Strictly Confidential   (For Internal and Restricted Use Only)

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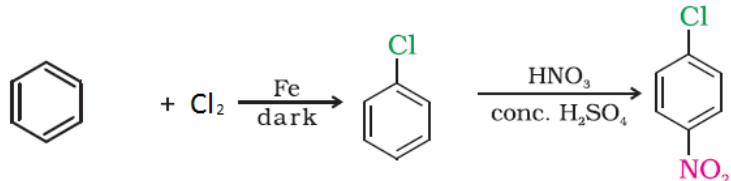# Marking Scheme ------- Chemistry

General Instructions

1. 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.

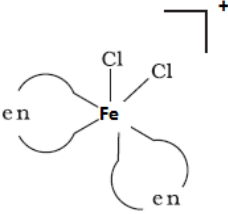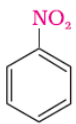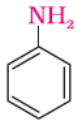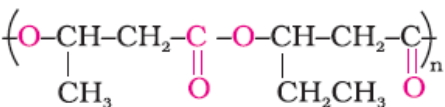14. Every Examiner should acquaint himself/herself with the marking schemes of all the sets.

Marking scheme – 2017 (Compartment)

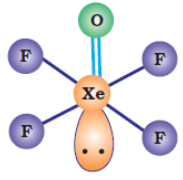# CHEMISTRY (043)/ CLASS XII

Set 56/1

Q.No	Value Points	Marks
1	Frenkel defect	1
2	Liquid –liquid colloidal systems ; example- milk (or any other)	½ , ½
3	Dichloridobis(ethane-1,2-diamine)cobalt(III) ion	1
4	/ Benzoquinone is formed	1
5	N,N-dimethylbutan-1-amine	1
6	$Ag^+ (aq) + e^- \rightarrow Ag(s)$ Because it has higher reduction potential	1 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 Example : It reduces $AgNO_3$ to metallic silver/ chemical equation	1 1
8	a) Due to high activation energy b) Rate = k $[A_2]^0$ $[B_2]^0$	1 1
	OR	
8	$R \rightarrow P$ $Rate = -\dfrac{d[R]}{dt} = k[R]$ or $\dfrac{d[R]}{[R]} = -kdt$ Integrating this equation, we get $\ln[R] = -kt + I$ (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 $\ln[R]_0 = -k \times 0 + I$ $\ln[R]_0 = I$ Substituting the value of I in equation (4.8) $\ln[R] = -kt + \ln[R]_0$ (4.9) Rearranging this equation $\ln\dfrac{[R]}{[R]_0} = -kt$ or $k = \dfrac{1}{t}\ln\dfrac{[R]_0}{[R]}$ $k = \dfrac{2.303}{t}\log\dfrac{[R]_0}{[R]}$	1 1
9	i. Because it has incompletely filled d orbitals in one of its oxidation state (Cu^{2+})	1

