#### Senior School Certificate Examination 2017 Marking Scheme ------ Chemistry

#### **General Instructions**

- The Marking Scheme provides general guidelines to reduce subjectivity in the marking. The answers given in the Marking Scheme are Suggested answers. The content is thus indicative. If a student has given any other answer which is different from the one given in the Marking Scheme, but conveys the same meaning, such answers should be given full weight-age.
- 2. The Marking Scheme carries only suggested value point for the answers. These are only guidelines and do not constitute the complete answers. The students can have their own expression and if the expression is correct the marks will be awarded accordingly.
- 3. The Head-Examiners have to go through the first five answer-scripts evaluated by each evaluator to ensure that the evaluation has been carried out as per the instruction given in the marking scheme. The remaining answer scripts meant for evaluation shall be given only after ensuring that there is no significant variation in the marking of individual evaluators.
- 4. Evaluation is to be done as per instructions provided in the Marking Scheme. It should not be done according to one's own interpretation or any other consideration Marking Scheme should be strictly adhered to and religiously followed.
- 5. If a question has parts, please award marks in the right hand side for each part. Marks awarded for different parts of the question should then be totaled up and written in the left hand margin and circled.
- 6. If a question does not have any parts, marks be awarded in the left-hand margin.
- 7. If a candidate has attempted an extra question, marks obtained in the question attempted first should be retained and the other answer should be scored out.
- 8. No Marks to be deducted for the cumulative effect of an error. It should be penalized only once.
- 9. A full scale of marks 0-70 has to be used. Please do not hesitate to award full marks if the answer deserves it.
- 10. Separate marking schemes for all the three sets have been provided.
- 11. As per orders of the Hon'ble Supreme Court. The candidate would now be permitted to obtain photocopy of the Answer Book on request on payment of the prescribed fee. All examiner/Head Examiners are once again reminded that they must ensure that evaluation is carried out strictly as per value points for each answer as given in the Marking Scheme.
- 12. The Examiners should acquaint themselves with the guidelines given in the Guidelines for sport Evaluation before starting the actual evaluation.
- 13. Every Examiner should stay upto sufficiently reasonable time normally 5-6 hours every day and evaluate 20-25 answer books and should minimum 15-20 minutes to evaluate each answer book.
- 14. Every Examiner should acquaint himself/herself with the marking schemes of all the sets.

# Marking scheme – 2017 (Compartment)

# CHEMISTRY (043)/ CLASS XII

#### Set 56/1

Q.No	Value Points	Marks
1	Frenkel defect	1
2	Liquid –liquid colloidal systems ; example- milk (or any other )	1/2 , 1/2
3	Dichloridobis(ethane-1,2-diamine)cobalt(III) ion	1
4	$ \begin{array}{c}                                     $	1
5	N,N-dimethylbutan-1-amine	1
6	$Ag^+(aq) + e^- \rightarrow Ag(s)$	1
	Because it has higher reduction potential	1
7	Hypophosphorous acid is a good reducing agent as it contains two P-H bonds. There is no P-H bond in orthophosphoric acid , so it is not a reducing agent	1
	Example : It reduces AgNO <sub>3</sub> to metallic silver/ chemical equation	1
8	a) Due to high activation energy	1
-	b) Rate = $k [A_2]^0 [B_2]^0$	1
8	$R \rightarrow P$ OR	
	Rate = $-\frac{d[R]}{dt} = k[R]$ or $\frac{d[R]}{[R]} = -kdt$ Integrating this equation, we get ln [R] = $-kt + 1$ (4.8) When $t = 0$ , $R = [R]_0$ , where $[R]_0$ is the initial concentration of the reactant. Therefore, equation (4.8) can be written as ln $[R]_0 = -k \times 0 + 1$ ln $[R]_0 = 1$ Substituting the value of I in equation (4.8) ln[R] = $-kt + \ln[R]_0$ (4.9) Recarranging this equation $\ln \frac{[R]}{[R]_0} = -kt$ or $k = \frac{1}{t} \ln \frac{[R]_0}{[R]}$ $k = \frac{2.303}{t} \log \frac{[R]_0}{[R]}$	1
	$t \in [R]$	1
9	i. Because it has incompletely filled d orbitals in one of its oxidation state (Cu <sup>2+</sup> )	1

