

அரசு தேர்விலையம் டார்ம், கல்யாண்
45 ஆம் ஆண்டு டார்ம்

QUARTERLY EXAMINATION - 2023

Exam No. _____

Time: 3-00 Hrs.

XII - CHEMISTRY

Marks : 70

PART - I

Note:1) Answer all the questions.

2) Choose the most appropriate answer from the given four alternatives

and write the option code and the corresponding answer. (15x1=15)

- The metal oxide which cannot be reduced to metal by carbon is
a) PbO b) Al₂O₃ c) ZnO d) FeO
- Which of the following reduction is not thermodynamically feasible?
a) Cr₂O₃ + 2Al → Al₂O₃ + 2Cr b) Al₂O₃ + 2Cr → Cr₂O₃ + 2Al
c) 3 TiO₂ + 4Al → 2 Al₂O₃ + 3Ti d) None of these
- Match items in Column-I with the items of Column-II and assign the correct code.**

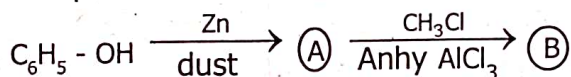
	Column - I		Column - II	
A. Bora Zole	-		1. B(OH) ₃	
B. Borlic acid	-		2. B ₃ N ₃ H ₆	
C. Quartz	-		3. Na ₂ [B ₄ O ₃ (OH) ₄] 8H ₂ O	
D. Borax	-		4. SiO ₂	
	A	B	C	D
<input checked="" type="radio"/> (a)	2	1	4	3
(b)	1	2	4	3
(c)	1	2	3	4
(d)	none of these			
- The basic structural unit of Silicate is
a) (SiO₃)²⁻ b) (SiO₄)²⁻ c) (SiO)⁻ d) (SiO₄)⁴⁻
- Among the following, which is the strongest oxidised agent?
a) Cl₂ b) F₂ c) Br₂ d) I₂
- XeF₆ on complete hydrolysis produces
a) XeOF₄ b) XeO₂F₂ c) XeO₃ d) XeO₂
- The magnetic moment of Mn²⁺ ion is
 a) 5.92 BM b) 2.80 BM c) 8.95 BM d) 3.90 BM
- The vacant space in bcc lattice Unit cell is
a) 48% b) 23% c) 32% d) 26%
- In FCC unit cell of the edge length is $8\sqrt{2}$ pm. The radius of the metal atom is _____ Å
 a) 0.04 b) 0.02 c) 8×10^{-2} d) $\frac{8}{\sqrt{2}}$
- The addition of a catalyst during a chemical reaction alters which of the following
a) Enthalpy b) Activation energy
c) Entropy d) Internal energy
- If 75% of a first order reaction was completed in 60minutes, 50% of the same reaction under the same conditions would be completed on
a) 20 minutes b) 30min c) 35min d) 75 minutes
- Which of the following fluoro-compounds is most likely to behave as a Lewis base?
a) BF₃ b) PF₃ c) CF₄ d) SiF₄
- Which of the following compound can be used as antifreeze in automobile radiators?
a) methanol b) ethanol
c) neopentyl alcohol d) ethane-1,2-diol

14. On reacting with neutral FeCl_3 , Phenol gives
 a) red b) violet c) dark green d) yellow
15. Which one of the following reduces Tollens reagent?
 a) formic acid b) acetic acid
 c) benzophenone d) none of these

PART - II

Note: Answer any 6 questions. Question No.24 is compulsory. (6x2=12)

16. What are the various steps involved in extraction of pure metals from their ores?
17. Write the action of water on diborane?
18. What is inert pair effect?
19. Which is more stable Fe^{+3} or Fe^{+2} . Explain.
20. Define: Unit cell.
21. Define: Rate law.
22. Write the expression for the solubility product of Hg_2Cl_2 .
23. What is formalin? Write its uses?
24. Complete the following reactions?

**PART - III**

Note: Answer any 6 questions. Question No.33 is compulsory. (6x3=18)

25. What is the role of quick lime in the extraction of Iron from its oxide Fe_2O_3 ?
26. Give the uses of Borax.
27. What is the hybridisation of iodine in IF_7 ? Give its structure.
28. Explain why Cr^{+2} is strongly reducing while Mn^{+3} is strongly oxidizing agent.
29. Why ionic crystals are hard and brittle?
30. Write the differences between rate and rate constant of a reaction?
31. Calculate the pH of 0.04M HNO_3 solution.
32. Differentiate Phenol and Ethanol.
33. What is Knoevenagel reaction?

PART - IV

Note: Answer the following questions.

