Series : SSO/1

Code No. **56/1/1**

RoUNo.

Candidates must write the Code on the title page of the answer-book.

- 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 student will read the question paper only and will not write any answer on the answer script during this period.

CHEMISTRY (Theory)

Time allowed,' 3 hours] *[Maximum marks,' 70*

General Instructions :

(i) All questions are compulsory.
(ii) Marks for each question are indicated against it.
(iii) Question numbers 1 to 8 are very short-answer questions and carry 1 mark each.
(iv) Question numbers 9 to 18 are short-answer questions and carry 2 marks each.
(v) Question numbers 19 to 27 are also short-answer questions and carry 3 marks each.
(vi) Question numbers 28 to 30 are long-answer questions and carry 5 marks each.
(vii) Use Log Tables, if necessary. Use of calculators is not allowed.

(i) 'ffiitJ!Ff~t I

(if) ~ J!Ffcfi W1R 3iq) ~ 1'fTI t I

(iii) JI'FI'- #I§!rr 1'# 8 'ffCf? J:rfrr MFJ-~ JI'FI' t I ~ J!Ffcfi ff;rr{ 1 3iq) t I

(iv) JI'FI'-#I§!rr 9 '# 18 'ffCf? 'frFI-~ JI'FI' t I ~ JI'FI' cfi ffrrz 2 3iq) t I

(v) JI'FI'-#I§!rr 19 '# 27 'ffCf? itt ey-~ JI'FI' t I ~ JI'FI' cfi ffrrz 3 3iq) t I

(vi) JI'FI'- #I§!rr 28 '# 30 cfW-'3fffti:r J!Fft I ~ JI'FI' cfi ff;rr{ 5 3iq) t I

(vii) 3IICINCfiHI'jW< MTrr ~T cfiT mcit I chffH2<1' cfi 3T{'(;;Trp:ift ~ r:rtf t I

1. Which point defect in crystals does not alter the density of the relevant solid ? 1

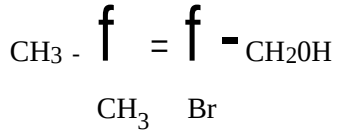
f~~<"il CfiTe$:rm~ (~) ~~omc);~~ qRCj~'1~*CRm?*

2. Define the term "Tyndall effect' , 1

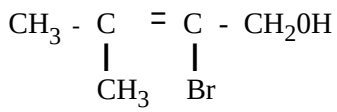
3. Why is the froth flotation method selected for the concentration of Sulphide ores? 1

4. Why is Bi(v) a stronger oxidant than Sb(v) ? 1

5. Give the IUPAC name of the following compound: 1



~ ~CfiT ~ <i~ ~ m (IUPAC) ;rrtT ~ :



6. Write the structure of 3-oxopentanal. 1

7. Why is an alkylamine more basic than ammonia ? 1

8. Give an example of elastomers. 1

$8'R.)&Hl CfiT~ dGlt\{Ol ~ I

9. A reaction is of second order with respect to a reactant. How will the rate of reaction be affected if the concentration of this reactant is 2

(i) doubled,

(ii) reduced to half?

~~~~.r~~ft:fP:Twqftt I<iRW~COT~

(i) ~CRWn~, ~ .

(ii) -3W:ITCRWn~,
M ~qftG;\~~M-?

10. Explain the role of 2

(i) Cryolite in the electrolytic reduction of alumina.

(ii) Carbon monoxide in the purification of nickel.

f.;l:;;r cnT ~ ~ :

(i) Q141'1I~~~.r$fllq'MI~lCOTm I .

(ii) ~ ~ ~ qR6:h{ol.r CfiT~f.:P1RT3ilcrul~\COm I

11. Draw the structures of the following molecules : 2

(i) XeF4

(ii) BrF3

f.;l:;;r -3IUJ31T qft fi{iH Ii! ~ ~ :

(i) XeF4

(ii) BrF3

12. Complete the following chemical reaction equations: 2

(i) $P_{4(s)} + NaOH_{(aq)} + O_{(l)}$

(ii) $I_{(aq)} + O_{(l)} + O_{3(g)}$

f.;l:;;r {lfIIIOlACfi ~ *i141Cfi{On cnT~~:
~~~~

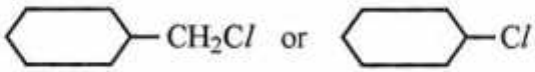
(i) P4(s) + NaOH(aq)+ ~O(l)-7

(ii) I-(aq)+ $H_{20(1)}$ + 03(g)-7

13. Differentiate between molality and molarity of a solution. What is the effect of change in temperature of a solution on its molality and molarity? 2

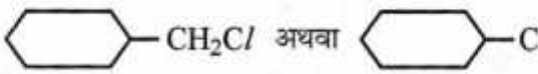
~.r ~ qft 'l'<1<1ctl- 'flM{ctl ~ ~ ~ ~ cnT ~ ~ 1"f1"lR ~ ~"ctlll ~ qR~ci'1COT ~ MM t ?