	ii. $Cr^{2+}(d^4)$ changes to $Cr^{3+}(d^3)$ while $Fe^{2+}(d^6)$ changes to $Fe^{3+}(d^5)$ . In aqueous medium	1
	$d^3$ is more stable than $d^5$ .	-
10.	a) CH <sub>3</sub> -CH(Br)-CH <sub>3</sub> аскон CH <sub>3</sub> -CH=CH <sub>2</sub> <u>нвг, Peroxide</u> CH <sub>3</sub> -CH <sub>2</sub> -CH <sub>2</sub> -Br b).	1
	$ + Cl_2 \xrightarrow{Fe}_{dark} \xrightarrow{Cl}_{conc. H_2SO_4} \xrightarrow{Cl}_{NO_2} $	1
11	In bcc, z=2 ;	
	d = $(zxM) / a^3 x N_A$ (i) Putting values of M in equation (i) M= 7.2g/ cm <sup>3</sup> x(288 x10 <sup>-10</sup> cm) <sup>3</sup> N <sub>A</sub> / 2	1
	= 51.8  g/mol	1
	(or any other correct method )	1
12	$\Delta rG^{\circ} = -nFE^{\circ}_{cell}$ , n=6 = - 6 × 96500 C/ mol × 0.34V	1/2
	= -196860 J /mol or -196.860 kJ/mol	1
	$E_{cell}^{o} = 0.059 V / n \times \log Kc$	1/2
4.2	$\log \text{Kc} = 0.34 \text{ V} \times 6 / 0.059 \text{ V} = 34.5762$	1
13	$t = \frac{2.303}{k_{2.202}} \log [R]o/[R]$	
	$t_{99\%} = \frac{2.303}{k} \log 100/1 = \frac{2.303}{k} \times 2$ (i)	1
	$t_{90\%} = \frac{2.303}{k} \log 100/10 = \frac{2.303}{k}$ (ii)	
	Dividing equation (i) by (ii)	1
	$t_{99\%} \qquad \frac{2.303}{k} \times 2$	
	$t_{90\%}$ $\frac{2.303}{k}$	
	t <sub>99%</sub> = 2 t <sub>90%</sub>	1
14	i) The colloidal particles scatter light in all directions in space.	1
	<ul> <li>ii) The zig-zag movement of particles of the dispersed phase due to unbalanced bombardment of the colloidal particles by the molecules of dispersion medium.</li> </ul>	1
	iii) As the adsorption is an exothermic process, it decreases with increase in temperature.	1
15	<ul> <li>a) i)The impurities are more soluble in the melt than in the solid state of the metal.</li> <li>ii)The more basic / reactive metal gets deposited at the cathode and the less</li> </ul>	1
	basic / reactive ones go to the anode mud.	1
	b) i)Ni ii) Ti/Zr	1/2 , 1/2
16	A: $Na_2CrO_4$ ; B: $Na_2Cr_2O_7$ 4. $Factor O_4$ ; B: $Na_2Cr_2O_7$	1/2 , 1/2
	4 $\operatorname{FeCr}_2O_4 + 8 \operatorname{Na}_2CO_3 + 7 O_2 \rightarrow 8 \operatorname{Na}_2\operatorname{Cr}O_4 + 2 \operatorname{Fe}_2O_3 + 8 \operatorname{CO}_2$	1
	$2\mathrm{Na_2CrO_4} + 2 \mathrm{~H^+} \rightarrow \mathrm{Na_2Cr_2O_7} + 2 \mathrm{~Na^+} + \mathrm{H_2O}$	1
	OR	
16	a) i)Due to d-d transition	1
	ii)Due to higher oxidation state of Mn in $Mn_2O_7$ / Due to high polarizing power of $Mp(V/II)$	1
	Mn(VII). b) $\mu = \sqrt{4(4+2)} = 4.90 \text{ B.M}$	1
		1

17 Hybridisation : d <sup>2</sup> sp <sup>3</sup> Magnetic character : Paramagnetic	
	1
	-
en <b>Fe</b>	
	1
en	
18. a) i)Due to –I effect of X , the ring gets partially deactivated	1
ii)They fail to form Hydrogen bonds with water/ more energy is required to bre	_
bonds in water and less energy is released when new attractions are set up.	
b)2-Bromo-2-methylbutane < 2-Bromopentane < 1-Bromopentane	1
19. a) Due to resonance, phenoxide ion is more stable than phenol whereas	
resonance in alkoxide ion / explained with the help of resonating structur	
b) .	
(i) $CH_3-CH_2-\overset{\cdots}{O}-H + H^+ \longrightarrow CH_3-CH_2+\overset{\cdots}{O}-H$	
(ii) $CH_{3}CH_{2} - \overset{\circ}{O}: + CH_{3} - CH_{2} - \overset{\circ}{O} + \overset{H}{H} \rightarrow CH_{3}CH_{2} - \overset{\circ}{O} - CH_{2}CH_{2} - \overset{\circ}{O} + CH_{3}CH_{2} - \overset{\circ}{O} + CH_{3}CH_{3} - CH_{3}CH_{$	1/2
(ii) CH <sub>2</sub> CH <sub>2</sub> $ \overset{\circ}{O}$ : + CH <sub>2</sub> $-$ CH <sub>2</sub> $\overset{\circ}{O}$ $\overset{\circ}{\longrightarrow}$ CH <sub>2</sub> CH <sub>2</sub> $-$ O $-$ CH <sub>2</sub> C	CH <sub>a</sub> + H <sub>a</sub> O
п	1
(iii) CH CH $\stackrel{+}{\bigcirc}$ CH CH $\stackrel{-}{\longrightarrow}$ CH CH $\stackrel{-}{\bigcirc}$ CH CH $\stackrel{+}{\rightarrow}$	
(iii) $CH_{3}CH_{2} \xrightarrow{\circ} O - CH_{2}CH_{3} \longrightarrow CH_{3}CH_{2} \xrightarrow{\circ} O - CH_{2}CH_{3} + H^{+}$	
H	1/2
20. i) A: $CH_3$ - $CH_2CN$ ; B: $CH_3$ - $CH_2$ - $CH_2NH_2$ ; C: $CH_3$ - $CH_2$ - $CH_2$ - $NH$ -COCH <sub>3</sub>	½ ×3
$\downarrow$ $\downarrow$ $\downarrow$ $\downarrow$	
+ -	1/ 22
ii) A: $Ar - N_2 BF_4$ ; B: C:	1/2 ×3
a) Because they are excreted in urine and cannot be stored in body; Vitam	nin C / B <sub>1</sub> / $\frac{1}{2}$ , $\frac{1}{2}$
B <sub>2</sub> / B <sub>6</sub>	
b) i) Essential amino acids are those which cannot be synthesized in the b	
supplied through diet whereas non-essential amino acid can be s	synthesized
in the body ii) In fibrous proteins, the polypeptide chains run parallel and are held tog	aether by
hydrogen or disulphide bonds while in globular, polypeptide chai	
around to give a spherical shape	
22 i) Phenol / 0.2 % phenol is antiseptic while 1% is disinfectant.	1
ii) Aspartame	ith contaton
iii) Cationic detergents are quaternary ammonium salts of amines w chlorides or bromides as anions/ Cationic part has a long chain	hydrocarbon
which is involved in cleansing action.	
23 a) Poly $\beta$ -hydroxybutyrate – co- $\beta$ -hydroxyvalerate / (PHBV)	1/2
OH	
	1/2 , 1/2
Monomers: $M_2 = 0.011$ , $M_2 = 0.0011$ , $M_3 = 0.012$ , $M_3 = 0.012$	
Monomers : Repeating unit :	
Kepeaung unu .	1/2
Monomers: Repeating unit: $\begin{pmatrix} O-CH-CH_2-C & -O-CH-CH_2-C \\   &   &   \\ CH_3 & O & CH_2CH_3 & O \end{pmatrix}$	Y <sub>2</sub>