(5x5=25)

34. a) (i) Explain the following terms with suitable examples. (3)
 i) Gangue ii) Slag (2)
 (ii) Give the basic requirement for vapour phase refining. (2)
(OR)
- b) (i) How is boric acid prepared from colemanite? (3)
 (ii) Write the uses of Silicon tetrachloride? (2)
35. a) (i) Illustrate the dehydrating property of sulphuric acid. (3)
 (ii) Write about the reducing property of phosphine. (2)
(OR)
- b) Compare Lanthanoids and actinoids. (5)
36. a) Differentiate crystalline solids and amorphous solids. (5)
(OR)
- b) Derive the integrated rate Law for a first order reaction. (5)
37. a) Derive an expression for Ostwald's dilution Law. (5)
(OR)
- b) Write any three methods of preparing ethers? (5)
38. a) (i) What is Schotten - Baumann reaction? (3)
 (ii) How is nitroglycerine prepared? (2)
(OR)
- b) Explain the mechanism of aldol condensation. (5)

QUARTERLY EXAMINATION 2023

PUDUKOTTAI DT

12TH STANDARD

CHEMISTRY

Question and Answer Key

சிறப்பு உடை கிடைப்பீயார்களா
கல்யாணி, டிபுளட் கோடல்-டி

Gov Hr Sec School
Kallur 622 209 Pudukottai.Dt
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PART I Choose the Correct Answer (Please see Answer in the question Paper marked above)

PART II

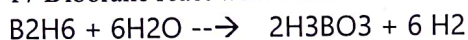
Answer any 6 questions

6x2=12

16. What are the various steps involved in extraction of pure metals from their ores?
Steps involved in extraction of pure metals from their ores are

- (i) Concentration of the ore
- (ii) Extraction of crude metal
- (iii) Refining of crude metal

17 Diborane react with water



18. What is inert pair effect?

❖ As we move down the group in p-block elements the outer ns² electrons become inert and do not involve in chemical combination.

❖ Only np electrons take part in chemical combination.

❖ This is known as inert pair effect

19. Among Fe²⁺ and Fe³⁺ which one is more stable why?

❖ The electronic configuration of Fe²⁺ ⇒ [Ar]3d⁶

❖ The electronic configuration of Fe³⁺ ⇒ [Ar]3d⁵

❖ Fe³⁺ is more stable, since it has half filled orbitals

20. Define unit cell

A Basic repeating the structural unit of crystalline solid is called unit cell.

21. Define Rate Law.

Rate law is the expression which relates the rate, the rate constant and the concentration of the reactants.



$$\text{Rate} = k[A]^x [B]^y$$

22. Write explanation of solubility product of HgCl₂



$$K_{sp} = [Hg_2^{2+}] [Cl^-]^2$$

$$= (s)(2s)^2$$

$$K_{sp} = 4s^3$$

23. What is Formalin write its uses

40% aqueous solution of Formaldehyde is called Formalin

Uses :-

- ❖ Preserving biological specimens
- ❖ It is used for Tanning
- ❖ Production of Bakelite.



PART III

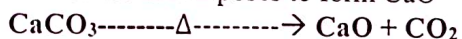
Answer any 6 questions

6x3=18

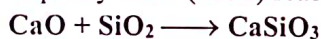
25. What is the role of limestone in the extraction of iron from its oxide Fe_2O_3 ?

Lime stone (CaCO_3) is used as a basic flux

Limestone decomposes to form CaO



Impurity silica (SiO_2) react with CaO form fusible slag calcium silicate.



Flux Gangue Slag

26. Give the uses of Borax.

- ❖ To identify coloured metal ions.
- ❖ Acts as preservative.
- ❖ To manufacture optical and borosilicate glass, enamels.
- ❖ As flux in metallurgy

27. What is the hybridisation of iodine in IF_7 ? Give its structure.

Interhalogen Hybridisation Structure

IF_7 Sp^3d^3 Pentagonalbipyramidal

28. Explain why Cr^{2+} is strongly reducing while Mn^{3+} is strongly oxidizing.

- ❖ E^0 value for Cr^{2+} is negative (-0.41V),
- ❖ If E^0 of a metal is large and negative, the metal is a powerful reducing agent.
- ❖ Where as E^0 Value for Mn^{3+} is positive (+1.57V).
- ❖ On the other hand, Mn^{3+} acts as oxidising agent

29. Why ionic crystals are hard and brittle?

- ❖ The structural units of an ionic crystal are cations and anions.
- ❖ They are bound together by strong electrostatic attractive forces.
- ❖ To maximize the attractive force, cations are surrounded by as many anions as possible.
- ❖ Hence ionic crystals are hard and brittle.

30. Differentiate between rate and rate constant of a reaction.

Sl.No	Rate	Rate constant of a reaction

1	It represents the speed in which thereactants are converted into products at any instant.	It is a proportional constant.
2	It is measured as decrease in the conc. of the reactants or increase in the concentration of products.	It is equal to the rate of reaction, when the concentration of each of the reactants in unity.
3	It dependson the initial concentration of reactants	It does not depend on the initial concentration of reactants.

