



Selection test – 2018

Sub: Chemistry

Class: 12

F.M: 70

Duration: 3 hrs 15 mins

Date: 12/11/2018

ANSWER KEY

Section – I

(Multiple choice type questions)

Choose the correct answer:

1×14=14

1. Cations are present in the interstitial sites in
 - a. Frenkel defect,
2. The correct order of the mobility of the alkali metal ions in aqueous solution is
 - b. $Rb^+ > K^+ > Na^+ > Li^+$
3. Which of the following electrolytes will have maximum coagulating value for AgI/Ag^+ sol
 - b. Na_3PO_4
4. A brown ring is formed in the ring test for the NO_3^- ion. It is due to the formation of
 - a. $[Fe(H_2O)_5(NO)]^{+2}$
5. Which of the following actinoids show oxidation state up to +7
 - b. Pu, d. Np.
6. Which of the given options are correct for $[Fe(CN)_6]^{-3}$ complex
 - a. d^2sp^3 hybridization
 - c. Paramagnetic
7. The position of Br in the compound $CH_3CH=CHC(Br)(CH_3)_2$ can be classified as
 - a. Allyl
8. How will you distinguish between benzyl alcohol and phenol?
 - a. Blue litmus test
9. CH_3CHO and $C_6H_5CH_2CHO$ can be distinguished chemically by
 - b. Iodoform test
10. The source of nitrogen in Gabriel synthesis of amines is
 - c. Potassium cyanide
11. Lysine is
 - a. α -amino acid
 - b. Basic amino acid
12. Which of the following polymers are condensation polymers
 - a. Bakelite
 - b. Melamine formaldehyde resin
13. Amoxicillin is semi-synthetic modification of
 - a. Penicillin
14. 0.2% solution of phenol is option
 - a. Antiseptic

Section –II

GROUP-A

(Very short answer type questions)

Answer the following questions (Alternatives are to be noted)

1×4=4

1. Under what condition is $E_{cell} = 0$ and $\Delta_r G = 0$?

Ans. In equilibrium state

OR

Depict the galvanic cell in which the cell reaction is $Cu + 2Ag^+ \longrightarrow 2Ag + Cu^{+2}$

$Cu(s) | Cu^{+2}(aq) || 2Ag^+(aq) | 2Ag(s)$

2. What happens when gelatine is mixed with gold sol?

Ans. Gold sol: Lyophobic sol, Gelatine: Lyophobic sol. Thus gelatine forms a protective coating around gold sol and stops its further coagulation when some electrolyte is added.

3. Calculate the spin magnetic moment of $M^{+2}(aq)$ ion ($Z=27$)

Ans. $\mu = (n(n+2))^{1/2} = (3 \cdot 5)^{1/2} = 3.87 \text{ BM}$

OR

Write down general electronic configuration of d-block element.

Ans. $(n-1)d^{1-10}ns^{1-2}$

4. Give example of an antioxidant. Ans. Butylated hydroxytoluene

GROUP-B

(Short answer type questions - I)

Answer the following questions (Alternatives are to be noted)

2×5=10

5. Why is the vapour pressure of an aqueous solution of glucose lower than that of pure water?

Ans. Solute occupies a portion of the surface of the solvent in a solution. Vapour pressure being a surface phenomenon, pure liquids always have higher vap. press. than its solutions.

OR

Explain why on addition of 1mol of NaCl to 1 litre of water, the boiling point of water increases, while addition of 1mole of methyl alcohol to 1litre of water decreases its boiling point.

Ans. NaCl is a less volatile than water, which occupies some surface area of water in the solution. As a result vapour pressure decreases and boiling point increases.

Methyl alcohol being more volatile than water, the reverse happens.

6. How will you distinguish between dispersed phase and dispersion medium in an emulsion?

Ans. Distinction can be made by dye test, conductivity test and dilution test.

OR

Why does bleeding stop by rubbing moist alum on the injury?

Alum contains Al^{+3} ions. Higher the ionic charge, higher is its capacity to help in coagulation. (Schultz-Hardy rule)

7. PF_5 is known but NF_5 is not known. Discuss why.

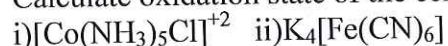
Ans. Absence of suitable orbitals to expand its valency. (3d is available to P, but not to N)

OR

All bonds of PF_5 are not equivalent. Explain why.

Ans. Application of Bent's rule in TBP geometry.

8. Calculate oxidation state of the central metal atom in the following complexes: (1+1)



Ans. i) +3, ii) +2.

9. Write the names and structure of the monomers of the following polymers: (1+1)

i) Buna-S, ii) Buna-N.

Ans. i) buta-1,3-diene and styrene in presence of Na ; ii) buta-1,3-diene and acrylonitrile.

GROUP-C

(Short answer type questions - II)

Answer the following questions (Alternatives are to be noted)

3×9=27

10. A cubic solid is made of two elements P and Q. Atoms Q are at the corners of the cube and P at the body centre. What is the formula of the compound? What is the co-ordination number of P and Q?