	<i>b)</i> PHBV is used in speciality packaging, orthopaedic devices and in controlled release of drugs.(any two)	1/2 , 1/2
	c) Concern for environment, caring (or any other)	1/2 , 1/2
24	a) Vapour pressure of the solvent decreases in the presence of non – voilatile solute (glucose) hence boiling point increases	2
	b) $p_{co2} = K_H X_{co2}$ $X_{co2} = p_{co2} / K_H$	1/2
	$= 2.53 \times 10^{5} \text{ Pa} / 1.67 \times 10^{8} \text{ Pa} = 1.51 \times 10^{-3}$ n <sub>H2O</sub> = 500g / 18 g/mol = 27.77 mol	1
	Let $n_{co2} = n \mod 1$	
	$X_{CO2} = n/(27.77 + n) = 1.51 \times 10^{-3}$ $n_{CO2} = 1.51 \times 10^{-3} \times 27.77 \text{ mol} = 0.042 \text{ mol}$	½ 1
	OR	-
24	a) i) The solutions which obey Raoult's law over the entire range of concentration. ii) It is the excess pressure that must be applied to a solution to prevent osmosis. b) $\Delta T_b = i K_b m$	1 1
	Here , m = $w_B x \ 1000 / M_B X w_A$ $\Delta T_b = [3 x \ 0.512 \text{ K kg mol}^{-1} \times 1000 \times 10 \text{ g}] / [111 \text{ g mol}^{-1} x 200\text{ g}]$	1
	= 0.69K	1
25	a) A: $NO_2$ ; B: $N_2O_4$ NaNO <sub>3</sub> + conc. $H_2SO_4 \longrightarrow$ NaHSO <sub>4</sub> + HNO <sub>3</sub> (or any other nitrate) Cu + 4 HNO <sub>3</sub> $\longrightarrow$ Cu(NO <sub>3</sub> ) <sub>2</sub> + 2 NO <sub>2</sub> + 2 H <sub>2</sub> O	½,½, 1
	$2NO_2 \_ cool \rightarrow N_2O_4$ b).	1
	F F F	
	F	1
	OR	
25	<ul> <li>a) i) Stability of higher oxidation state decreases down the group from S to Te/ Stability of lower oxidation state increases down the group from S to Te.</li> <li>ii) ClO<sub>3</sub><sup>-</sup> is more stable than ClO<sup>-</sup> / ClO<sub>3</sub><sup>-</sup> is a weak conjugate base than ClO<sup>-</sup> / Due to</li> </ul>	1
	higher oxidation state of chlorine in $HClO_3$ iii) Fluorine and oxygen are most electronegative and very reactive.	1
	b) i).	1
	$4NaCl + MnO_2 + 4H_2SO_4 \rightarrow MnCl_2 + 4NaHSO_4 + 2H_2O + Cl_2$ ii).	1
	$6XeF_4 + 12 H_2O \rightarrow 4Xe + 2XeO_3 + 24 HF + 3 O_2$	1
26	a) i) Due to steric and + I effect of two methyl groups in propanone.	1
	ii) Because it is a deactivating group / Due to electron withdrawing carboxylic group resulting in decreased electron density at o- and p- position.	1
	iii) Due to resonance, electrophilicity of carbonyl carbon is reduced. b) i) Add NaOH and $I_2$ to both the compounds and heat, acetophenone forms yellow ppt of	1
	iodoform. ii) Add NaHCO <sub>3</sub> solution to both the compounds, benzoic acid will give effervescence and liberate $CO_2$ .	1 1
	(Or any other suitable test)	
	OR	
26	a) A: CH <sub>3</sub> CHO ; B: CH <sub>3</sub> -CH(OH)-CH <sub>2</sub> -CHO ; C: CH <sub>3</sub> -CH=CH-CHO ;	1×4

D: CH <sub>3</sub> -CH(CH <sub>3</sub> )-OH	
b) $CH_3$ -O- $CH_3$ < $CH_3CHO$ < $CH_3$ - $CH_2$ - $OH$ < $CH_3$ - $COOH$	1

1	Dr. (Mrs.) Sangeeta Bhatia	6	Sh. Rakesh Dhawan	
2	Dr. K.N. Uppadhya	7	Dr. (Mrs.) SunitaRamrakhiani	
3	Prof. R.D. Shukla	8	Mrs. Preeti Kiran	
4	Sh. S.K. Munjal	9	Dr. Azhar Aslam Khan	
5	Sh. D.A. Mishra	10	Ms. GarimaBhutani	