14. Which ones in the following pairs of substances undergoes S_N2 substitution reaction faster and why ? 2

(i)  or

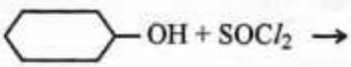
(ii)  or 

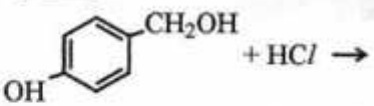
निम्न यौगिक युग्मों में से कौन एक यौगिक अधिक तीव्र S_N2 प्रतिस्थापन अभिक्रिया करता है और क्यों ?

(i) 

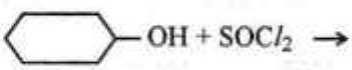
(ii)  अथवा 

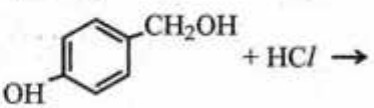
15. Complete the following reaction equations : 2

(i) 

(ii) 

निम्न अभिक्रियाओं को पूर्ण कर लिखिये :

(i) 

(ii) 

16. Explain what is meant by 2

(i) a peptide linkage

(ii) a glycosidic linkage

स्पष्ट कीजिए कि निम्नलिखित का क्या अर्थ होता है :

(i) पेप्टाइड लिंकेज

(ii) ग्लाइकोसाइडिक लिंकेज

17. Name two water soluble vitamins, their sources and the diseases caused due to their deficiency in diet. 2

जल में घुलनशील दो विटामिनों के नाम लिखिये । उनके स्रोतों का उल्लेख कीजिए और उन बीमारियों के नाम लिखिए जो इन विटामिनों की भोजन में कमी के कारण होती हैं ।

18. Draw the structures of the monomers of the following polymers: 2

(i) Teflon

(ii) Polythene

OR

What is the repeating unit in the condensation polymer obtained by combining H02CC~C~C02H (succinic acid) and ~NC~C~~ (ethylene diamine).

~ G4§<1Cf11t- l{Cf'<1Cf11ctt ~<il'1lQ ~ ~ :

(i) ~

(ii) qlctl~');=f

H02CC~C~C02H (*iCR"i)f.:jCf' ~) ~ ~NC~CH2~ (~ sl~QlOn'1) t- ~ ~m-q:r~~1l~ ~CITffi~~~?

19. Iron has a body centred cubic unit cell with a cell edge of 286.65 pm. The density of iron is 7.87 g cm-^{3}. Use this information to calculate Avogadro's number (At. mass of Fe = 56 g mol-I). 3

.am COTF CfiTlf ~ ~'1ICf'I< ~ m-r (@"ffi ~ I ~ ~ m-r t- ~ ctt ~ 286.65 pm mm t' I .am COTEA('q 7.87 g cm-^{3} ~ I ~ ~ COTF ~ ~ Qc:n1llit mszrrCOQRCf'<1'1 ~ I (Fe COT~ ~C4qH = 56 g mol")

20. 100 mg of a protein is dissolved in just enough water to make 10.0 mL of solution. If this solution has an osmotic pressure of 13.3 mm Hg at 25°C, what is the molar mass of the protein ? 3

(R = 0.0821 L atm mol-^{1} K-l and 760 mm Hg = 1 atm.)

~ miR ctt 100 mg l1BIT eN~ \1fR l1BIT 1l~ itco 10.0 mL ~ ~ TT<IT ~ I ~~~COT 25°C 'q"{ q<lmon ~ 13.3 mrn HgmmmiRCOTmw ~C4qH q<:fTtWrr?

(R = 0.0821 L atm mor ' K-i ~ ~ qI<j40:SH ~ = 760 mm Hg)

21. A first order reaction has a rate constant of 0.0051 min-i. If we begin with 0.10 M concentration of the reactant, what concentration of reactant will remain in solution after 3 hours ? 3

~ WI11. ctt ~ Cf;T G:\ ~ 0.0051 min"! t- I ~ ~ ~ 1l ~ t-
0.10 M~t-mv.r~cRm 3 tftt-~ ~Cf;T~~~~?

22. How are the following colloids different from each other in respect of dispersion medium and dispersed phase ? Give one example of each type. 3

(i) An aerosol (ii) A hydrosol (iii) An emulsion

~~ ~~cR~~~llf.p:;, Cfll<1I~'5~ ~¢ ~~~ ~? ~
mCl1T~-~d~I~{OI 'l;ft~:

(i) ~~hl1<1 (ii) ~1~~lBl<1 (iii) ~liC'f(H

23. Account for the following: 3

(i) NH3 is a stronger base than PH_3.