     Courtesy : CBSE

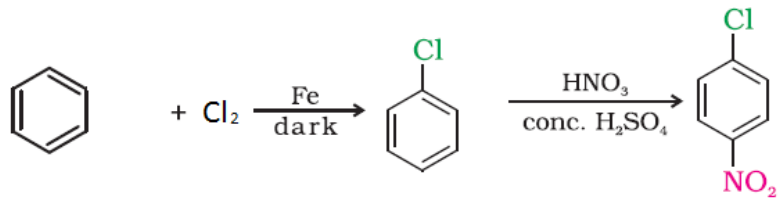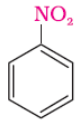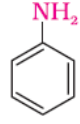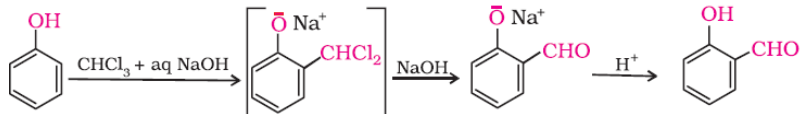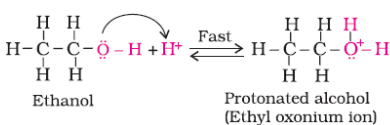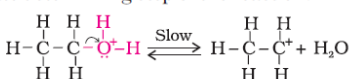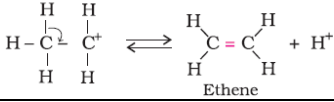|		
	ii. Cr^{2+} (d^4) changes to Cr^{3+} (d^3) while Fe^{2+} (d^6) changes to Fe^{3+} (d^5) . In aqueous medium d^3 is more stable than d^5.	1
10.	a) $CH_3\text{-}CH(Br)\text{-}CH_3$ $\xrightarrow{\text{alc KOH}}$ $CH_3\text{-}CH=CH_2$ $\xrightarrow{\text{HBr, Peroxide}}$ $CH_3\text{-}CH_2\text{-}CH_2\text{-}Br$	1
	b) .	1
11	In bcc, z=2 ; $d = (zxM) /a^3 x\ N_A$ (i) Putting values of M in equation (i) $M= 7.2g/ cm^3 \times (288\ x10^{-10}\ cm)^3\ N_A / 2$ $= 51.8\ g/ mol$ (or any other correct method)	1 1 1
12	$\Delta rG^o = -nFE^o_{cell}$, n=6 $= -6 \times 96500\ C/ mol \times 0.34V$ $= -196860\ J /mol$ or $-196.860\ kJ/mol$ $E^o_{cell}= 0.059V / n \times log\ Kc$ $log\ Kc = 0.34\ V \times 6 / 0.059V = 34.5762$	½ 1 ½ 1
13	$t= \dfrac{2.303}{k} log\ [R]o/[R]$ $t_{99\%}= \dfrac{2.303}{k} log\ 100/1 = \dfrac{2.303}{k} \times 2$ ----- (i) $t_{90\%}= \dfrac{2.303}{k} log\ 100/10 = \dfrac{2.303}{k}$ -------(ii) Dividing equation (i) by (ii) $\dfrac{t_{99\%}}{t_{90\%}} = \dfrac{\dfrac{2.303}{k} \times 2}{\dfrac{2.303}{k}}$ $t_{99\%}= 2\ t_{90\%}$	1 1 1
14	i) The colloidal particles scatter light in all directions in space. 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. iii) As the adsorption is an exothermic process, it decreases with increase in temperature.	1 1 1
15	a) i)The impurities are more soluble in the melt than in the solid state of the metal. ii)The more basic / reactive metal gets deposited at the cathode and the less basic / reactive ones go to the anode mud. b) i)Ni ii) Ti/Zr	1 1 ½ , ½
16	A: Na_2CrO_4 ; B: $Na_2Cr_2O_7$ $4\ FeCr_2O_4 + 8\ Na_2CO_3 + 7\ O_2 \rightarrow 8\ Na_2CrO_4 + 2\ Fe_2O_3 + 8\ CO_2$ $2Na_2CrO_4 + 2\ H^+ \rightarrow Na_2Cr_2O_7 + 2\ Na^+ + H_2O$	½ , ½ 1 1
	OR	
16	a) i)Due to d-d transition ii)Due to higher oxidation state of Mn in Mn_2O_7 / Due to high polarizing power of Mn(VII). b) $\mu = \sqrt{4(4+2)} = 4.90\ B.M$	1 1 1

