Q1. Consider the decomposition of N_2O_4 into NO_2 . The total pressure at equilibrium is 1 atm and temperature is 300K. if percentage decomposition of N_2O_4 at equilibrium is 11.1% , then the density of the equilibrium mixture at 300K is ?

(1) 2.2 g/L   (2) 3.3 g/L   (3) 4.4 g/L   (4) 5.5 g/L

Q2. Pure oxygen diffuses through an aperture in **112** seconds, whereas an equal volume of a mixture of oxygen and another gas containing **80%** oxygen diffuses from the same aperture in **224** seconds. Then the molecular weight of the gas is ?

(1) 1024 **(2)** 512 **(3)** 256 **(4)** 128

Q3. A gas expands against a variable pressure given by P = 10/ V , where P is in atm and V is the volume of the gas at each stage of the expansion in liters. Further during expansion from 10 L to 100 L , the gas undergoes a change in internal energy of 420 J. then the heat absorbed by the gas during expansion is ?

(1) 2k J **(2)** 2.78 k J   (3) 3kJ **(4)** 3.78 kJ

Q4. The enthalpy of hydrogenation of cyclohexane is $-119.5 \, kJ/mol$. if resonance energy of benzene is $-150.4 \, kJ/mol$, its (benzene) enthalpy of hydrogenation would be :

(1) $-508.9 \, kJ \, /mol$
(2) $-208.1 \, kJ/mol$
(3) $-269.9 \, kJ/mol$
(4) -358.5 kJ/mol

Q5. The correct order of Magnetic moments (values in BM and spin only) among the following is :

(1) $[MnCl_4]^{2-} > [CoCl_4]^{2-} > [Fe(CN)_6]^{4-}$
(2) $[MnCl_4]^{2-} > [Fe(CN)_6]^{4-} > [CoCl_4]^{2-}$
(3) $[Fe(CN)_6]^{4-} > [MnCl_4]^{2-} > [CoCl_4]^{2-}$
(4) $[Fe(CN)_6]^{4-} > [CoCl_4]^{2-} > [MnCl_4]^{2-}$

Q6. Calculate E^0 for the reaction

$Ag^+_{(aq)} + CL^-_{(aq)} \rightarrow AgCl_{(s)}$, given that
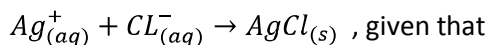
$\Delta G^0_f(AgCl) = \frac{-109kJ}{mol}, \Delta G^0_f(Cl^-) = -\frac{129kJ}{mol} \text{ and } \Delta G^0_f(Ag^+) = \frac{77kJ}{mol}$

(1) 0.5 V (2) 0.59 V   (3) 1.0 V (4) 1.18 V

Q7. Select the correct statement(s) :

(a) Stabilities of variable oxidation states can be explained by standard electrode potential
(b) Cr^{2+} is unstable and Cr^{3+} is stable in aqueous solution
(c) Fe^{2+} is stable and Fe^{3+} is unstable in aerated water
(d) All of the above are correct answer

(1) (a) & (c)
(2) (b) & (c)
(3) (a) & (b)
(4) None of these

Q8. The appearance of color in solid alkali metal halides is generally due to :

(1) F- centers
(2) Schottky defect
(3) Frenkel defect
(4) Interstitial effect

Q9. $AlCl_3$ exists as dimer Al_2Cl_6 in solid state as well as in solution of non-polar solvents such as benzene. when dissolved in water , it gives :

(1) $Al^{3+} + 3Cl^-$
(2) $[Al(H_2O)_6]^{3+} + 3 \, Cl^-$
(3) $[Al(OH)_6]^{3-} + 3HCl$
(4) $Al_2O_3 + 6 \, HCl$

Q10. The final product L in the sequence of reaction given below is

$$\xrightarrow{NaBH_4/H_2O} J \xrightarrow[\text{excess}]{NaH} K \xrightarrow[\text{excess}]{CH_3I} L$$

(1)

(2)

(3).

