

+2 PCB TEST – 6 (23.3.2019) Answer Key

CHEMISTRY

1. B

Sol. $d = \frac{Z \times M}{N_A \times V} \Rightarrow 2.70 = \frac{Z \times 27}{6.023 \times 10^{23} \times (405 \times 10^{-10})^3}$
 $Z = 4$

2. B

Sol. $Mg(NO_3)_2 \rightarrow Mg^{2+} + 2NO_3^-$
 $\alpha = \frac{i-1}{n-1} = \frac{2.74-1}{3-1} = \frac{1.74}{2} = 0.87$

Degree of dissociation = $0.87 \times 100 = 87\%$

3. A

Sol. Oxidation takes place at magnesium electrode and reduction at hydrogen electrode.

4. B

5. D

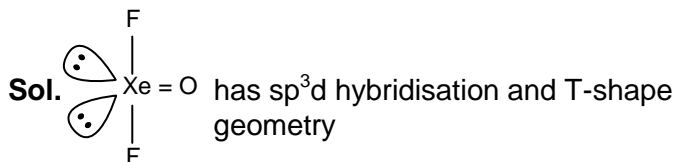
Sol. The unit of rate of reaction is $\text{mol L}^{-1} \text{s}^{-1}$. It does change with order.

6. A

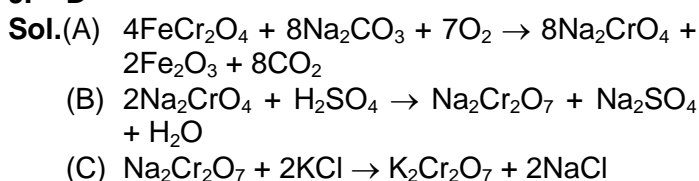
7. B

Sol. Calamine – $ZnCO_3$; Barytes – $BaSO_4$
 Cinnabar – HgS ; Limestone – $CaCO_3$

8. A

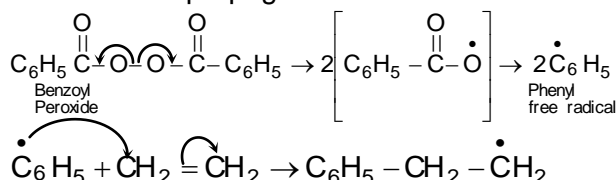


9. D

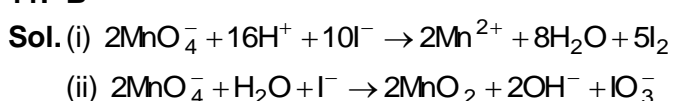


10. D

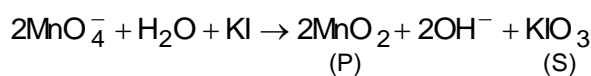
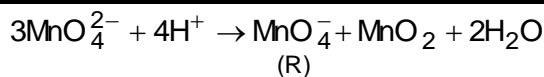
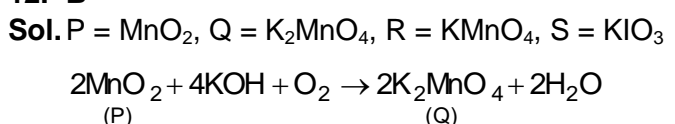
Sol. Free radical is generated by peroxide in the chain initiating step. The free radical join with monomers to propagate the chain.



11. B



12. B



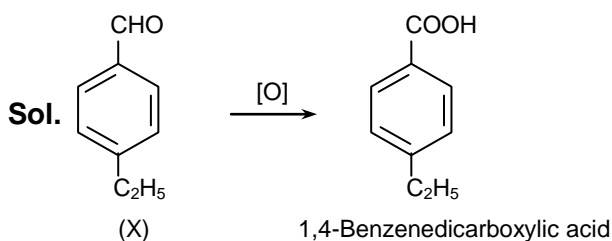
13. B

Sol. $La(OH)_3$ is most basic. Hence, (I) is wrong. (II) is correct due to lanthanoid contraction. (III) is correct because Ce^{4+} tends to change to stable Ce^{3+} .