17	Hybridisation : d^2sp^3 Magnetic character : Paramagnetic 	1 1 1
18.	a) i)Due to –I effect of X , the ring gets partially deactivated ii)They fail to form Hydrogen bonds with water/ more energy is required to break hydrogen bonds in water and less energy is released when new attractions are set up. b)2-Bromo-2-methylbutane < 2-Bromopentane < 1-Bromopentane	1 1 1
19.	a) Due to resonance, phenoxide ion is more stable than phenol whereas there is no resonance in alkoxide ion / explained with the help of resonating structures. b) . 	1 ½ 1 ½
20.	i) A: $CH_3\text{-}CH_2CN$; B: $CH_3\text{-}CH_2\text{-}CH_2NH_2$; C: $CH_3\text{-}CH_2\text{-}CH_2\text{-}NH\text{-}COCH_3$ ii) A: $Ar-\overset{+}{N_2}\overset{-}{B}\overset{-}{F}_4$; B: C :	½ ×3 ½ ×3
21	a) Because they are excreted in urine and cannot be stored in body; Vitamin C / B_1 / B_2/ B_6 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 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	½ , ½ 1 1
22	i) Phenol / 0.2 % phenol is antiseptic while 1% is disinfectant. ii) Aspartame 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.	1 1 1
23	a) *Poly β-hydroxybutyrate – co-β-hydroxyvalerate / (PHBV)* *Monomers :* *Repeating unit :* 	½ ½ , ½ ½

Courtesy : CBSE

	b) PHBV is used in speciality packaging, orthopaedic devices and in controlled release of drugs.(any two)	½ , ½
	c) Concern for environment , caring (or any other)	½ , ½
24	a) Vapour pressure of the solvent decreases in the presence of non – voilatile solute (glucose) hence boiling point increases	2
	b) $p_{CO2} = K_H X_{CO2}$	½
	$X_{CO2} = p_{CO2} / K_H$	
	$= 2.53 \times 10^5$ Pa / 1.67×10^8 Pa $= 1.51 \times 10^{-3}$	1
	$n_{H2O} = 500g / 18$ g/mol $= 27.77$ mol	
	Let $n_{CO2} = n$ mol	
	$X_{CO2} = n / (27.77 + n) = 1.51 \times 10^{-3}$	½
	$n_{CO2} = 1.51 \times 10^{-3} \times 27.77$ mol $= 0.042$ mol	1
	OR	
24	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
	$\Delta T_b = [3 \times 0.512$ K kg mol$^{-1} \times 1000 \times 10$ g$] / [111$ g mol^{-1} x200g$]$	1
	$= 0.69$K	1
25	a) A: NO_2 ; B: N_2O_4	½ , ½ ,
	$NaNO_3 +$ conc. $H_2SO_4 \longrightarrow NaHSO_4 + HNO_3$ (or any other nitrate)	1
	$Cu + 4 HNO_3 \longrightarrow Cu(NO_3)_2 + 2 NO_2 + 2 H_2O$	1
	$2NO_2 \xrightarrow{cool} N_2O_4$	1
	b) .	1
	OR	
25	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.	1
	ii) ClO_3^- is more stable than ClO^- / ClO_3^- is a weak conjugate base than ClO^- / Due to higher oxidation state of chlorine in $HClO_3$	1
	iii) Fluorine and oxygen are most electronegative and very reactive.	1
	b)	
	i) .	
	$4NaCl + MnO_2 + 4H_2SO_4 \rightarrow MnCl_2 + 4NaHSO_4 + 2H_2O + Cl_2$	1
	ii).	
	$6XeF_4 + 12 H_2O \rightarrow 4Xe + 2XeO_3 + 24 HF + 3 O_2$	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.	1
	b) i) Add NaOH and I_2 to both the compounds and heat, acetophenone forms yellow ppt of iodoform.	1
	ii) Add $NaHCO_3$ solution to both the compounds, benzoic acid will give effervescence and liberate CO_2.	1
	(Or any other suitable test)	
	OR	
26	a) A: CH_3CHO ; B: $CH_3-CH(OH)-CH_2-CHO$; C: $CH_3-CH=CH-CHO$;	1×4