31.

$$PH = -\log(H^+)$$

$$= -\log(0.04)$$

$$= -\log 4 \times 10^{-2}$$

$$= 2 - \log 4$$

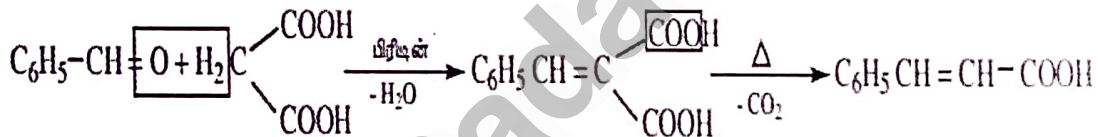
$$= 2 - 0.6021$$

$$= 1.3979$$

32. Difference between Phenol and Alcohol

Test	Phenol	Ethanol
1	With neutral FeCl ₃ Purple colouration	No reaction
2	With Benzene diazonium chloride	To form a red orange dye
3	With NaOH To give sodium phenoxide	No reaction

33 Write a note on Knoevenagel Reaction.



பென்சால்டிஹைட்ரல்

மெலோனிக் அமிலம்

சின்னா மிக் அமிலம்

Benzaldehyde

Malonic acid

Cinnamic acid

PART IV

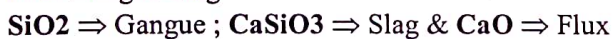
Answer the following

5x5=25

34. i) Explain the following terms with suitable examples. a) Gangue b) slag

❖ **Gangue:** The Rocky Nonmetallic impurity associated with ore.❖ **Slag:** The fusible product formed when flux react with gangue.

Flux Gangue Slag



ii) Give the basic requirements for vapour phase refining.

❖ The metal should form a volatile compound with the reagent.

❖ The volatile compound decomposes to give the pure metal

(or)

ii) Preparation of Colemanite

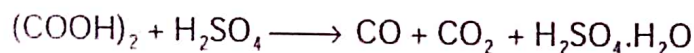
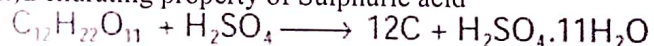


35 a) i) Uses of Silicon tetrachloride

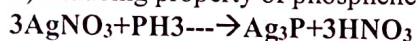
1. used as a conductor

2. used as a silica gel

ii) Dehydrating property of Sulphuric acid



ii) Reducing property of phosphine



or) b.

Compare Lanthanoids and Actinoids

Sl	Lanthanoids	Actinoids
1	Differentiating electrons enter in 4f orbital.	Differentiating electrons enter in 5f orbital.
2	Binding energy of 4f orbitals are higher	Binding energy of 5f orbitals are lower
3	They show less tendency to form complexes.	They show greater tendency to form complexes
4	Most of the lanthanoids are colourless	Most of the actinoids are coloured
5	They do not form oxocations	They do not form oxocations such as UO_2
6	Oxidation states +2, +3 & +4	Oxidation states +3, +4, +5, +6 & +7

36.

i) What are the differences between crystalline and amorphous solids

S no	Crystalline solids	amorphous solids
1	Long range orderly arrangement of constituents.	Short range (or) random arrangement of constituents
2	Definite Shape	Irregular Shape.
3	Anisotropic Nature.	Isotropic Nature.
4	True Solids	Pseudo Solids (or) Super cooled liquids
5	Definite Heat of fusion.	Heat of fusion not definite
6	Have Sharp Melting Point	No Sharp Melting Point.

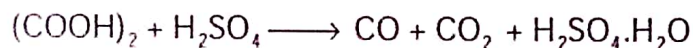
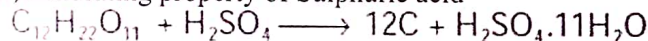


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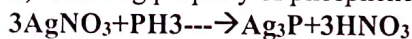
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5	Definite Heat of fusion.	Heat of fusion not definite
6	Have Sharp Melting Point	No Sharp Melting Point.

7	Ex. NaCl, Diamond.	Ex. Rubber, Plastic
---	--------------------	---------------------

or

ii)

Derive integrated rate law for a first order reaction.

$A \rightarrow \text{Product}$

Rate of the reaction = $-dA/dt$

$-d[A]/dt \propto [A]^1$

$-d[A]/dt = K[A]^1$

$-d[A]/A = K \cdot dt$

When time changes from $(t = 0) \Rightarrow (t = t)$

Concentration changes from $[A_0] \Rightarrow [A]$

On Integrating the above equation within these limits

$-d[A]$

$A/[A]$

$[A_0] = K \int_0^t dt$

t
 t_0

$[-\ln[A]] [A_0]$

$[A] = K \int_0^t dt$

$[-\ln[A]] - [-\ln[A_0]] = K [t - 0]$

$Kt = \ln[A_0]/[A]$

$K = 1/t \ln[A_0]/[A] \ln = 2.303 \log K = 2.303 t \log [A_0]/[A]$

37) a) Derive an expression for Oswald's Dilution law

Oswald's dilution law relates the dissociation constant of the weak acid (K_a) with its degree of dissociation (α) and the concentration (C).