# Marking scheme – 2017 (Compartment)

# CHEMISTRY (043)/ CLASS XII

#### Set 56/2

Q.No	Value Points	Marks
1	Dispersion medium- liquid/ water ; Dispersed phase – liquid/ oil	1/2 , 1/2
2	Tetraamminechloridonitrito-N -cobalt(III) ion	1
3	N,N-dimethylbutan-1-amine	1
4	Schottky Defect	1
5	ОН	1
	$ \left[ \begin{array}{c} \\ \end{array} \right] + Zn \longrightarrow \left[ \begin{array}{c} \\ \end{array} \right] + ZnO $	
	/ Benzene is formed	
6	a) Due to high activation energy	1
	b) Rate = $k [A_2]^0 [B_2]^0$	1
	OR	
6	$R \rightarrow P$	
	Rate = $-\frac{d[R]}{dt} = k[R]$	
	$Rate = -\frac{dt}{dt} - R[R]$	
	d[R]	
	or $\frac{d[R]}{[R]} = -kdt$	
	Integrating this equation, we get	
	$\ln \left[ R \right] = -kt + I \tag{4.8}$	
	When $t = 0$ , R = [R] <sub>0</sub> , where [R] <sub>0</sub> is the initial concentration of the	
	reactant.	
	Therefore, equation (4.8) can be written as $\ln [R]_0 = -k \times 0 + I$	
	$\ln [R]_0 = I$	
	Substituting the value of I in equation (4.8)	
	$\ln[R] = -kt + \ln[R]_0 \tag{4.9}$	1
	Rearranging this equation	
	$\ln \frac{[R]}{[R]_0} = -kt$	
	$[R]_0 = m$	
	1 [B]	
	or $k = \frac{1}{t} \ln \frac{[R]_0}{[R]}$	
	t [R]	
	2,303 [R].	
	$k = \frac{2.303}{t} \log \frac{[\mathrm{R}]_0}{[\mathrm{R}]}$	
	t [R]	1
7	i) Silver can exhibit +2 oxidation state wherein it will have incompletely filled d-orbital.	1
	ii) Much higher third ionisation energy of Mn where the required change $$ is from d $^5$ to d $^4$	1
8	a) CH <sub>3</sub> -CH(Br)-CH <sub>3</sub> аскон CH <sub>3</sub> -CH=CH <sub>2</sub> _ <u>нвг, Peroxid</u> e CH <sub>3</sub> -CH <sub>2</sub> -CH <sub>2</sub> -Br	1
	b) .	

	$+ Cl_2 \xrightarrow{Fe}_{dark} \xrightarrow{Cl}_{conc. H_2SO_4} \xrightarrow{Cl}_{NO_2}$	1
9	Hypophosphorous acid is a good reducing agent as it contains two P-H bonds. There is no P-H bond in orthophosphoric acid , so it is not a reducing agent	1
	Example : It reduces AgNO <sub>3</sub> to metallic silver/ chemical equation	1
10.	$Ag^+(aq) + e^- \rightarrow Ag(s)$	1
	Because it has higher reduction potential	1
11	<ul> <li>i) Phenol / 0.2 % phenol is antiseptic while 1% is disinfectant.</li> <li>ii) Aspartame</li> </ul>	1
	<ul> <li>iii) Aspartance</li> <li>iii) Cationic detergents are quaternary ammonium salts of amines with acetates, chlorides or bromides as anions/ Cationic part has a long chain hydrocarbon which is involved in cleansing action.</li> </ul>	1
12	a) Because they are excreted in urine and cannot be stored in body; Vitamin C / $B_1$ /	1/2 , 1/2
	$B_2/B_6$	/2,/2
	b) i) Essential amino acids are those which cannot be synthesized in the body and are supplied through diet whereas non-essential amino acid can be synthesized in the body	1
	ii) In fibrous proteins, the polypeptide chains run parallel and are held together by hydrogen or disulphide bonds while in globular, polypeptide chains coil around to give a spherical shape	1
13	i) A: CH <sub>3</sub> - CH <sub>2</sub> CN ; B: CH <sub>3</sub> - CH <sub>2</sub> - CH <sub>2</sub> NH <sub>2</sub> ; C: CH <sub>3</sub> - CH <sub>2</sub> - CH <sub>2</sub> -NH-COCH <sub>3</sub>	½ ×3
	$NO_2$ $NH_2$	/- 0
	ii) A: $Ar - \dot{N}_2 BF_4$ ; B: C:	½ ×3
14	a) i)Due to –I effect of X , the ring gets partially deactivated	1
	ii)They fail to form Hydrogen bonds with water/ more energy is required to break hydrogen	1
	bonds in water and less energy is released when new attractions are set up.	
	b)2-Bromo-2-methylbutane < 2-Bromopentane < 1-Bromopentane	1
15	i). OH CHCl <sub>3</sub> + aq NaOH ii). Step 1: Formation of protonated alcohol. ii).	1
	$\begin{array}{c} H & H \\ H - C - C - \ddot{O} - H + H^{+} & \xrightarrow{Fast} H - C - C - O^{+} - H \\ H & H & H & H \\ E thanol & Protonated alcohol \\ (Ethyl oxonium ion) \end{array}$	1/2
	Step 2: Formation of carbocation: It is the slowest step and hence, the rate determining step of the reaction. $\begin{array}{c} H & H \\ H & - C - C \\ H & H \end{array} \begin{array}{c} H & H \\ H - C - C \\ H & H \end{array} \begin{array}{c} H & H \\ H \\ H \end{array} \begin{array}{c} H & H \\ H \\ H \end{array} \begin{array}{c} H & H \\ H \\ H \end{array} $	⅓
	Step 3: Formation of ethene by elimination of a proton. $\begin{array}{cccc} H & H \\ H - C & C^{+} \\ H & H \\ Ethene \\ \end{array} \xrightarrow{H} C = C \\ H & H^{+} \\ H & H^{+} \\ Ethene \\ \end{array}$	1
16	Hybridisation : d <sup>2</sup> sp <sup>3</sup>	1
	Spin : Low spin	1