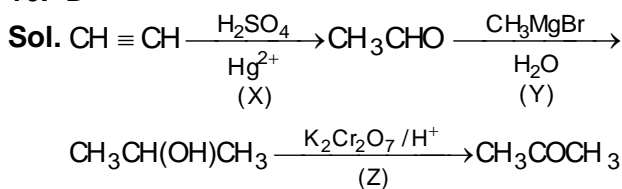
14. A

Sol. — CH_3 group is o, p-directing

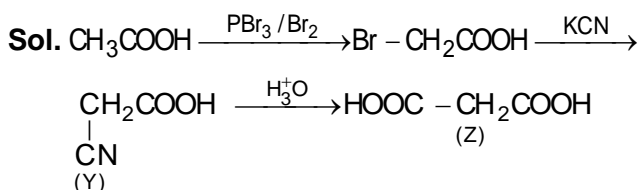
15. C



16. D

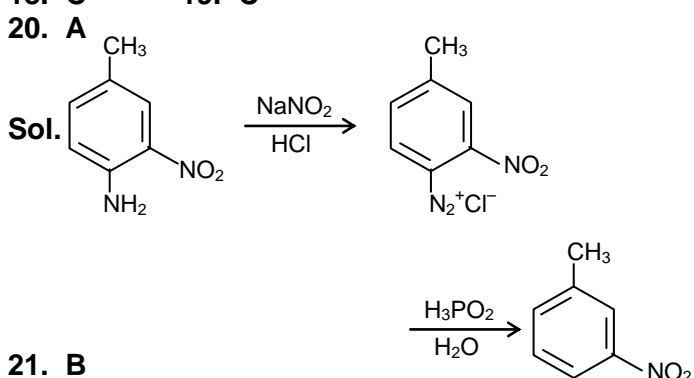


17. B

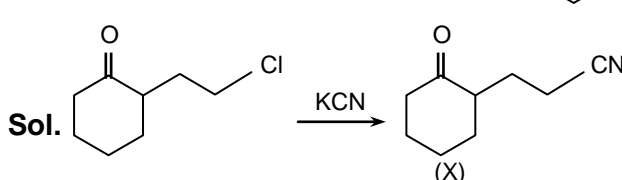


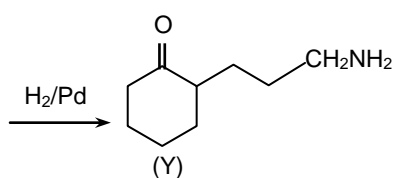
18. C

19. C



21. B





22. A

Sol. Pure monomers are required because even the traces of impurities act like inhibitors which leads to the formation of polymers with shorter chain lengths.

23. C

24. B

Sol. In (i) H_2O_2 reduces KMnO_4 to MnSO_4 and is oxidised to O_2 .

In (ii) H_2O_2 oxidises $\text{Cr}(\text{OH})_3$ to Na_2CrO_4 and is reduced to H_2O .

25. A

Sol. For cubic, $a = b = c$, $\alpha = \beta = \gamma = 90^\circ$

Tetragonal, $a = b \neq c$, $\alpha = \beta = \gamma = 90^\circ$

Orthorhombic, $a \neq b \neq c$, $\alpha = \beta = \gamma = 90^\circ$

Hexagonal, $a = b \neq c$, $\alpha = \beta = 90^\circ$, $\gamma = 120^\circ$

26. D

Sol. In fig. (Y) zinc is deposited at the zinc electrode and copper dissolves at copper electrode

27. C

Sol. The CFSE of the ligands is in the order: $\text{H}_2\text{O} < \text{NH}_3 < \text{CN}^-$

Hence, excitation energies is in the order:

$[\text{Co}(\text{H}_2\text{O})_6]^{3+} < [\text{Co}(\text{NH}_3)_6]^{3+} < [\text{Co}(\text{CN})_6]^{3-}$

From the relation $E = \frac{hc}{\lambda} \Rightarrow E \propto \frac{1}{\lambda}$

The order of absorption of wavelength of light in the visible region:

$[\text{Co}(\text{H}_2\text{O})_6]^{3+} > [\text{Co}(\text{NH}_3)_6]^{3+} > [\text{Co}(\text{CN})_6]^{3-}$

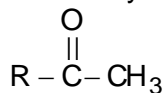
28. D

Sol. Iodoform is formed from

(i) $\text{CH}_3\text{CH}_2\text{OH}$

(ii) CH_3CHO

(iii) All carbonyl compounds of the type



(iv) 2° alcohol $\text{R} - \text{CHOH}$



(a) $\text{CH}_3\text{CH}_2 - \overset{\text{O}}{\parallel} \text{C} - \text{CH}_3$ $\text{R} - \overset{\text{O}}{\parallel} \text{C} - \text{CH}_3$ Yes

(b) $\text{CH}_3\overset{\text{O}}{\underset{\text{OH}}{\text{C}}}\text{HCH}_3$ $\text{R} - \overset{\text{O}}{\underset{\text{OH}}{\text{C}}}\text{HCH}_3$ Yes
 2° alcohol

(c) $\text{CH}_3\overset{\text{O}}{\parallel} \text{C}(\text{CH}_3)_2$ $\text{R} - \overset{\text{O}}{\parallel} \text{C} - \text{CH}_3$ Yes

(d) $\text{CH}_3\overset{\text{O}}{\parallel} \text{C}(\text{CH}_3)\text{CH}_2\text{OH}$ No

29. A

Sol. Depression in freezing point (ΔT_f) can be given as $\Delta T_f = i \cdot K_f \cdot m$. To solve this problem, we will have to first calculate the value of ΔT_f and i . Finally, put all the given valued and calculated value in the expression of

$$\Delta T_f = i \cdot K_f \cdot \frac{\text{mass of solute}}{\text{molar mass of solute} \times \text{mass of solvent}}$$

to calculate the mass of solute.