(ii) Sulphur has a greater tendency for catenation than oxygen.

(iii) Bond dissociation energy of F2 is less than that 'of Cl_2.

OR

Explain the following situations:

(i) In the structure of HNO_3 molecule, the N - O bond. (121 pm) is shorter than N - OH bond (140 pm).

(ii) SF_4 is easily hydrolysed whereas SF_6 is not easily hydrolysed.

(iii) XeF_2 has a straight linear structure and not a bent angular structure.

f.p:;, 't -3W:m ~ cmur ~ :

(i) PH3cR,~~NH3~~~t I

(ii) ~ICffiI"11cR~~~ll~~~mmt I

(iii) F2 cR ~ fCl4l"11~ Cl_2 cR ~ fCl'41\Jj4 ~ q;11 mm ~ I

f.p:;, 'q'{lCR21T,m ~ -3W:m WI$i I~ :

(i) HNO_3 '3lUlcR ~ ll, N - '$4 (121 pm) N - OH '$4 (140 pm) cR ~~ q;11 ~mmtl

(ii) SF_4 ~~\iWf 3mfu;m~t~ SF_6 ~~\iWf ~~mm I

(iii) XeF_2 '3lUlcR~~~'1'~mm~mmt I

24. For the complex *[Fe(en)2C12]Cl,* (en = ethylene diamine), identify 3

(i) the oxidation number of iron,

(ii) the hybrid orbitals and the shape of the complex,

(iii) the magnetic behaviour of the complex,

(iv) the number of geometrical isomers,

(v) whether there is an optical isomer also, and

(vi) name of the complex. (At. no. of Fe = 26)

ChIAk'1eru (~) *[Fe(en)2Cl2]Cl* ~1.'11'1 ;g1~Qtft'1 =' en) c);m-f.p:;:rCfft~~:

(i) .a:w:rv; Cfft aQil4'1 ~ i

(vi) ChIAk'1eru cfiT";{111 (4".~. Fe = 26)

25. Explain the mechanism of the following reactions: 3

(i) Addition of Grignard's reagent to the carbonyl group of a compound forming an adduct followed by hydrolysis.

(ii) Acid catalysed dehydration of an alcohol forming an alkene.

(iii) Acid catalysed hydration of an alkene forming an alcohol.

f.p:;:r ~3IT Cfft f~4IfCjR:r Cfft~ ~ :

(i) ~ ~ c); ChI4tf"lH ~ ~ ftrr.nt ~ CfiT <Wr ~ ~ ~ 41qq)H CfiT \1f(Yf ~I

(ii) QP-hl(:IH c); ~ ~ f.:l~I.'11Ch{OI~ ~ CfiT"aFRT I

(iii) ~ ~ c); ~ ~ G1Hq)\1I'1 ~ QP-hl(:IH CfiT"aFRT I

26. Giving an example for each describe the following reactions: 3

(i) Hofmann's bromamide reaction

(ii) Gatterman reaction

(iii) A coupling reaction

"W~ *II m ~ 3ql(:{OI tc:R f.:l"8 ~¢ll Cf1T quf.:r ~ :

(i) (:llfiJOIH ctr CjlM14I~;g ~,

(ii) 112{14H~,

(iii) <Jl1R.aTI~ I

27. Explain the following types of substances with one suitable example, for each case: 3

(i) Cationic detergents.

(il) Food preservatives.

(iii) Analgesics.

~ ~ *II m ~-~ ~ 3qlt'){OI tt ~f.:l"8 W qft"&IT@:IT :t.1f.31tJ::

(i) <),214r.;Cf) 3iQ14I;;1Cf) I

(ii) ~~I

(iii) ~ I

28. (a) Define molar conductivity of a substance and describe how for weak and strong electrolytes, molar conductivity changes with concentration of solute. How is such change explained ? 5

(b) A voltaic cell is set up at 25°C with the following half cells:

Ag" (0.001 M) I Ag and Cu^{2+} (0.10 M) I Cu

What would be the voltage of this cell? (E^o_{cell} = 0.46 V)

OR

(a) State the relationship amongst cell constant of a cell, resistance of the solution in the cell and conductivity of the solution. How is molar conductivity of a solute related to conductivity of its solution?

