with diborane gives 2-
Hydroxymethylphenol. What will be the observation when P is added to ferric chloride
solution? Identify all variables and give the reactions involved.

P= 2-Hydroxyacetophenone  Q= 2=Hydroxybenzoic acid  R= 2- hydroxybenzoyl chloride

S=  
T= 2-Ethylphenol

Reduction reaction, Wolf kischner

Violet color is obtained  (0.5 each)  (1.5 mk for reactions )

25  a)  Give reasons for the following :
   (i) Scuba divers carry oxygen tanks diluted with Helium.
   To avoid bends formation as He passes easily through capillaries and blood vessels. (1)

   (ii) When mercuric iodide is added to an aqueous solution of KI, the freezing point is raised.
   Complex formation takes place, no of ions decrease. (1)

   (iii) Sugar dissolves faster in hot water as compared to cold water.
   Endothermic dissolution (1)

b) At 300K, the vapour pressure of an ideal solution containing one mole of A and three moles
of B is 550mm Hg. At the same temperature if one mole of B is added more to the solution, the
vapour pressure of the solution increases by 10mmHg. Calculate the vapour pressure of A and
B in their respective pure state.

\[
P_T = P_A^0 \chi_A + P_B^0 \chi_B \\
550 = P_A^0 (1/1+3) + P_B^0 (3/1+3) \quad (0.5) \\
P_A^0 + 3P_B^0 =2200 \\
560 = P_A^0 (1/1+4) + P_B^0 (4/1+4) \quad (0.5) \\
P_A^0 + 4P_B^0 =2800 \\
P_A^0 = 400 \text{ mm} \quad P_B^0 = 600 \text{ mm} \quad (0.5 \text{ each})
\]

OR

a) The following graphs showing variation in vapour pressure is obtained when liquids M, N
and P are mixed.

**M and N**

Give probable examples for M, N, and P. Using these examples explain the above variations in graphs.
- M = acetone
- N = carbon disulphide
- P = chloroform (any other example also)  
  M decreases the intermolecular forces of M, vap press inc
  N forms H-bond with M, intermolecular forces inc, vap press decreases.}

1.5 exp

**b)** The vapour pressure of ethanol and methanol are 44.5 mmHg and 88.7 mmHg respectively. An ideal solution is formed at the same temperature by mixing 60g of ethanol and 40 g of methanol. Calculate the vapour pressure of the solution.

\[ n_{\text{ethanol}} = \frac{60}{46} = 1.304 \]
\[ n_{\text{methanol}} = \frac{40}{32} = 1.250 \]

\[ \chi_{\text{ethanol}} = 0.51 \quad \chi_{\text{methanol}} = 0.49 \]

\[ P_T = 44.5 \times 0.51 + 88.7 \times 0.49 = 66.15 \text{ mm} \]

**a)** Why does the value of X decrease to Y, as shown in above graph? Give reason for the same.

Note: this ques is common to both choices

Alternate pathway with lower energy barrier is given by catalyst. (1+1)

b) In a first order reaction a substance is half decomposed in 20 min. How much time will it take for 3/4 decomposition.

\[ K = \frac{0.693}{20} = 0.034 \]

\[ T = \frac{2.303}{K} \log \frac{[A_0]}{[A_t]} \]

\[ \frac{1}{4}[A_0] = [A_t] \]

\[ T = \frac{2.303}{0.034} \log 4 = 40 \text{ min} \]

**c)** Graphically represent the variation of rate constant with temperature.
b) Graphically represent the variation of rate of reaction with concentration for first order reaction.

\[
\frac{\log K_2}{\log K_1} = \frac{E_a}{2.303R} \left[ \frac{1}{T_1} - \frac{1}{T_2} \right] \quad (0.5)
\]

\[
\log 2 = (E_a / 2.303 \times 8.314) \times (10/300 \times 310) \quad (1)
\]

\[
E_a = 53598.5 \text{ J/mol} = 53.598 \text{ KJ/mol} \quad (0.5)
\]

c) The rate of a particular reaction doubles when temperature changes from 27 to 37°C. Calculate the energy of activation.

\[
\begin{align*}
\log \frac{K_2}{K_1} &= \frac{E_a}{2.303R} \left[ \frac{1}{T_1} - \frac{1}{T_2} \right] \\
\log 2 &= (E_a / 2.303 \times 8.314) \times (10/300 \times 310) \\
E_a &= 53598.5 \text{ J/mol} = 53.598 \text{ KJ/mol}
\end{align*}
\]

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**CHEMISTRY (Set -B)**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>1</td>
<td>Why does ZnS conduct electricity when temperature is raised? average valence of 4, semi conductor</td>
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<tr>
<td>3</td>
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<td>Out of Valium and Ranitidine, which drug is to be prescribed to a person suffering from acid reflux? What are such drugs called. Ranitidine, antacid/antihistamine</td>
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<tr>
<td>5</td>
<td>Using example describe Hoffmann Bromamide degradation.</td>
</tr>
<tr>
<td>12</td>
<td>b) What happens when Propanone reacts with Ethyl magnesium chloride, followed by hydrolysis? 2-Methylpropan-2-ol</td>
</tr>
</tbody>
</table>
| 14 | a) Why does salt act as food preservative? releases moisture out of cells  
   b) What is Alitame? Give any one advantage of using this compound. less on calories  
   c) Give the compound added to soaps to impart antiseptic properties. Bithional OR |
| 16 | a) Alkyl diazonium salts immediately decompose to release N2 gas highly unstable, no resonance  
   b) Aniline on nitration produces substantial amounts of meta derivative. Acidic medium causes aniline to protonate giving anilinium ion which is meta directing |
20 Answer the following-
   a) Describe the type of stoichiometric defect shown by ionic solid if there is not much difference in the ionic sizes of cation and anion. What is the effect of this defect on the density of solid?
      Schottky defect, explanation, density decreases
   b) Which type of defect is shown in the figure X? Also give its characteristic feature.
      Metal deficiency defect, conductivity increases, non stoichiometric

22 Give complete reactions for the following when:
   a) n-butyl chloride is treated with aqueous KOH.
   CH₃CH₂CH₂CH₂Cl + aq KOH → CH₃CH₂CH₂CH₂OH
   b) A bromo compound on reaction with AgNO₂ followed by treatment with Fe/ HCl produces propanamine.
   CH₃CH₂CH₂Br + AgNO₂ → CH₃CH₂CH₂NO₂ → CH₃CH₂CH₂NH₂