Ans. Contribution of Q = $8 \cdot (1/8) = 1$

Contribution of P = 1

Hence formula PQ and co-ordination no. of the atoms p & Q is 8

(2+1)

OR

Copper crystallizes into FCC lattice with edge length 3.61×10^{-8} cm. Show that the calculated density is in agreement with its measured value of 8.92 g cm^{-3} .

Ans. $\rho = (Z \cdot M) / (a^3 \cdot N_0 \cdot 10^{-30}) = 8.97 \text{ g cm}^{-3}$

11. i) Will elevation in boiling point temperature be same for 0.1 M NaCl and 0.1 M sucrose solution? Explain.

Ans. No it will not be same as, colligative properties do not depend upon molar concentration alone. It also depends on the number of particles.

ii) How does osmotic pressure vary with temperature?

Ans. Increases with rise in temperature. $\pi = CRT$ (2+1)

12. Calculate the E.M.F. of the cell

$Zn/Zn^{+2}(aq)(0.01M) || Cd^{+2}(0.1M)Cd$ at 298K. (Given $E^\circ_{Zn^{+2}/Zn} = -0.76V$; $E^\circ_{Cd^{+2}/Cd} = -0.40V$)

Ans. 0.3895 V.

OR

The measured E.M.F. at 25°C for the cell reaction,

$Zn(s) + Cu^{+2}(1.0M) \longrightarrow Cu(s) + Zn^{+2}(0.1 M)$, is 1.3V, Calculate E° for the cell reaction.

Ans. 1.27 V

13. Name the common elements present in anode mud in the electro-refining process of copper. Why are they present?

Ans. Ag, Au, Pt – which are less reactive than Cu. As a result they cannot lose electron easily and act as an anode.

Why is Zn not extracted from ZnO through reduction using CO?

Ans. $ZnO + CO \longrightarrow Zn + CO_2$ Due to no entropy change. The process is thermodynamically unfavourable. (2+1)

OR

How is “cast iron” different from “pig iron”?

Ans. Cast iron has 3% Carbon and Pig iron has 4% Carbon.

Give example and differentiate between Calcination and Roasting.

Ans. Calcination: $ZnCO_3 \xrightarrow{\text{Heat}} ZnO + CO_2$, in absence of air

Roasting: $ZnS + O_2 \longrightarrow ZnO + 2SO_2$, in presence of excess air (1+2)

14. What is Lanthanide contraction? What are the consequences of lanthanide contraction?

Ans. The decrease in the atomic &/or ionic radii of the elements of the lanthanides moving from left to right is known as Lanthanide contraction.

i) Difficult separation,

ii) Variation in mp, bp, reduction potential and basicity. (2+1)

OR

Why are Mn^{+2} compounds more stable than Fe^{+2} compounds towards oxidation to their +3 state?

Ans. Mn^{+2} has half filled stable configuration ($3d^5$) while Fe^{+2} has a $3d^6$ configuration.

Write down the numbers of 3d electrons present in each of the following ions: Ru^{+2} and Rh^{+2} .

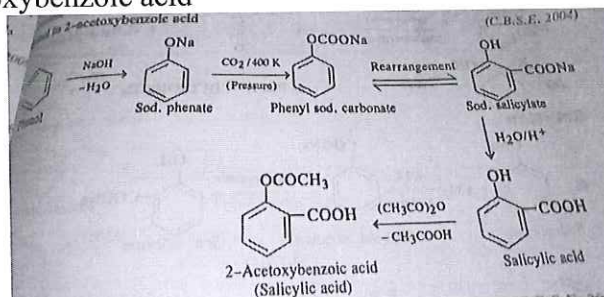
Ru^{+2} : 6; Rh^{+2} : 7. (2+1)

15. Write the structures of the major products in each of the following reactions: (0.5×6)

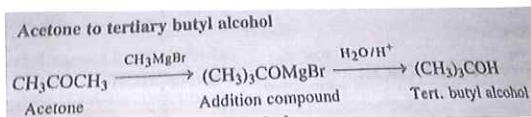
- (i) $CH_3-CH-CH_2-I$
- (ii) 2-methylpropene
- (iii) $CH_3CH_2C(CH_3)_2Br$
- (iv) $C_6H_5OC_2H_5$
- (v) CH_3CH_2CN
- (vi) $CH_3CH_2CH_2Cl$