(b) A voltaic cell is set up at 25°C with the following half-cells:

All *Al3+* (0.001 M) and Ni |Ni^{2+} (0.50 M)

Calculate the cell voltage [$EO^{\circ}_{Ni^{2+}/Ni}$ = - 0.25 V, $EO^{\circ}_{Al^{3+}/Al}$ = - 1.66 V]

(a) m Cfft~ ilR'1(h('11 Cfft~ ~ I ~ ~ ~ ~ ~ Cfft~\ illi;'1(h('1IQ ~.] ~ qf{c"~1 'Y"{ ~ m Jf~ m-ffi ~? ~ q\1:qfl..n CfiT Cfi'RUT ~~I

(b) 25°C 'Y"{ 3fl:t m.rr Ag" (0.001 M) I Ag ~ Cu^{2+} (0.10 M) I Cu q;l ~ CR" 1ZCfi ~mvrtiRT<ITT[<:ITt- I~mvr~~Cf<TIM"? (B°ecH = 0.46 V)

(a) fcRft ~ Cfft illi;'1(h('1l, mvr .q~ CfiT ~ ~ mvr W-rocn ~ ~ ~ q;l ~ I~Cfft~ illi;'1(h('11 ~ ~ Cfft illi;'1(h('11 CfiT ~ ~ ~ I

(b) ~ ~ mvr 25°C 'Y"{ f.:p:::;:r 3fl:t m.rr "{)fiq)fi\1('1t- :

All *Al3+* (0.001 M) ~ Ni I Ni^{2+} (0.50 M)

mvrCfft~ q\1:(hf(1('1 ~ I [$E^{o}_{Ni^{2+}/Ni}$ =-0.25V, $E^{o}_{Al^{3+}/Al}$ =-1.66 V]

29. (a) Complete the following chemical reaction equations: 5

(b) Explain the following observations about the transition/inner transition elements:

(i) There is in general an increase in density of element from titanium (Z = 22) to copper (Z = 29).

(ii) There occurs much more frequent metal-metal bonding in compounds of heavy transition elements (3^{rd} series).

(iii) The members in the actinoid series exhibit a larger number of oxidation states than the corresponding members in the lanthanoid series.

OR

(a) Complete the following chemical equations for reactions:

(b) Give an explanation for each of the following observations :

(i) The gradual decrease in size (actinoid contraction) from element to element is greater among the actinoids than that among the lanthanoids (lanthanoid contraction).

(ii) The greatest number of oxidation states are exhibited by the members in the middle of a transition series.

(iii) With the same d-orbital configuration (d") Cr^{2+} ion is a reducing agent but Mn^{3+} ion is an oxidising agent.

(i) $MnO_4^-(aq) + C_2O_4^{2-}(aq) + H^+(aq) \sim$

(ii) $Cr_2O_7^{2-}(aq) + Fe^{2+}(aq) + H^+(aq) \sim$

(ii) 'IlTU ~¢f)4 01 "ffi'CIT ("ffmit ~) c); ~ 1l~ mq-mq 3itGRT 3i-m If[ir \1fffi ~ 1

(iii) QfCfC:'114:g ~ c);"ffi'Cf ~ ~ ~ c); men C!?13i-G-a-n *'~~ 1l~ aQ:q4'1 ~·~cnm~ 1

.(a) f.:p:;; <lfll4f-'1Cfl fltfiCfl<On cnT ~"Cf)'{ ~ :

(i) $MnO_4^-(aq) + S_2O_3^{2-}(aq) + Hz0(l) \sim$

(ii) $Cr_2O_7^{2-}(aq) + HzS(g) + H^+(aq) \sim$

(b) f.:p:;; ~q(11Cfl'1l C!?1~~:

(i) QfCfC:'1l~:slll '(tCfi"ffi'Cf ~ .311ffi"ffi'Cf 1l~ c); ~ 1l flI41""4(11 c:rc:rq (QfCfC:'1l~:g

~) ~lffiC[i(i ~~'11~:s1 c); (~~'1I~:g~) ~~\1ffii1~ I

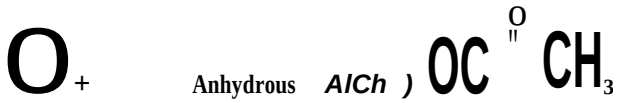
(ii) '(tCfi ~ ~ 1l ~ aq*H ~ 5!}uft c); ~ c);"ffi'CIT ID<T ~ moT ~I

(iii) m d-~ ~ (d^4) c); ~ Cr^{2+} 3WR 3iQ:q14Cfl ~ ~ Mn^{3+} 3WR aQ:q14Cfl ~ I

(a) f.rr:;:r~~~~~:

(i) ~ ·~)~tFnt~Cfl **31lB,**

(ii) c:1~{"i ~ ~';>:llf?-st>I~Sl

(ii) 

(iii) 

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