r		
	en co	1
	en en	
17	i)The impurities are more soluble in the melt than in the solid state of the metal. ii) Different components of a mixture are differently adsorbed on the surface of adsorbent.	1 1
	iii)The more basic / reactive metal gets deposited at the cathode and the less basic / reactive ones go to the anode mud.	1
18.	A: Na <sub>2</sub> CrO <sub>4</sub> ; B: Na <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> 4 FeCr <sub>2</sub> O <sub>4</sub> + 8 Na <sub>2</sub> CO <sub>3</sub> + 7 O <sub>2</sub> $\rightarrow$ 8 Na <sub>2</sub> CrO <sub>4</sub> + 2 Fe <sub>2</sub> O <sub>3</sub> + 8 CO <sub>2</sub>	½,½ 1
	$2\mathrm{Na}_{2}\mathrm{CrO}_{4} + 2 \mathrm{~H}^{+} \rightarrow \mathrm{Na}_{2}\mathrm{Cr}_{2}\mathrm{O}_{7} + 2 \mathrm{~Na}^{+} + \mathrm{H}_{2}\mathrm{O}$	1
	OR	
18	a) i)Due to d-d transition	1
10	ii)Due to higher oxidation state of Mn in $Mn_2O_7$ / Due to high polarizing power of Mn(VII).	1
	b) $\mu = \sqrt{4(4+2)} = 4.90 \text{ B.M}$	1
19.	i) The colloidal particles scatter light in all directions in space.	1
	ii) The zig-zag movement of particles of the dispersed phase due to unbalanced	
	bombardment of the colloidal particles by the molecules of dispersion medium.	1
	iii) As the adsorption is an exothermic process, it decreases with increase in temperature.	1
20.	$t = \frac{2.303}{k} \log [R]o/[R]$	
	$t_{000} = \frac{r_{2.303}}{r_{2.303}} \log 100/1 = \frac{2.303}{r_{2.303}} \times 2 (i)$	
	$t_{99\%} = \frac{\frac{2.303}{k}}{\frac{1}{k}} \log \frac{100}{1} = \frac{\frac{2.303}{k} \times 2}{\frac{1}{k}} = \frac{2.303}{\frac{1}{k}} \times 2 - \dots - (i)$ $t_{90\%} = \frac{\frac{2.303}{k}}{\frac{1}{k}} \log \frac{100}{10} = \frac{\frac{2.303}{k}}{\frac{1}{k}} - \dots - (ii)$	1
	Dividing equation (i) by (ii)	1
	$t_{99\%} \qquad \frac{2.303}{k} \times 2$	
	$\frac{k}{k}$	
	$\frac{2.303}{2.303}$	
	$t_{90\%} - k$	1
	$t_{99\%} = 2 t_{90\%}$	1
21	In bcc, z=2 ;	
	d = $(zxM) / a^3 x N_A$ (i) Putting values of M in equation (i)	1
	$M = 7.2g/ \text{ cm}^3 \text{ x}(288 \text{ x}10^{-10} \text{ cm})^3 \text{ N}_A / 2$	1
	= 51.8 g/ mol	1
	(or any other correct method )	1
22	$\Delta r G^{\circ} = -n F E^{\circ}_{cell} , n=6$	1/2
	$= -6 \times 96500 \text{ C/mol} \times 0.30 \text{ V}$	
	= -173700  J/mol = -173.7  kJ/mol	1
	$E_{cell}^{\circ} = 0.059V / n \times \log Kc$	½ 1
23	log Kc = $0.30 \text{ V} \times 6 / 0.059 \text{ V} = 30.5$ a) Poly $\beta$ -hydroxybutyrate – $co$ - $\beta$ -hydroxyvalerate / (PHBV)	1 1/2
23	OH OH	, -
	Monomers : $CH_3-CH-CH_2-COOH$ , $CH_3-CH_2-CH-CH_2-COOH$	1/2 , 1/2

