

**Series 50S I**Code No. **56/1**  
em- ;t.Roll No.  
m-f ;t.Candidates must write the Code on  
the title page of the answer-book.-cRTamn ep)-g cp) :TIR ~d51 a, ~--  
"CR ~ ffi-& I

- Please check that this question paper contains 12 printed pages.
- Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains 30 questions.
- Please write down the Serial Number of the question before attempting it.
- 15 minutes time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the students will read the question paper only and will not write any answer on the answer script during this period.
- ~ ~ ~ ~ 1% ~ ~ ~ -q ~ ~ 12 ~ I
- ~ ~ -q ~ ~ Cfit am ~ ~ m ~ it ~ ~ ~ ~ Cfill ~ ~ ~ IR ~ I
- ~ ~ ~ ~ 1% ~ ~ ~ -q 30 >m" ~ I
- ~ ~ 'SI'v;r (fiT ~ rt1&"i1 ~ ~ ~ ~, ~ ~ (fiT ~ ~ ~
- ~ "5IT-1- ~ it ~ ~ ~ 15 fiRe: q)f ~ ~ I"fiIT ~ I >m"-~ q)f fcefi\iT ~ -q  
10.15 ~ fc.nlrr ~ I 10.15 ~ ~ 10.30 ~. (fq; ~ ~ ~ it ~ 3fu:  
~ 3ICIT~ ~ m ~ ~ ~ ~r~Cfill IR ~ ~ ~ ft;r@t

**CHEMISTRY (Theory)**

&lt;tlII'I~ ra\$11~ &lt;"C&amp;OI Rictj)

Time allowed : 3 hours

Maximum Marks : 70



# STUDENTSUVIDHA

General Instructions

(i) All questions are compulsory.

<http://studentsuvidha.in/>

(ii) Marks for each question are indicated against it.

(iii) Questions number 1 to 8 are very short-answer questions and

carry 1 mark each.

(iv) Questions number 9 to 18 are short-answer questions and carry 2 marks each.

(v) Questions number 19 to 27 are also short-answer questions and carry 3 marks each.

(vi) Questions number 28 to 30 are long-answer questions and carry 5 marks each.

(vii) Use Log Tables, if necessary. Use of calculators is not allowed.

f174/04 ~ :

(i) "«tit w;; 31Frqpf ~ I

(ii) ~ w;; it ~ 3fq; ~ 1JT! ~ I

(iii) w;;~ 1 it 8 rrq; 31Fr ey~ w;; ~. I ~ w;; it fclrl: 1 3fq; ~ I

(iv) w;;~ 9 it 18 rrq; ey~ w;; ~ I ~ w;; it fclrl: 2 3fq; ~. I

(v) w;;~ 19 it 27 rrq; 'Jft ey~ w;; ~. I ~ w;; it fclrl: 3 3fq; ~. I

(vi) w;;~ 28 it 30 f{tef~ w;; ~ I ~ w;; it fclrl: 5 3fq; ~. I

(vii) 3i7q~qq;rljffH c#Tr ~ q;r m q/t I ~f1&cdr it ~ q,7 3lJl1frr ;rtf. ~ I

1. Define 'order of a reaction'.
2. What is meant by 'shape selective catalysis' ?
3. Differentiate between a mineral and an ore.







12. What do you understand by the rate law and rate constant of a reaction ? Identify the order of a reaction if the units of its rate constant are :

(i)  $L^{-1} \text{ mol s}^{-1}$

(ii)  $L \text{ mol}^{-1} \text{ s}^{-1}$

3W:r ~ ~ ~ ~ ~ 31R ~ ~ ~ q<IT ~ ~ ? ~ ~ ~  
RJOOff('iruHl ~ ~ ~ qiT W Chl ~ ~ ~ :

(i)  $L^{-1} \text{ mol s}^{-1}$

(ii)  $L \text{ mol}^{-1} \text{ s}^{-1}$

13. The thermal decomposition of  $\text{HCO}_2\text{H}$  is a first order reaction with a rate constant of  $2.4 \times 10^{-3} \text{ s}^{-1}$  at a certain temperature. Calculate how long will it take for three-fourths of initial quantity of  $\text{HCO}_2\text{H}$  to decompose. ( $\log 0.25 = -0.6021$ )