(4). None of these
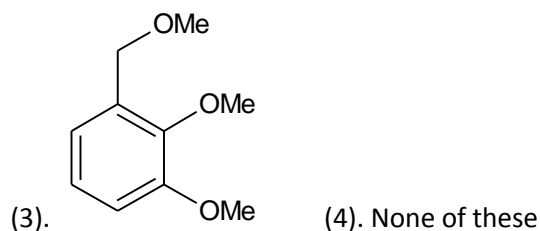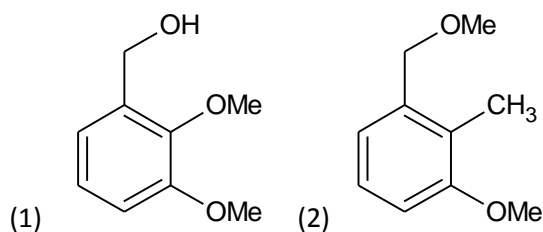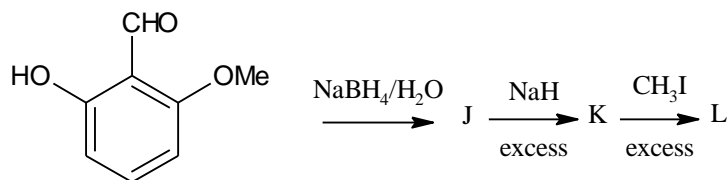
Q11. The final major product of the following reaction


$$\xrightarrow[H_2O]{NaOH} A \xrightarrow{H_3O^+} B$$
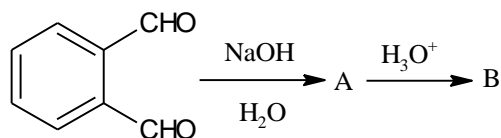
(1) Is both an acid as well an aldelyde
(2) Is a cyclic ester
(3) Is both and acid and an alcohol
(4) Is an alcohol and aldehyde

Q12. For the reaction $X \rightarrow Y$, the enthalpy for this reaction is 80 kJ, the energy of the reactant X is 160 kJ, while the activation energy for the given reaction is 200kJ. Then

(1) The threshold energy of this reaction is 40 kJ
(2) The energy of the product Y is 80kJ
(3) The activation energy of the reaction $Y \rightarrow X$ is 120 kJ
(4) None of the these

Q13. The product of the following reaction is

$$\xrightarrow{NH_4HS} A$$

(1)

(2)

(3).   (4). None of these
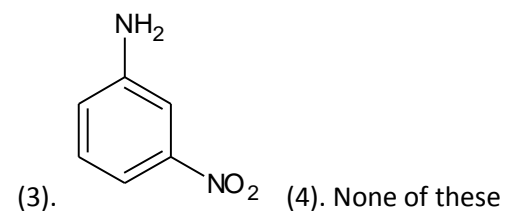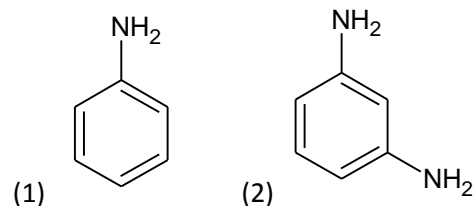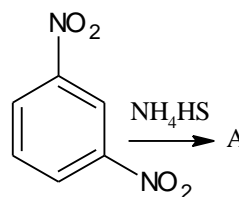
Q14. The vapor pressure of an equimolar mixture of benzene and toluene was found to be 80 torr. If the vapor above the liquid phase is condensed in a beaker , vapor pressure of this

Condensate was found to be 100 torr. If P_B^0 denotes the pure vapor pressure of benzene, then which of the following is true?