D: CH_3-CH(CH_3)-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	½ , ½
2	Tetraamminechloridonitrito-N -cobalt(III) ion	1
3	N,N-dimethylbutan-1-amine	1
4	Schottky Defect	1
5	/ Benzene is formed	1
6	a) Due to high activation energy b) Rate = k $[A_2]^0$ $[B_2]^0$	1 1
	OR	
6	$R \rightarrow P$ Rate $= -\dfrac{d[R]}{dt} = k[R]$ or $\dfrac{d[R]}{[R]} = -kdt$ Integrating this equation, we get ln [R] = − kt + I (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 × 0 + I ln $[R]_0$ = I Substituting the value of I in equation (4.8) ln[R] = -kt + ln$[R]_0$ (4.9) Rearranging this equation $\ln \dfrac{[R]}{[R]_0} = -kt$ or $k = \dfrac{1}{t} \ln \dfrac{[R]_0}{[R]}$ $k = \dfrac{2.303}{t} \log \dfrac{[R]_0}{[R]}$	1 1
7	i) Silver can exhibit +2 oxidation state wherein it will have incompletely filled d-orbital. ii) Much higher third ionisation energy of Mn where the required change is from d^5 to d^4	1 1
8	a) CH_3-CH(Br)-CH_3 $\xrightarrow{\text{alc KOH}}$ CH_3-CH=CH_2 $\xrightarrow{\text{HBr, Peroxide}}$ CH_3-CH_2-CH_2-Br b) .	1

		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 Example : It reduces $AgNO_3$ to metallic silver/ chemical equation	1 1
10.	$Ag^+ (aq) + e^- \longrightarrow Ag(s)$ Because it has higher reduction potential	1 1
11	i) Phenol / 0.2 % phenol is antiseptic while 1% is disinfectant. ii) Aspartame 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.	1 1 1
12	a) Because they are excreted in urine and cannot be stored in body; Vitamin C / B_1 / B_2/ B_6 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 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	½ , ½ 1 1
13	i) A: $CH_3- CH_2CN$; B: $CH_3- CH_2- CH_2NH_2$; C: $CH_3- CH_2- CH_2-NH-COCH_3$ ii) A: $Ar - \overset{+}{N_2}\overset{-}{BF_4}$; B: C :	½ ×3 ½ ×3
14	a) i)Due to –I effect of X , the ring gets partially deactivated ii)They fail to form Hydrogen bonds with water/ more energy is required to break hydrogen bonds in water and less energy is released when new attractions are set up. b)2-Bromo-2-methylbutane < 2-Bromopentane < 1-Bromopentane	1 1 1
15	i). ii) .	1 ½ ½ 1
16	Hybridisation : d^2sp^3 Spin : Low spin	1 1

17		1
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. iii)The more basic / reactive metal gets deposited at the cathode and the less basic / reactive ones go to the anode mud.	1 1 1
18.	A: Na_2CrO_4 ; B: $Na_2Cr_2O_7$ $4\ FeCr_2O_4 + 8\ Na_2CO_3 + 7\ O_2 \rightarrow 8\ Na_2CrO_4 + 2\ Fe_2O_3 + 8\ CO_2$ $2Na_2CrO_4 + 2\ H^+ \rightarrow Na_2Cr_2O_7 + 2\ Na^+ + H_2O$	½ , ½ 1 1
	OR	
18	a) i)Due to d-d transition ii)Due to higher oxidation state of Mn in Mn_2O_7 / Due to high polarizing power of Mn(VII). b) $\mu = \sqrt{4(4+2)}$ = 4.90 B.M	1 1 1
19.	i) The colloidal particles scatter light in all directions in space. 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. iii) As the adsorption is an exothermic process, it decreases with increase in temperature.	1 1 1
20.	$t = \frac{2.303}{k}\ log\ [R]o/[R]$ $t_{99\%} = \frac{2.303}{k}\ log\ 100/1\ = \frac{2.303}{k} \times 2$ ----- (i) $t_{90\%} = \frac{2.303}{k}\ log\ 100/10\ = \frac{2.303}{k}$ -------(ii) Dividing equation (i) by (ii) $\dfrac{t_{99\%}}{t_{90\%}} = \dfrac{\frac{2.303}{k} \times 2}{\frac{2.303}{k}}$ $t_{99\%} = 2\ t_{90\%}$	 1 1 1
21	In bcc, z=2 ; d = (zxM) /a^{3}x N$_A$ (i) Putting values of M in equation (i) M= 7.2g/ cm^3 x(288 x10^{-10} cm)^3 N$_A$ / 2 = 51.8 g/ mol (or any other correct method)	 1 1 1