~ ~ mq "tf{  $2.4 \times 10^{-3} \text{ s}^{-1}$  ~ G\ ~ ~ W:r  $\text{HCO}_2\text{H}$  CfiT ~ ~ ~  
-W.m W qiT ~ mar ~ I qRCfiI?1~ ~  $\text{HCO}_2\text{H}$  Chl ~ ~ 11ffl ~  
~ "ffi;r~~~ (fCfi ~ if fcfiff;rr "flflff ~ I ( $\log 0.25 = -0.6021$ )

14. Describe the principle controlling each of the following processes:

(i) Vapour phase refining of titanium metal

(ii) Froth floatation method of concentration of a sulphide ore

(i) 21\$IRIJJOt ~ CfiT CfiT&r ~ qR&;f){ol

(ii) fIOFiI~:S ~ CfiT ~ ~ m ~ ~





15. How would you account for the following :

'2

- $\text{Cr}^{2+}$  is reducing in nature while with the same d-orbital configuration ( $d^4$ )  $\text{Mn}^{3+}$  is an oxidising agent.
- In a transition series of metals, the metal which exhibits the greatest number of oxidation states occurs in the middle of the series.

RkLf~Rgd q;) CfIRUT ~ ~ ~ :

- $\text{Cr}^{2+}$  ~ 3NCIIICfi ~ ~ m d~ fer;::<rm ( $d^4$ ) it ~  $\text{Mn}^{3+}$  ~ 3QiIIICfi ~ ~ I
- ~ ~3TI ctt 1% m ~ ~, ~ mq ~ ~ ~ 3QiIIICfi ~ ~ q;8 cm-rr ~, ~ ~ it 1ftZr ~ ~ ~ ~ I

16. Complete the following chemical equations:

2

(i)



OR

State reasons for the following :

2

- $\text{Cu}(\text{I})$  ion is not stable in an aqueous solution.
- Unlike  $\text{Cr}^{3+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Fe}^{3+}$  and the subsequent other  $\text{M}^{2+}$  ions of the 3d series of elements, the 4d and the 5d series metals generally do not form stable cationic species.

(i)

(ii)

3I?;fCfT

f~kif~Rgd it cmuT ~ :

(0  $\text{Cu}(\text{I})$  3WR ~ ~ ~ ~ ~ I

- ~ ctt 3d ~ ~  $\text{Cr}^{3+}$ ,  $\text{Mn}^{2+}$ ,  $\text{Fe}^{3+}$  am: (iffG ~  $\text{M}^{2+}$  3Wr.IT it fcfqffi 4d afu 5d ~ it ~ ~141~d: ~ ~ ~ WillniJI ~ ~



17. Explain what is meant by the following:

2

- (i) peptide linkage
- (ii) pyranose structure of glucose

~ ~ fct; RlO4lr~Rg(l ~ q<IT ~ ~ ~ :

- (i) qQ:l~s ~
- (ii) ~ ctr ftHl'11~ ~

18. Write the main structural difference between DNA and RNA. Of the four bases, name those which are common to both DNA and RNA.

2

DNA am: RNA -q: ~. ~(iHl(iiCfl 3lw q;) ~ I T.R ~ -q: ~ ~ ~ ~  
~\li)~zyrr-q:~~~ I

19. A solution prepared by dissolving 8.95 mg of a gene fragment in 35.0 mL of water has an osmotic pressure of 0.335 torr at 25° C. Assuming that the gene fragment is a non-electrolyte, calculate its molar mass.

3

~ ~ 35.0 mL # ~. ~ ~ ~ Ctr 8.95. mg 11ro ~ M(111"i ~ ITIIT  
~ 25° C IR q{l~{ufl eysf 0.335 torr ~ I ~ ~ ~ fct; ~ '@US  
~3Hqell,1I ~, ~ 3IfUTCf (~) S::OI!!!l"l~ ~ I

20. Classify colloids where the dispersion medium is water. State their characteristics and write an example of each of these classes.