16. Convert: i) Phenol to 2-acetoxybenzoic acid

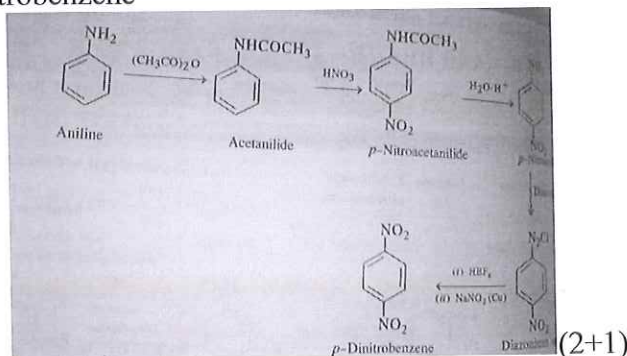
(2+1)



ii) Acetone to tertiary butyl alcohol



17. Convert: i) Aniline to *p*-dinitrobenzene



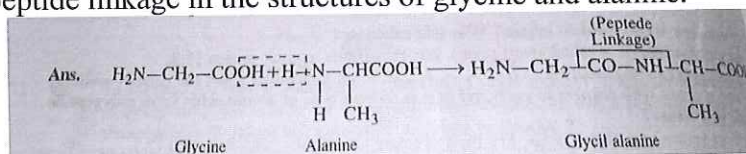
iii) What is Hinsberg's reagent?
 Ans. benzene sulphonyl chloride (used to separate primary secondary and tertiary amines)

OR

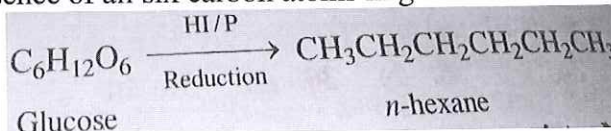
Account for the following:

- i) Aniline does not undergo Friedel-Craft's reaction,
 Ans. Aniline being a Lewis base, forms a complex with AlCl₃, which is a Lewis acid. Therefore the reaction cannot take place.
- ii) pK_b of aniline is more than that of methylamine.
 Ans. Aniline is less basic & the e⁻-pair on N is involved in conjugation with the phenyl ring. Thus is less available for protonation than methylamine.

18. Show the presence of peptide linkage in the structures of glycine and alanine.



How do you explain the presence of all six carbon atoms in glucose in a straight chain?



Group-D

(Long answer type questions)

5×3=15

19. The rate constant of a reaction is 1.5×10⁷s⁻¹ at 50°C and 4.5×10⁷s⁻¹ at 100°C. Calculate the value of activation energy for the reaction. (R=8.314JK⁻¹mol⁻¹)

Ans. 22.012 kJ

In a first order reaction, the units of the rate constant do not depend upon the concentration of the reactants. Justify.

Ans. For 1st order reaction k = (2.303*log(a/(a-x)))/t, which is a unit-less quantity.

OR

Give one example of pseudo first order reaction.

Ans. CH₃COOC₂H₅ + H₂O → CH₃COOH + C₂H₅OH

A reaction is of second order with respect to a reactant. How is the rate of reaction affected if the concentration of the reactant is reduced to half.

Ans. For a 2nd order reaction,

2A → products. Rate, r = k*[A]²

When concentration of reaction is halved, then rate r' = r/4

20. Explain why is NH₃ basic while PH₃ is feebly basic in nature.

Ans. P has vacant $3d$ orbital. Therefore the e^- -pair is much more delocalized than that in N.
Why iodine is more soluble in KI solution than in water? (2)

Ans. In KI, I forms KI_3 which is ionic in nature. (1)

Write one use of noble gas. (1)

Ne used in fluorescent lamps and tubes.

OR

Oxygen molecule has the formula O_2 while Sulphur is S_8 Why? (2)

Ans. O forms a double bonded molecule with itself. S due to larger size cannot make sidewise overlap of orbitals. As a result s forms S_8 molecule.

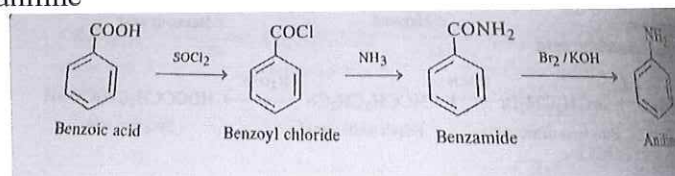
Explain why both N and Bi do not form penta-halides while phosphorus does. (2)

Ans. N has no $3d$ orbital to expand its valency to 5. Bi due to relativistic effect has small size and shows +3 oxidation state instead of +5.

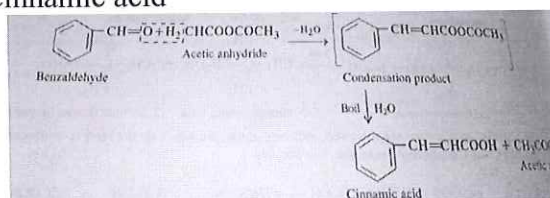
Which halogen has tendency to form cation? (1)

Ans. Iodine.

21. Convert: Benzoic acid to aniline (2)



Benzaldehyde to Cinnamic acid (2)



Name two reagents which can be used to convert $>C=O$ to $>CH_2$ group. (1)

Ans. i) $Zn(Hg) + HCl$, ii) $NH_2NH_2 + KOH$