	Repeating unit :	
		1/2
	$ \begin{array}{c} \left( \begin{array}{c} \mathbf{O} - \mathbf{C} \mathbf{H} - \mathbf{C} \mathbf{H}_2 - \mathbf{C} \\ \mathbf{O} - \mathbf{C} \mathbf{H}_2 - \mathbf{C} \\ \mathbf{H}_3 \end{array} \right)_{n} \\ \mathbf{C} \mathbf{H}_3 \end{array} \xrightarrow{\mathbf{O}} \begin{array}{c} \mathbf{C} \mathbf{H}_2 \mathbf{C} \mathbf{H}_2 \\ \mathbf{C} \mathbf{H}_3 \end{array} \xrightarrow{\mathbf{O}} \begin{array}{c} \mathbf{O} \\ \mathbf{C} \mathbf{H}_2 \mathbf{C} \mathbf{H}_3 \end{array} $	
	$CH_3$ $O$ $CH_2CH_3$ $O$	
	b) PHBV is used in speciality packaging, orthopaedic devices and in controlled release of	1/2 , 1/2
	drugs.(any two)	1/ 1/
24	<ul> <li>c) Concern for environment , caring (or any other)</li> <li>a) i) Due to steric and + I effect of two methyl groups in propanone.</li> </ul>	½,½ 1
27	ii) Because it is a deactivating group / Due to electron withdrawing carboxylic group resulting	1
	in decreased electron density at o- and p- position.	
	iii) Due to resonance, electrophilicity of carbonyl carbon is reduced.	1
	b) i) Add NaOH and $I_2$ to both the compounds and heat, acetophenone forms yellow ppt of	
	iodoform.	1
	ii) Add NaHCO <sub>3</sub> solution to both the compounds, benzoic acid will give effervescence and liberates CO <sub>2</sub> .	1
	(Or any other suitable test)	
	OR	
24	a) A: CH <sub>3</sub> CHO ; B: CH <sub>3</sub> -CH(OH)-CH <sub>2</sub> -CHO ; C: CH <sub>3</sub> -CH=CH-CHO ;	1×4
	D: $CH_3$ - $CH(CH_3)$ - $OH$	
	b) CH <sub>3</sub> -O-CH <sub>3</sub> < CH <sub>3</sub> CHO < CH <sub>3</sub> -CH <sub>2</sub> -OH < CH <sub>3</sub> -COOH	1
25	a) Vapour pressure of the solvent decreases in the presence of non – voilatile solute	2
	(glucose) hence boiling point increases b) p <sub>co2</sub> = K <sub>H</sub> X <sub>co2</sub>	1/2
	$X_{co2} = p_{co2} / K_{H}$	72
	$= 2.53 \times 10^5$ Pa / 1.67 × 10 <sup>8</sup> Pa = 1.51 × 10 <sup>-3</sup>	1
	n <sub>H20</sub> = 500g / 18 g/mol = 27.77 mol	
	Let n <sub>co2</sub> = n mol	
	$X_{CO2} = n/(27.77 + n) = 1.51 \times 10^{-3}$	1/2
	$n_{co2} = 1.51 \times 10^{-3} \times 27.77 \text{ mol} = 0.042 \text{ mol}$	1
25	a) i) The solutions which obey Raoult's law over the entire range of concentration.	1
25	ii) It is the excess pressure that must be applied to a solution to prevent osmosis.	1
	<b>b</b> ) $\Delta T_b = i K_b m$	
	Here, $m = w_B x 1000 / M_B X w_A$	1
	$\Delta T_b = [3 \times 0.512 \text{ K kg mol}^{-1} \times 1000 \times 10 \text{ g}] / [111 \text{ g mol}^{-1} \times 200\text{g}]$ = 0.69K	1
	= 0.09K	1
26	a) A: $NO_2$ ; B: $N_2O_4$	1/2 , 1/2 ,
	NaNO <sub>3</sub> + conc. $H_2SO_4 \longrightarrow$ NaHSO <sub>4</sub> + HNO <sub>3</sub> (or any other nitrate)	1
	$Cu + 4 HNO_3 \longrightarrow Cu(NO_3)_2 + 2 NO_2 + 2 H_2O$ $2NO_2 \_ cool \_ N_2O_4$	1
	b).	1
	0	
	F	
	Xe	
		1
	OR	
26	a) i) Stability of higher oxidation state decreases down the group from S to Te/ Stability of	1
	lower oxidation state increases down the group from S to Te.	-
	ii) $CIO_3^-$ is more stable than $CIO^- / CIO_3^-$ is a weak conjugate base than than $CIO^- / Due$ to	1
	higher oxidation state of chlorine in HClO <sub>3</sub>	

 $\begin{array}{c|c} \mbox{iii) Fluorine and oxygen are most electronegative and very reactive.} & 1 \\ \mbox{b)} \\ \mbox{i)} \ . & 1 \\ \mbox{4NaCl} + \ MnO_2 + \ 4H_2SO_4 \rightarrow \ MnCl_2 + \ 4NaHSO_4 + \ 2H_2O + \ Cl_2 \\ \mbox{ii)} \ . & 1 \\ \mbox{6XeF}_4 + \ 12 \ \ H_2O \rightarrow \ 4Xe + \ 2XeO_3 + \ 24 \ \ HF + \ 3 \ \ O_2 \\ \end{array}$ 

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# Marking scheme – 2017 (Compartment)

# CHEMISTRY (043)/ CLASS XII

#### Set 56/3

Q.No	Value Points	Marks
1	OH OH Br I	1
	$+ 3 Br_2 \longrightarrow Br$	
	Br / 2,4,6-Tribromophenol is formed	
2	Dichloridobis(ethane-1,2-diamine)cobalt(III) ion	1
3	AgBr	1
4	N,N-dimethylbutan-1-amine	1
5	Dispersed phase - liquid/ water ; Dispersion medium – liquid/ oil	1
6	a) CH <sub>3</sub> -CH(Br)-CH <sub>3</sub> alr KOH CH <sub>3</sub> -CH=CH <sub>2</sub> HBr, Peroxide CH <sub>3</sub> -CH <sub>2</sub> -CH <sub>2</sub> -Br	1
	b) .	
	Cl	
	+ $Cl_2 \xrightarrow{Fe} dark$ $Cl \\ conc. H_2SO_4$	
	$+ Cl_2 \xrightarrow{Fe} (1 - \frac{Fe}{1 - Fe}{1 - \frac{Fe}{1 - \frac{Fe}{1 - Fe}}}}}}}}}}}}}}}}}}}}}}}}}}$	1
	conc. H <sub>2</sub> SO <sub>4</sub>	1
	NO <sub>2</sub>	
7	i) Due to absence of unpaired electrons	1
	ii) Due to high $\Delta_{a}H^{\phi}$ and low $\Delta_{hyd}H^{\phi}$	1
8	Hypophosphorous acid is a good reducing agent as it contains two P-H bonds. There is no	1
0	P-H bond in orthophosphoric acid, so it is not a reducing agent	1
	Example : It reduces $AgNO_3$ to metallic silver/ chemical equation	1
9	$Cu^{2+}(aq) + 2e \rightarrow Cu(s)$	1
	Because it has higher reduction potential	1
10.	i) Zero Order	1
	ii) Pseudo-first Order	1
11	a) i)The impurities are more soluble in the melt than in the solid state of the metal.	1
	ii)The more basic / reactive metal gets deposited at the cathode and the less	
	basic / reactive ones go to the anode mud.	1
	b) i)Ni ii) Ti/Zr	1/2 , 1/2
42		
12	i) High energy of activation is needed	1
	ii) Blood being a colloidal solution, it gets coagulated by alum (an electrolyte ).	1
13	iii) Dust particles along with water suspended in air scatter blue light which reaches our eyes. A: $Na_2CrO_4$ ; B: $Na_2Cr_2O_7$	1
12	4 FeCr <sub>2</sub> O <sub>4</sub> + 8 Na <sub>2</sub> CO <sub>3</sub> + 7 O <sub>2</sub> $\rightarrow$ 8 Na <sub>2</sub> CrO <sub>4</sub> + 2 Fe <sub>2</sub> O <sub>3</sub> + 8 CO <sub>2</sub>	½,½ 1
		<b>–</b>
	$2\mathrm{Na}_{2}\mathrm{CrO}_{4} + 2 \mathrm{~H}^{+} \rightarrow \mathrm{Na}_{2}\mathrm{Cr}_{2}\mathrm{O}_{7} + 2 \mathrm{~Na}^{+} + \mathrm{H}_{2}\mathrm{O}$	1
		-
	OR	
13	a) i)Due to d-d transition	1
	ii)Due to higher oxidation state of Mn in $Mn_2O_7$ / Due to high polarizing power of $M_2O(41)$	1
	Mn(VII).	
L	b) $\mu = \sqrt{4(4+2)} = 4.90 \text{ B.M}$	1
14	$\Delta rG^{\circ} = -nFE^{\circ}_{cell}$ , n=6	1/2