(1) $(P_B^0)^2 - 320\, P_B^0 + 4800 = 0$
(2) $(P_B^0)^2 - 160\, P_B^0 - 4800 = 0$
(3) $(P_B^0)^2 - 160 P_B^0 + 4800 = 0$
(4) $(P_B^0)^2 - 320\, P_B^0 + 4800 = 0$

Q15. Match List –I (Name of the reaction) with List –II (intermediate) and select the correct answers using the codes given below :

List –I		List-II	
A	Sandmeyer	1.	carbanion
B	Friedel-Crafts	2	carbene
C	Claisen condensation	3	carbocation
D	Reimer-Teimannn	4	Free radical

Codes :

	A	B	C	D
(1)	4	2	1	3
(2)	1	3	4	2
(3)	4	3	1	2
(4)	1	2	4	3

Use the following codes to answer Q16-20. codes are :

(1) If both assertion (A) as well as reason (R) are correct and (R) is the correct explanation of (A)
(2) If both (A) and (R) are correct but (R) is not the correct explanation of (A)
(3) If (A) is correct but (R) is incorrect
(4) If (A) is incorrect but (R) is correct

Q16. **Assertion (A)** : Benzene does not react with HBr
Reason (R) : Aromaticity is lost due to addition

Q17. **Assertion (A)**: All the activating groups and the weakly deactivating substituent are ortho and Para-directing.
Reason (R) : $-NH_2$,$-OH$, $-NH_3$ are ortho and Para directing groups

Q18. **Assertion (A)**: if one component obeyed Raoult's law over a certain range of composition , the other component would not obey Henry's law in that range .
Reason (R) : Raoult's law is a special case of Henry's law.

Q19. **Assertion (A)** : the hydrogen gas warms up during Joule-Thomson expansion
Reason (R) : The temperature at which the Joule-Thomson coefficient becomes negative is called Joule-Thomson inversion temperature.

Q20. **Assertion (A)** : On heating a solid for a long time , radiations become white and then blue as the temperature becomes very high.
Reason (R) : Radiations emitted go from a lower frequency to higher frequency as the temperature increases.

Q21. The higher oxidizing power of fluorine is due to :
(1) High electron affinity
(2) High heat of dissociation and low heat of hydration
(3) Low heat of dissociation and high heat of hydration
(4) High heat of dissociation and high heat of hydration

Q22. The end product of hydrolysis of XeF_6 is?

(1) XeF_4O
(2) XeF_2O_2
(3) XeO_3
(4) XeO_3^-

Q23. Ethanol on reaction with bleaching powder forms

(1) $CHCl_3$ (2) CCl_3CHO (3) CH_2ClCHO (4) CCl_4

Q24. In P_4 (tetrahedral) :

(1) Each P is joined to four P
(2) Each P is joined to three P
(3) Each P is joined to two P
(4) P_4 does not exist

Q25. Which of the following is not blackened by atmospheric H_2S ?

(1) TiO_2 (2) ZnO (3) $ZnSO_4$ + BaS (4) all of these

Q26. Which of the following compound is amphoteric?

(1) $Cr(OH)_2$ (2) $Fe(OH)_2$ (3) $Cr(OH)_3$ (4) $Fe(OH)_3$

(1) Kjeldahl
(2) Carius
(3) Both (1) and (2)
(4) None of these

Q27. Gold number of a lyophilic sol is such property that :
(1) Larger its value , the greater is the peptizing power
(2) The lower its value, the greater is the peptizing power
(3) The lower its value, the greater is the protecting power
(4) The larger its value, the greater is the protecting power

Q28. As branching in alkane increases , boiling point decreases due to :

(1) Decreased surface for intermolecular attraction
(2) Dipole-dipole interactions
(3) Both of the above
(4) None of the above

Q29-30 are based on the following paragraph , read the paragraph carefully and answer the question that follow

"The transition metal has unparalleled tendency to form co-ordination compounds with Lewis bases that is with groups which are able to donate an electron pair (called ligands)".

Q29. The tendency to form complexes by transition metal compared to s and p block elements is due to:

(1) Their smaller size
(2) Higher nuclear charge
(3) Presence of lower energy vacant orbitals to accept lone pair of electrons donated by ligands
(4) All of the above

Q30. Out of $[Fe(CN)_6]^{4-}$, $[Ni(CN)_4]^{2-}$ and $[Ni(CO)_4]$:

(1) All have identical geometry
(2) All are paramagnetic
(3) All are diamagnetic
(4) $[Fe(CN)_6]^{4-}$ is diamagnetic but the other two are paramagnetic.