OR

Explain what is observed when

- (i) an electric current is passed through a sol
- (ii) a beam of light is passed through a sol
- (iii) an electrolyte (say NaCl) is added to ferric hydroxide sol

3

~ ~ ~ -cnB chl(1T~Sl CflT Cj/ITCfl{OI ~ I ~ crf ctr ~:n~(11 am:  
~~~ 3tl:lti{OI ~ I

~ ~ fct; q<IT mm. ~ ~

- (i) fclim mc-r -q: ~ ~ 'WT ~ ctr \iffit ~
- (ii) wrnr ctr ~ f\$(U13\J1 q;) fclim mc-r # ~ ~ ~ ~
- (iii) CfiW ~ (~ NaCl) ~ t?1~\*TCRil-S mc-r # Sfffi ~ ~



1. How would you account for the following :

3

- $\text{H}_2\text{S}$  is more acidic than  $\text{H}_2\text{O}$ .
- The N - O bond in  $\text{NO}$ ; is shorter than the N - O bond in  $\text{NO}_2$ .
- Both  $\text{O}_2$  and  $\text{F}_2$  stabilize high oxidation states but the ability of oxygen to stabilize the higher oxidation state exceeds that of fluorine.

Rklf~o ~ Cf<IT CfIRUT ~ :

- $\text{H}_2\text{O}$  Clil ~  $\text{H}_2\text{S}$  am ~ t
- $\text{NO}$ ; it N - O ~  $\text{NO}_2$ ; it N - O ~ ~ -mc:r mm t
- $\text{O}_2$  am:  $\text{F}_2$  ~ m ~ dqil~'1 ~3Tl cit \*:2IIf4~ ~ ~ ~ ~  
~amr., Clil ~ ailCf4I'5I'1 ~ t

22. Explain the following terms giving a suitable example in each case :

3

- Ambident ligand
- Denticity of a ligand
- Crystal field splitting in an octahedral field

~ dt!Olil{OI~ ~ Rklf(1f&o ~ 'tG Clil am:9QT ~ :

- ~ ~ (Ambident ligand)
- ~ Clil ~ (Denticity)
- 3i~lh{1q))~ ~ it m;f(!{1 ~ M%!rt

23. Rearrange the compounds of each of the following sets in order of reactivity towards  $\text{S}_\text{N}2$  displacement:

3

- 2-Bromo-2-methylbutane, 1-Bromopentane, 2-Bromopentane
- 1-Bromo-3-methylbutane, 2-Bromo-2-methylbutane, 3-Bromo-2-methylbutane
- 1-Bromobutane, 1-Bromo-2,2-dimethylpropane .. 1-Bromo-2-methylbutane

Rklf(1f&o ~ ~ ~ ~ cit ~  $\text{S}_\text{N}2$  ~ Clil flf~ol ~ 9fit it ~ :

- 2~2~M{1iiXil'1, 1~141~;!'12-iltl)~;!'1
- 1~3~{1iiXilrt, 2-mm-2~M{1iiXil'1,3-mm-2~{1iiXil'1
- l~t¥fliiXil'1, l-mm-2,2~21{1541q'1, l-mm-2~21{1iiXil'1



24. How would you obtain the following : 3

- (i) Benzoquinone from phenol
- (ii) 2-Methylpropan-2-ol from methylmagnesium bromide
- (iii) Propan-2-ol from propene

31Jtr f:lkf~f~('1 ~ ~ em-

- (i) ~ ~ ~fctqOil'i
- (ii) itf2l(1~J;ft~llfs:t dls:tI~:S ~ 2-4f2I(1sf1Q+2-arn
- (iii) mtiR ~ ~-2-affi;r

25. State reasons for the following : 3

- (i) pKb value for aniline is more than that for methylamine.
- (ii) Ethylamine is soluble in water whereas aniline is not soluble in water.