	$-6 \times 06500 \text{ C/mal } \times 2.02 \text{V}$				
	= - 6 × 96500 C/ mol × 2.02V = -1169580 J /mol or -116.958 kJ/mol	1			
	$E_{cell}^{\circ} = 0.059V / n \times \log Kc$	1 1/2			
	$\log \text{Kc} = 2.02 \text{ V} \times 6 / 0.059 \text{ V} = 205.42$	1			
15	$\log RC = 2.02 V \times 0 / 0.039 V = 203.42$ In bcc, z=2 ;	1			
12					
	$d = (zxM) / a^3 x N_A $ (i)	1			
	Putting values of M in equation (i)	1			
	M= 7.2g/ cm <sup>3</sup> x(288 x10 <sup>-10</sup> cm) <sup>3</sup> $N_A$ / 2				
	= 51.8 g/ mol				
	(or any other correct method )	1			
16					
	ii)They fail to form Hydrogen bonds with water/ more energy is required to break hydrogen	1			
	bonds in water and less energy is released when new attractions are set up.				
47	b)2-Bromo-2-methylbutane < 2-Bromopentane < 1-Bromopentane	1			
17	i) A: $CH_3$ - $CH_2CN$ ; B: $CH_3$ - $CH_2$ - $CH_2NH_2$ ; C: $CH_3$ - $CH_2$ - $CH_2$ - $NH$ -COCH <sub>3</sub> NO <sub>2</sub> NH <sub>2</sub>	½ ×3			
	$\downarrow$ $\downarrow$ $\downarrow$ $\downarrow$ $\downarrow$				
	+ -	1/			
	ii) A: $Ar - N_2BF_4$ ; B: C:	½ ×3			
18.	a) Because they are excreted in urine and cannot be stored in body; Vitamin C / $B_1$ /	1/2 , 1/2			
_	$B_2/B_6$				
	b) i) Essential amino acids are those which cannot be synthesized in the body and are	1			
	supplied through diet whereas non-essential amino acid can be synthesized				
	in the body				
	ii) In fibrous proteins, the polypeptide chains run parallel and are held together by	1			
	hydrogen or disulphide bonds while in globular, polypeptide chains coil around to give a spherical shape				
19.	i) Phenol / 0.2 % phenol is antiseptic while 1% is disinfectant.	1			
15.	ii) Aspartame	1			
	iii) Cationic detergents are quaternary ammonium salts of amines with acetates,	-			
	chlorides or bromides as anions/ Cationic part has a long chain hydrocarbon	1			
	which is involved in cleansing action.				
20.	i) $[Cr(H_2O)_6]Cl_3$	1			
	<ul><li>ii) Hexaaquachromium(III) chloride</li><li>iii) Paramagnetic and high spin</li></ul>	1			
		1/2 , 1/2			
21	$t_{1/2} = \frac{0.093}{k}$	1/2			
	$k = = \frac{0.693}{693 s}$				
	$693 s = 0.001 s^{-1}$	1			
	$k = \frac{2.303}{t} \log [R]o/[R]$	1/			
		1/2			
	$t = \frac{2.303}{k} \log [R]o/[R]$				
	$=\frac{2.303}{0.001} \log 100/10$				
	k = 2303  s	1			
22	a) Due to resonance, phenoxide ion is more stable than phenol whereas there is no	1			
	resonance in alkoxide ion / explained with the help of resonating structures.	-			
	b) .				
l	I	1			