Degree of dissociation (α) =

Number of moles dissociation

Total no. of moles

$CH_3COOH \rightleftharpoons H^+ + CH_3COO^-$

Dissociation constant of Acetic acid is

$K_a = \frac{[H^+][CH_3COO^-]}{[CH_3COOH]}$ ---- (1)

Content CH_3COOH H^+ CH_3COO^-

initial number of moles	1 CH_3COOH	0 H^+	0 CH_3COO^-
Number of moles Ionized	α	0	0
umber of moles remaining	$(1 - \alpha)$	α	α
Equilibrium concentration	$C(1 - \alpha)$	$C\alpha$	$C\alpha$

Substitute the value in equation (1)

$$K_a = C\alpha \cdot C\alpha / C(1 - \alpha)$$

$$K_a = C\alpha^2 / (1 - \alpha) \text{---- (2)}$$

When $1 \gg \alpha$ the denominator is neglected so $(1 - \alpha) \approx 1$

$$K_a = C\alpha^2$$

$$\alpha^2 = K_a / C$$

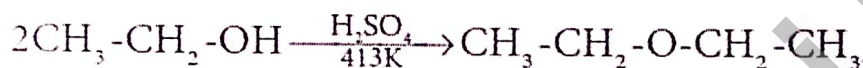
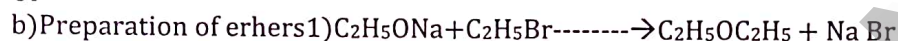
Degree of dissociation $\alpha = K_a / C$

Concentration of acid $[H^+] = C\alpha$

$$= C K_a / C$$

$$[H^+] = K_a C$$

Or



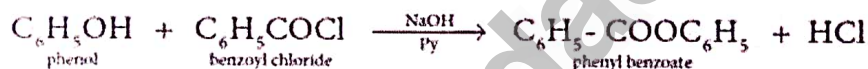
எத்தனால்

டைஎத்தில் ஈதர்

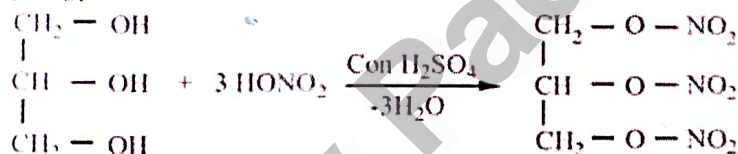
ethanol

diethyl ether

38 i) Schotten bauman reaction



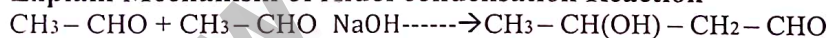
ii) Nitroglycerin



or

Aldol condensation

Explain Mechanism of Aldol condensation Reaction



Acetaldehyde

Aldol

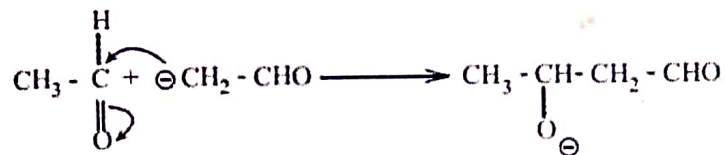
Mechanism

படி 1: காரத்தின் உதவியுடன் α - ஹைட்ரஜன் அணுவானது புரோட்டானாக நீக்கப்பட்டு கார்பன் எதிரயனி உருவாகிறது.



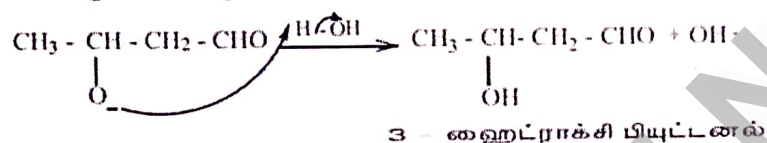
Removal of alpha hydrogen and formation of carbocation

படி 2 : இந்த கார்பன் எதிரயனியானது மற்றொரு அயனியுறா ஆல்டிஹைடுலுள்ள கார்பனைல் கார்பனை தாக்கி ஆல்காக்சைடு அயனியை உருவாக்குகிறது.



And react with ldehyde Formation of alkoxide ion

படி 3 : இவ்வாறு உருவான ஆல்காக்சைடு அயனியானது நீரினால் புரோட்டானேற்றம் பெற்று ஆல்டைலை உருவாக்குகிறது.



protonation with water formation of Aldol

Wish You All Success

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