22	$\Delta_r G^o$ = -nFE$^o_{cell}$, n=6
	    = - 6 × 96500 C/ mol × 0.30 V
	      = -173700 J /mol = -173.7 kJ/mol
	E$^o_{cell}$= 0.059V / n × log Kc
	log Kc = 0.30 V ×6 / 0.059V = 30.5
		½
		
		1
		½
		1

23	a) *Poly β-hydroxybutyrate – co-β-hydroxyvalerate / (PHBV)* *Monomers :* CH_3–$\overset{\overset{\displaystyle OH}{\textstyle\vert}}{CH}$–$CH_2$–COOH , CH_3–CH_2–$\overset{\overset{\displaystyle OH}{\textstyle\vert}}{CH}$–$CH_2$–COOH	½ ½ , ½

		Repeating unit : *b)* PHBV is used in speciality packaging, orthopaedic devices and in controlled release of drugs.(any two) c) Concern for environment , caring (or any other)	½ ½ , ½ ½ , ½
24		a) i) Due to steric and + I effect of two methyl groups in propanone. ii) Because it is a deactivating group / Due to electron withdrawing carboxylic group resulting in decreased electron density at o- and p- position. 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 iodoform. ii) Add $NaHCO_3$ solution to both the compounds, benzoic acid will give effervescence and liberates CO_2. (Or any other suitable test)	1 1 1 1 1
		OR	
24		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 < CH_3CHO < CH_3-CH_2-OH < CH_3-COOH	1×4 1
25		a) Vapour pressure of the solvent decreases in the presence of non – voilatile solute (glucose) hence boiling point increases b) p_{CO2} = K_H X_{CO2} X_{CO2} = p_{CO2}/ K_H = 2.53 × 10^5 Pa / 1.67 × 10^8 Pa = 1.51 × 10^{-3} n_{H2O} = 500g / 18 g/mol = 27.77 mol Let n_{CO2} = n mol X_{CO2} = n/ (27.77 +n) = 1.51 × 10^{-3} n_{CO2} = 1.51 × 10^{-3} × 27.77 mol = 0.042 mol	2 ½ 1 ½ 1
		OR	
25		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) ΔT_b = i K_b m Here , m = w_Bx 1000/ M_BX w_A ΔT_b =[3 x 0.512 K kg mol^{-1} × 1000 × 10 g] / [111 g mol^{-1} x200g] = 0.69K	1 1 1 1 1
26		a) A: NO_2 ; B: N_2O_4 $NaNO_3$ + conc. H_2SO_4 ⟶ $NaHSO_4$ + HNO_3 (or any other nitrate) Cu + 4 HNO_3 ⟶ $Cu(NO_3)_2$ + 2 NO_2 + 2 H_2O 2NO_2 ⟶cool N_2O_4 b) .	½ , ½ , 1 1 1 1
		OR	
26		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. ii) ClO_3^- is more stable than ClO^- / ClO_3^- is a weak conjugate base than than ClO^- / Due to higher oxidation state of chlorine in $HClO_3$	1 1

		1
iii) Fluorine and oxygen are most electronegative and very reactive. b) i) . $$4NaCl + MnO_2 + 4H_2SO_4 \rightarrow MnCl_2 + 4NaHSO_4 + 2H_2O + Cl_2$$ ii). $$6XeF_4 + 12 H_2O \rightarrow 4Xe + 2XeO_3 + 24 HF + 3 O_2$$		1
		1

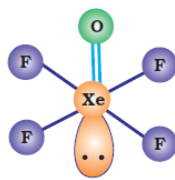| 1	Dr. (Mrs.) Sangeeta Bhatia		6	Sh. Rakesh Dhawan	
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Marking scheme – 2017 (Compartment)