$\Delta T_f = \text{Freezing point of } \text{H}_2\text{O} - \text{freezing point of ethylene glycol solution} = 0 - (-6^\circ) = 6^\circ$

$K_f = 1.86^\circ \text{ kg mol}^{-1}$

$w_1 = \text{mass of ethylene glycol in grams}$

$w_2 = \text{mass of solvent (H}_2\text{O) in grams} = 4000 \text{ g}$

$m_1 = \text{Molar mass of ethylene glycol} = 62 \text{ g mol}^{-1}$

$i = \text{van't Hoff factor} = 1$ (ethylene glycol being non-electrolyte)

$$\Delta T_f = \frac{1000 K_f w_1(i)}{m_1 w_2}$$

$$\therefore 6 = \frac{1000 \times 1.86 \times w_1 \times 1}{62 \times 4000}$$

$w_1 = 800 \text{ g}$

30. D

Sol.(a) S_2 molecule is paramagnetic due to unpaired electrons in MO and is blue-coloured compound, thus true.

(b) The vapour at 100°C consists mostly of S_8 rings, thus correct.

(c) At 600°C , the gas mainly consists of S_2 molecules, thus correct.

(d) Oxidation states of sulphur are

- 2 in H_2S

0 in S_8

+2 in $\text{S}_2\text{O}_3^{2-}$

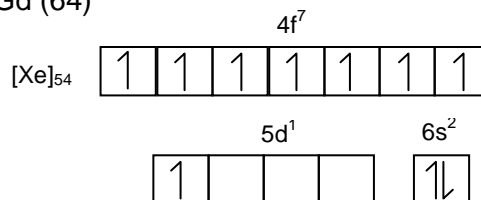
+4 in SO_2

+6 in SO_3

Thus, incorrect (Valency cannot be less than 4)

31. D

Sol. Gd (64)

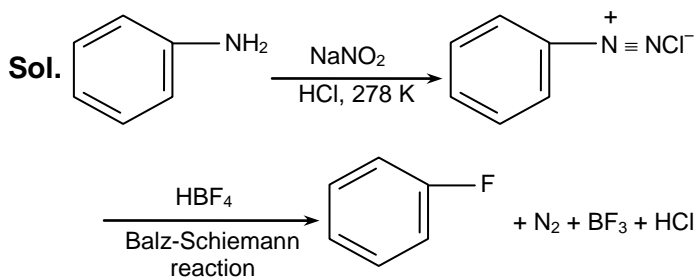


All the electron in 4f-orbital are unpaired, hence stable. Thus, Gd (64) has EC as

$[\text{Xe}]_{54} 4f^7 5d^1 6s^2$

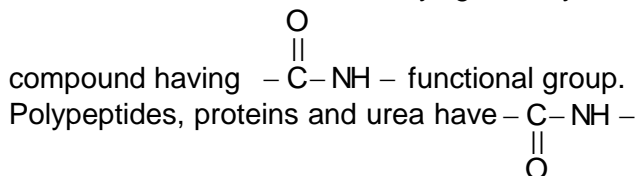
Instead of $[\text{Xe}]_{54} 4f^8 6s^2$

32. C



33. A

Sol. Biuret test is characteristically given by the



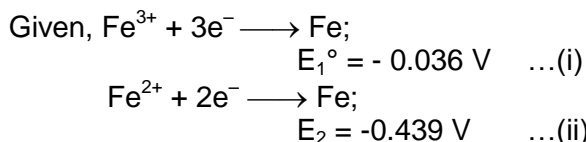
(peptide) linkage while carbohydrates have glycosidic linkage. So test of carbohydrates should be different from that of other three. Biuret test produces violet colour on addition of dil. CuSO_4 to alkaline solution of a compound containing peptide linkage.

34. C

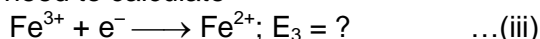
Sol. The most common oxidation state of lanthanoid is +3. Lanthanoids in +3 oxidation state usually have unpaired electrons in f-subshell and impart characteristic colour in solid as well as in solution state due to f-f transition. (Except lanthanum and lutetium).