	н	
	(i) $CH_3 - CH_2 - \overset{\cdots}{O} - H + H^+ \longrightarrow CH_3 - CH_2 - \overset{\cdots}{O} - H$	1/2
	(ii) $CH_{3}CH_{2} - \overset{\bigcirc}{H} + CH_{3} - CH_{2} - \overset{\frown}{O} + \overset{H}{H} \rightarrow CH_{3}CH_{2} - \overset{+}{O} - CH_{2}CH_{3} + H_{2}O$	1
	(iii) $CH_{3}CH_{2} \xrightarrow{+} O - CH_{2}CH_{3} \longrightarrow CH_{3}CH_{2} - O - CH_{2}CH_{3} + H^{+}$ H	1∕₂
23	a) Poly $\beta$ -hydroxybutyrate – co- $\beta$ -hydroxyvalerate / (PHBV)	1/2
	$\begin{array}{c} OH \\ CH_{3}-CH-CH_{2}-COOH \\ Monomers: \end{array}, CH_{3}-CH_{2}-CH_{2}-CH_{2}-CH_{2}-CH_{2}-COOH \\ Repeating unit: \end{array}$	Y <sub>2</sub> , Y <sub>2</sub>
	$ \begin{array}{c} \left( \begin{array}{c} \mathbf{O} - \mathbf{CH} - \mathbf{CH}_2 - \mathbf{C} \\   &   \\ \mathbf{CH}_3 \end{array} \right) \left( \begin{array}{c} \mathbf{O} - \mathbf{CH} - \mathbf{CH}_2 - \mathbf{C} \\   &   \\ \mathbf{CH}_3 \end{array} \right) \left( \begin{array}{c} \mathbf{O} \\ \mathbf{CH}_2 \mathbf{CH}_3 \end{array} \right) \left( \begin{array}{c} \mathbf{O} \\ \mathbf{CH}_3 \mathbf{CH}_3 \end{array} \right) \left( \begin{array}{c} $	½
	<ul> <li>b) PHBV is used in speciality packaging, orthopaedic devices and in controlled release of drugs.(any two)</li> <li>c) Concern for environment, caring (or any other)</li> </ul>	1/2 , 1/2 1/2 , 1/2
24	a) A: NO <sub>2</sub> ; B: N <sub>2</sub> O <sub>4</sub> NaNO <sub>3</sub> + conc. H <sub>2</sub> SO <sub>4</sub> $\longrightarrow$ NaHSO <sub>4</sub> + HNO <sub>3</sub> (or any other nitrate) Cu + 4 HNO <sub>3</sub> $\longrightarrow$ Cu(NO <sub>3</sub> ) <sub>2</sub> + 2 NO <sub>2</sub> + 2 H <sub>2</sub> O 2NO <sub>2</sub> $\_$ cool $\longrightarrow$ N <sub>2</sub> O <sub>4</sub> b) .	½,½, 1 1 1
	F F F F	1
	OR	
24	<ul> <li>a) i) Stability of higher oxidation state decreases down the group from S to Te/ Stability of lower oxidation state increases down the group from S to Te.</li> <li>ii) ClO<sub>3</sub><sup>-</sup> is more stable than ClO<sup>-</sup> / ClO<sub>3</sub><sup>-</sup> is a weak conjugate base than than ClO<sup>-</sup> / Due to higher oxidation state of obligation in UClO</li> </ul>	1 1
	<ul> <li>higher oxidation state of chlorine in HClO<sub>3</sub></li> <li>iii) Fluorine and oxygen are most electronegative and very reactive.</li> <li>b)</li> </ul>	1
	i). $4NaCl + MnO_2 + 4H_2SO_4 \rightarrow MnCl_2 + 4NaHSO_4 + 2H_2O + Cl_2$ ii).	1
	$6\mathrm{XeF_4}+12~\mathrm{H_2O}\rightarrow4\mathrm{Xe}+2\mathrm{XeO_3}+24~\mathrm{HF}+3~\mathrm{O_2}$	1
25	a) i) Due to steric and + I effect of two methyl groups in propanone.	1
	ii) Because it is a deactivating group / Due to electron withdrawing carboxylic group resulting in decreased electron density at o- and p- position.	1
	<ul><li>iii) Due to resonance, electrophilicity of carbonyl carbon is reduced.</li><li>b) i) Add NaOH and I<sub>2</sub> to both the compounds and heat, acetophenone forms yellow ppt of</li></ul>	1
	iodoform.	1
	ii) Add NaHCO <sub>3</sub> solution to both the compounds, Benzoic acid will give effervescence and liberates CO <sub>2</sub> .	1
	(Or any other suitable test)	

	OR					
25	25 a) A: $CH_3CHO$ ; B: $CH_3$ - $CH(OH)$ - $CH_2$ - $CHO$ ; C: $CH_3$ - $CH=CH$ - $CHO$ ; D: $CH_3$ - $CH(CH_3)$ - $OH$					
	b) $CH_3^{-}O-CH_3 \stackrel{<}{<} CH_3CHO < CH_3-CH_2-OH < CH_3-COOH$	1				
26	a) Vapour pressure of the solvent decreases in the presence of non – voilatile solute (glucose) hence boiling point increases	2				
	b) $p_{CO2} = K_H X_{CO2}$	1/2				
	$X_{co2} = p_{co2}/K_{H}$					
	$= 2.53 \times 10^5$ Pa / 1.67 $\times 10^8$ Pa $= 1.51 \times 10^{-3}$	1				
	n <sub>H20</sub> = 500g / 18 g/mol = 27.77 mol					
	Let n <sub>co2</sub> = n mol					
	$X_{CO2} = n/(27.77 + n) = 1.51 \times 10^{-3}$	1/2				
	$n_{c02} = 1.51 \times 10^{-3} \times 27.77 \text{ mol} = 0.042 \text{ mol}$	1				
	OR					
26	a) i) The solutions which obey Raoult's law over the entire range of concentration.	1				
	ii) It is the excess pressure that must be applied to a solution to prevent osmosis.	1				
	b) $\Delta T_{b} = i K_{b} m$					
	Here , $m = w_B x 1000 / M_B X w_A$	1				
	$\Delta T_{b} = [3 \times 0.512 \text{ K kg mol}^{-1} \times 1000 \times 10 \text{ g}] / [111 \text{ g mol}^{-1} \times 200\text{ g}]$	1				
	= 0.69K	1				

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