CHEMISTRY (043)/ CLASS XII

Set 56/3

Q.No	Value Points	Marks
1	/ 2,4,6-Tribromophenol is formed	1
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) $CH_3\text{-}CH(Br)\text{-}CH_3$ $\xrightarrow{\text{alc KOH}}$ $CH_3\text{-}CH=CH_2$ $\xrightarrow{\text{HBr, Peroxide}}$ $CH_3\text{-}CH_2\text{-}CH_2\text{-}Br$ b) .	1 1
7	i) Due to absence of unpaired electrons ii) Due to $\text{high } \Delta_a H^{\ominus} \text{ and low } \Delta_{hyd} H^{\ominus}$	1 1
8	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 Example : It reduces $AgNO_3$ to metallic silver/ chemical equation	1 1
9	Cu^{2+} (aq) + 2e$^-$ $\longrightarrow$ Cu (s) Because it has higher reduction potential	1 1
10.	i) Zero Order ii) Pseudo-first Order	1 1
11	a) i)The impurities are more soluble in the melt than in the solid state of the metal. ii)The more basic / reactive metal gets deposited at the cathode and the less basic / reactive ones go to the anode mud. b) i)Ni ii) Ti/Zr	1 1 ½ , ½
12	i) High energy of activation is needed ii) Blood being a colloidal solution, it gets coagulated by alum (an electrolyte). iii) Dust particles along with water suspended in air scatter blue light which reaches our eyes.	1 1 1
13	A: Na_2CrO_4 ; B: $Na_2Cr_2O_7$ $$4\,FeCr_2O_4 + 8\,Na_2CO_3 + 7\,O_2 \rightarrow 8\,Na_2CrO_4 + 2\,Fe_2O_3 + 8\,CO_2$$ $$2Na_2CrO_4 + 2\,H^+ \rightarrow Na_2Cr_2O_7 + 2\,Na^+ + H_2O$$	½ , ½ 1 1
	OR	
13	a) i)Due to d-d transition ii)Due to higher oxidation state of Mn in Mn_2O_7 / Due to high polarizing power of Mn(VII). b) $\mu = \sqrt{4(4+2)}$ = 4.90 B.M	1 1 1
14	$\Delta_r G^o$ = -nFE^o_{cell} , n=6	½

	= - 6 × 96500 C/ mol × 2.02V	
	= -1169580 J /mol or -116.958 kJ/mol	1
	E^o_{cell}= 0.059V / n × log Kc	½
	log Kc = 2.02 V ×6 / 0.059V = 205.42	1
15	In bcc, z=2 ; d = (zxM) /a^3x N_A (i) Putting values of M in equation (i) M= 7.2g/ cm^3 x(288 x10^{-10} cm)^3 N_A / 2 = 51.8 g/ mol (or any other correct method)	1 1 1
16	a) i)Due to –I effect of X , the ring gets deactivated ii)They fail to form Hydrogen bonds with water/ more energy is required to break hydrogen bonds in water and less energy is released when new attractions are set up. b)2-Bromo-2-methylbutane < 2-Bromopentane < 1-Bromopentane	1 1 1
17	i) A: CH_3- CH_2CN ; B: CH_3- CH_2- CH_2NH_2 ; C: CH_3- CH_2- CH_2-NH-$COCH_3$ ii) A: $Ar-\overset{+}{N_2}\overset{-}{B}F_4$; B: C :	½ ×3 ½ ×3

18.	a) Because they are excreted in urine and cannot be stored in body; Vitamin C / B_1 / B_2/ B_6
	  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
	   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
		½ , ½
		