- (iii) Primary amines have higher boiling points than tertiary amines.

f:lkf~f&('1 it qf{UT ~ :

- (i) Qf:lcil'i ~ ~ pKb qif lfR ~ itf2l(1Q~~ .~ 3lf~ mm ~
- (ii) v:M(1Q~i ~ -q lj(1'i~fl(1 ~ ~ Qf:lcil'i ~ -q ~ ~
- (iii) ~12IMCfl ~ it Cfq2l'iicfl ~ ~ ~ ~ ~ ~ I

26. Draw the structures of the monomers of the following polymers : 3

- (i) Polythene
- (ii) PVC
- (iii) Teflon

f:lkf~f&('1 ci4~wbi it Q>Cfl(1c6lCtT ~{T.HI~ ~

- (i) ~ ~
- (ii) PVC
- (iii) ~





27. What are the following substances? Give one example of each. . 3

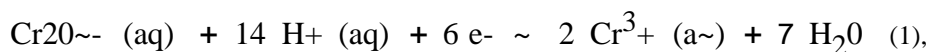
- (i) Food preservatives
- (ii) Synthetic detergents
- (iii) Antacids

R<sup>1</sup>f(1fuj(1 -qzyf cp:rr ~ ~ ? ~ ~ CfiT ~ 3(IJ~(OI ~

- (i) ~
- (ii) 'f~(1 3iqql;#Cfl
- (iii) ~O:C:lfHS (Antacids)

28. (a) What type of a battery is lead storage battery ? Write the anode and cathode reactions and the overall cell reaction occurring in the operation of a lead storage battery.

- (b) Calculate the potential for half-cell containing 0.10 M ~Cr2O7<sup>2-</sup> (aq), 0.20 M Cr<sup>3+</sup> (aq) and 1.0 x 10<sup>-4</sup> M H<sup>+</sup> (aq). The half-cell reaction is



and the standard electrode potential is given as  $E^\circ = 1.33 \text{ V}$ . 5

OR

- (a) How many moles of mercury will be produced by electrolysis of 1.0 M Hg(NO<sub>3</sub>)<sub>2</sub> solution with a current of 2.00 A for 3 hours? [Hg(NO<sub>3</sub>)<sub>2</sub> = 200.6 g mol<sup>-1</sup>]

- (b) A voltaic cell is set up at 25°C with the following half-cells Al<sup>3+</sup>(0.001 M) and Ni<sup>2+</sup>(0.50 M). Write an equation for the reaction that occurs when the cell generates an electric current and determine the cell potential.

(Given:  $E^\circ_{\text{Ni}^{2+}/\text{Ni}} = -0.25 \text{ V}$ ,  $E^\circ_{\text{Al}^{3+}/\text{Al}} = -1.66 \text{ V}$ )

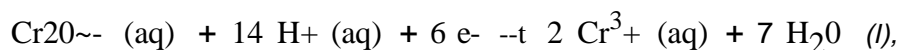
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- (a) mm 'f~114~ ~ fcfiB ~ 'Cfi1 ~ ~ \*||mm 'f~114~ ~ ~ q)J1l Cfi''G 'tR  
-m ~ ~ IR ~ mm ~ ~, -fielCfi,( -m ~ ~ mm  
t~1

- (b) 0.10 M ~Cr2O7<sup>2-</sup> (aq), 0.20 M Cr<sup>3+</sup> (aq) 1.0 x 10<sup>-4</sup> M H<sup>+</sup> (aq)

qffi aN-m-r CfiT fcNq QRCfi(1( ~ 1

aN-m-r ~ ~ ~ ~ ~



~ ~ ~ \$~&?lg fcNq W1r ~ ~,  $E^\circ = 1.33 \text{ V}$ .



\*

(a) 3 ~ it fffi; 2.00 A q,l fcfWL ~ it m2f 1.0 M Hg(NO<sub>3</sub>)<sub>2</sub> ~  
CfiT ~ ~ \ffffiT ~ -ffi liciU it ~ ~ CfiT 3MIG:i ~ ?  
[Hg(NO<sub>3</sub>)<sub>2</sub> = 200.6 g mol<sup>-1</sup>]