35. C

Sol. Electrode potential is an intensive property, therefore, it cannot be calculated directly by solving equations. To determine it, we will have to calculate the value of ΔG for each equation by formula $\Delta G = -nE^\circ F$. Since, ΔG is an extensive property, therefore, it can be calculated by solving equations.



We need to calculate



We can obtain then (iii) by subtracting (ii) from (i) but E_3 , we cannot obtain that way because electrode potential is intensive property. That's when we determine E_3° .

Calculating $\Delta G_3 = \Delta G_1 - \Delta G_2$ [ΔG is an extensive property]

$$\Delta G_3 = 3 \times 0.036 F - 2 \times 0.439 F$$

$$\Delta G_3 = 0.108 F - 0.878 F$$

$$-1 \times F \times E_3^\circ = -0.770 F$$

$$E_3^\circ = 0.770 \text{ V}$$

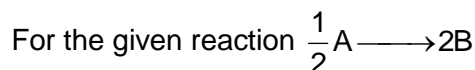
36. A

Sol. The splitting of d-orbitals depends on the strength of ligand. Strong ligand caused higher splitting of d-orbitals, i.e., higher CFSE for octahedral complexes. According to spectrochemical series, the correct order of strength of ligand is $\text{CN}^- > \text{NH}_3 > \text{H}_2\text{O} > \text{C}_2\text{O}_4^{2-}$. Thus the magnitude of Δ_0 will be the highest for $[\text{Co}(\text{CN})_6]^{3-}$.

37. B

Sol. For reaction, $aA \longrightarrow bB$

$$-\frac{1}{a} \frac{d[A]}{dt} = \frac{1}{b} \frac{d[B]}{dt} = \text{Rate of reaction}$$



$$-\frac{2d[A]}{dt} = \frac{1}{2} \frac{d[B]}{dt} = \text{Rate of reaction}$$

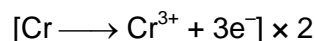
Rate of disappearance of A

$$= -\frac{d[A]}{dt} = \frac{1}{2 \times 2} \frac{d[B]}{dt} = \frac{1}{4} \frac{d[B]}{dt}$$

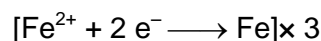
38. A

Sol. $\text{Cr} | \text{Cr}^{3+} (0.1 \text{ M}) || \text{Fe}^{2+} (0.01 \text{ M}) | \text{Fe}$

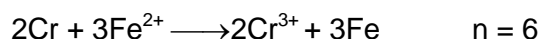
Oxidation half-cell



Reduction half-cell



Net cell reaction



$$E_{\text{cell}}^\circ = E_{\text{oxid}}^\circ + E_{\text{red}}^\circ = 0.72 - 0.42 = 0.30 \text{ V}$$

$$E_{\text{cell}} = E_{\text{cell}}^\circ - \frac{0.0591}{n} \log \frac{[\text{Cr}^{3+}]^2}{[\text{Fe}^{2+}]^3} = 0.30 - \frac{0.0591}{6} \log \frac{(0.1)^2}{(0.01)^3}$$

$$= 0.30 - \frac{0.0591}{6} \log \frac{10^{-2}}{10^{-6}}$$

$$= 0.30 - \frac{0.0591}{6} \log 10^4$$

$$E_{\text{cell}} = 0.2606 \text{ V}$$

39. C

Sol. Titration of oxalic acid by KMnO_4 in the presence of HCl gives unsatisfactory result because HCl is a better reducing agent than oxalic acid and HCl reduces preferably MnO_4^- to Mn^{2+} .

40. C

Sol. Higher the gold number, lesser will be the protective power of colloid.

41. D

Sol. Activity $\propto N$

$$\frac{N}{N_0} = \left(\frac{1}{2}\right)^n \quad \text{or} \quad \frac{1}{10} = \left(\frac{1}{2}\right)^n \quad \text{or} \quad 10 = 2^n$$

Taking log on both sides

$$\log 10 = n \log 2$$

$$n = \frac{1}{0.301} = 3.32$$

Time = $n \times$ half-life

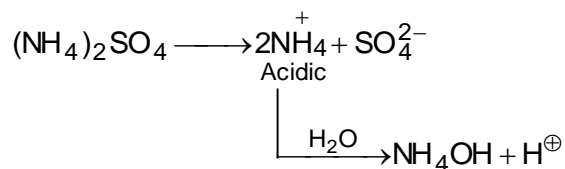
$$= 3.32 \times 30$$

$$= 99.6 \text{ days}$$

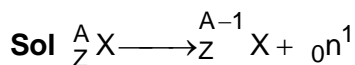
$$= 100 \text{ days}$$

42. D

Sol. Ammonium sulphate produce H^+ ions on hydrolysis. This will increase the acidity



43. A



Isotopes are species having same number of proton, but different number of neutron.

44. A

45. B