		1
		
		1

19.	i) Phenol / 0.2 % phenol is antiseptic while 1% is disinfectant. ii) Aspartame 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.	1 1 1
20.	i) [Cr(H$_2$O)$_6$] Cl$_3$ ii) Hexaaquachromium(III) chloride iii) Paramagnetic and high spin	1 1 ½ , ½
21	$t_{1/2}$= $\frac{0.693}{k}$ k= = $\frac{0.693}{693\ s}$ = 0.001 s^{-1} k= $\frac{2.303}{t}$ log [R]o/[R] t= $\frac{2.303}{k}$ log [R]o/[R] =$\frac{2.303}{0.001}$ log 100/10 k = 2303 s	½ 1 ½ 1
22	a) Due to resonance, phenoxide ion is more stable than phenol whereas there is no resonance in alkoxide ion / explained with the help of resonating structures. b) .	1

	(i) $CH_3-CH_2-\ddot{O}-H + H^+ \longrightarrow CH_3-CH_2-\overset{+}{\underset{\cdot\cdot}{O}}-H$ with H on top	½
	(ii) $CH_3CH_2-\ddot{O}: + CH_3-CH_2-\overset{+}{O}\langle\begin{smallmatrix}H\\H\end{smallmatrix} \rightarrow CH_3CH_2-\overset{H}{\underset{}{O}}-CH_2CH_3 + H_2O$	1
	(iii) $CH_3CH_2-\overset{+}{\underset{H}{O}}-CH_2CH_3 \longrightarrow CH_3CH_2-O-CH_2CH_3 + \overset{+}{H}$	½
23	a) *Poly β-hydroxybutyrate – co-β-hydroxyvalerate / (PHBV)*	½
	Monomers : $CH_3-\overset{OH}{\underset{}{CH}}-CH_2-COOH$, $CH_3-CH_2-\overset{OH}{\underset{}{CH}}-CH_2-COOH$	½ , ½
	Repeating unit : $\left(O-\overset{}{\underset{CH_3}{CH}}-CH_2-\overset{}{\underset{O}{C}}-O-CH-CH_2-\overset{}{\underset{O}{C}}\right)_n$ with CH_2CH_3	½
	b) PHBV is used in speciality packaging, orthopaedic devices and in controlled release of drugs.(any two)	½ , ½
	c) Concern for environment , caring (or any other)	½ , ½
24	a) A: NO_2 ; B: N_2O_4	½ , ½ ,
	$NaNO_3 +$ conc. $H_2SO_4 \longrightarrow NaHSO_4 + HNO_3$ (or any other nitrate)	1
	$Cu + 4 HNO_3 \longrightarrow Cu(NO_3)_2 + 2 NO_2 + 2 H_2O$	1
	$2NO_2 \xrightarrow{cool} N_2O_4$	1
	b) .	
		1
	OR	
24	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.	1
	ii) ClO_3^- is more stable than ClO^- / ClO_3^- is a weak conjugate base than than ClO^- / Due to higher oxidation state of chlorine in $HClO_3$	1
	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
	$6XeF_4 + 12 H_2O \rightarrow 4Xe + 2XeO_3 + 24 HF + 3 O_2$	
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
	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 $NaHCO_3$ solution to both the compounds, Benzoic acid will give effervescence and liberates CO_2.	1
	(Or any other suitable test)	

		OR	
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 < CH_3CHO < CH_3-CH_2-OH < CH_3-COOH		1×4 1
26	a) Vapour pressure of the solvent decreases in the presence of non – voilatile solute (glucose) hence boiling point increases b) $p_{CO2} = K_H \, X_{CO2}$ $X_{CO2} = p_{CO2}/ K_H$ $= 2.53 \times 10^5$ Pa / 1.67×10^8 Pa = 1.51×10^{-3} n_{H2O} = 500g / 18 g/mol = 27.77 mol Let n_{CO2} = n mol X_{CO2} = n/ (27.77 +n) = 1.51×10^{-3} n_{CO2} = $1.51 \times 10^{-3} \times 27.77$ mol = 0.042 mol		2 ½ 1 ½ 1
		OR	
26	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) $\Delta T_b = i \, K_b \, m$ Here , m = w_B x 1000/ M_B X w_A ΔT_b =[3 x 0.512 K kg $mol^{-1} \times 1000 \times 10$ g] / [111 g mol^{-1} x200g] = 0.69K		1 1 1 1 1

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