(b) ~ cilRl~ m-r ~ 25° C TR f.p.;f aN-m# it m2f ~ ~ \ffffiT ~ :  
Al<sub>3</sub>+(0.001 M) am: Ni<sup>2+</sup>+(0.50 M). ~ ~ CfiT wilCF)ol ~ ~ m-r  
it fcfWL ~ ~ Cli8 TR mm ~ am: m-r CfiT fcr1lq ~ ~ I  
$$E_{Ni^{2+}/Ni}^{EO} = - 0.25 \text{ V}, \quad E_{Al^{3+}/Al}^{EO} = - 1.66 \text{ V}$$

29. (a) Draw the structures of the following molecules :

(i) (HPO<sub>3</sub>)<sub>3</sub>

(ii) BrF<sub>3</sub>

(b) Complete the following chemical equations:

(i) HgCl<sub>2</sub> + PH<sub>3</sub> ~

(ii) SO<sub>3</sub> + H<sub>2</sub>SO<sub>4</sub> -->

(iii) XeF<sub>4</sub> + H<sub>2</sub>O ~

**OR**

(a) What happens when

(i) chlorine gas is passed through a hot concentrated solution of NaOH?

(ii) sulphur dioxide gas is passed through an aqueous solution of a Fe (III) salt ?

(b) Answer the following :

(i) What is the basicity of H<sub>3</sub>PO<sub>3</sub> and why ?

(ii) Why does fluorine not play the role of a central atom in interhalogen compounds ?

(iii) Why do noble gases have very low boiling points ?

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- (a) f.p-OirctRsH1~.m    ctt ~<:qOil~ ~ ~ :
- (i)  $(\text{HPO}_3)_3$
- (ii)  $\text{BrFs}$
- (b) R""1rctMd <1~llfRCfl ~111Cf1<u0it lfU ~ :
- (i)  $\text{HgCl}_2 + \text{PH}_3 \sim$
- (ii)  $8\text{O}_3 + \text{H}_2\text{SO}_4 \sim$
- (iii)  $\text{XeF}_4 + \text{H}_2\text{O} \sim$
- &?:fCfT
- (a) <FIT mm ~ ~
- (i)  $\text{NaOH} \sim \sim 7\text{Wf} \sim$  it iR'1l{lrj ikf ~ ctt \lfTffl ~ ?
- (ii)  $\text{Fe (III)} \sim \sim \sim \sim$  it ~ ~ ~3iTCR'II~S ikf ~ ctt  
 \lfTffl ~ ?
- (b) R""1rctr~d ~ ~ ~ :
- (i)  $\text{H}_3\text{PO}_3$  ctt ~ (basicity) <FIT ~ a:iR<sub>cp.ff</sub> ?
- (ii)  $3\text{HHI} \sim \sim \text{J1rj} \sim$  it 1:RJ~ ~ ~ ctt ~ it<sub>cp.ff</sub> 'Zf@ mm  
 ~ ?
- (iii) ~ (~) itm ~ qq~'1iCfl ~ ~ cp.ff ~ ~ ?

30. (a) Illustrate the following name reactions :

- (i) Cannizzaro's reaction
- (ii) Clemmensen reduction

(b) How would you obtain the following:

- (i) But-2-enal from ethanal
- (ii) Butanoic acid from butanol
- (iii) Benzoic acid from ethylbenzene

5

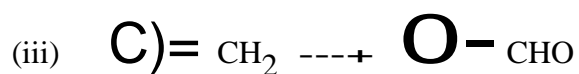
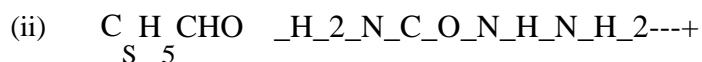
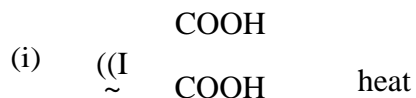
OR

(a) Give chemical tests to distinguish between the following :

- (i) Benzoic acid and ethyl benzoate
- (ii) Benzaldehyde and acetophenone



- (b) Complete each synthesis by giving missing reagents or products in the following :



5

