

PET-2017 (Chemistry- Faculty of Sciences)

Roll No:

Date... 25 JUN 2017

Signature of the Candidate:

Q1 Which one of the following statements concerning radioactive decay is true?

- a) The half-life of a radioactive isotope depends on the amount of radioactive material present.
- b) The activity of a radioactive isotope is inversely proportional to its decay constant.
- c) The half-life increases as more of the isotope decays.
- d) The half-life is inversely proportional to the decay constant.

Q2 The pK_{a1} , pK_{a2} values of oxalic acid are 1.25 and 4.26 respectively. Choose the correct statement.

- a) The predominant ionic form at $p^H = 7$ is $HC_2O_4^-$
- b) The predominant ionic form at $p^H = 2$ is $C_2O_4^{2-}$
- c) The predominant ionic form at $p^H = 4$ is $C_2O_4^{2-}$
- d) The predominant ionic form at $p^H = 3$ is $HC_2O_4^-$

Q3 According to the Arrhenius equation, the correct relation between specific rate (k), temperature (T) and activation energy (E_a) is:

- a) $k = A.e^{-E_a/RT}$
- b) $\log k = \log A - \frac{E_a}{2.303RT}$
- c) $\ln k = \ln A - \frac{E_a}{RT}$
- d) All

Q4 Which of the following statements best describes the working of a catalyst?

- a) A catalyst decreases the enthalpy of the reaction and thus by increasing the rate.
- b) A catalyst decreases the activation energy barrier of a reaction by providing an alternative reaction mechanism.
- c) A catalyst increases the effective concentration of the reactants.
- d) A catalyst increases the collision frequency and helps in orienting the molecules in proper configuration.

Q5 The crystal field splitting energy (Δ) for $CoCl_4^{2-}$ is 18000 cm^{-1} . The Δ for $CoCl_2^{2-}$ would be

- a) 18000 cm^{-1}
- b) 16000 cm^{-1}
- c) 8000 cm^{-1}
- d) 2000 cm^{-1}

Q6 Which one of the following free ions has the lowest magnetic moment?

- a) Ce^{3+}
- b) Nd^{3+}
- c) Sm^{3+}
- d) Gd^{3+}



25 JUN 2017

Q7 The compound which obeys 18-electron rule is

- a) $\text{Mn}(\text{CO})_3$ b) $\text{Fe}(\text{CO})_4$ c) $\text{V}(\text{CO})_6$ d) $\text{Cr}(\text{CO})_6$

Q8 Solid ammonium nitrate, NH_4NO_3 (s), dissolves spontaneously in water at 25°C ,

NH_4Cl (s) \rightarrow NH_4^+ (aq) + Cl^- (aq); If this process is endothermic, which of the following is most likely true?

- a) $\Delta G > 0$ b) $\Delta G = 0$ c) $\Delta S < 0$ d) $\Delta S > 0$

Q9 The expected spin-only magnetic moments for $[\text{Fe}(\text{CN})]^{4-}$ and $[\text{FeF}]^{3-}$ respectively are

- a) 1.73 and 7.73 B.M. c) 0.0 and 1.73 B.M.
b) 1.73 and 5.92 B.M. d) 0.0 and 5.92 B.M.

Q10 Which one of the following complex ions shows the minimum intensity of absorption in the uv-visible region?

- a) $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$ b) $[\text{V}(\text{H}_2\text{O})_6]^{2+}$ c) $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$ d) $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$

Q11 For which one of the following ions, the colour is NOT due to a d-d transition?

- a) CrO_4^{2-} b) $\text{Cu}(\text{NH}_3)_4^{4+}$ c) $\text{Ti}(\text{H}_2\text{O})_6^{3+}$ d) CoF_6^{3-}

Q12 Wilkinson's catalyst is

- a) $[\text{Rh}(\text{CO})_2\text{I}_2]^{1-}$ b) $(\text{Ph}_3\text{P})_3\text{RhCl}$
c) $\text{Co}_2(\text{CO})_8$ d) $(\text{Ph}_3\text{P})_2\text{Rh}(\text{CO})\text{Cl}$

Q13 Beer's Law states that

- a) Absorbance is proportional to both the path length and conc. of the absorbing species
b) Absorbance is proportional to the log of the concentration of the absorbing species
c) Absorbance is equal to P_0 / P
d) None of the above

Q14 Apolarogram is obtained when _____ is plotted against _____

- a) current, time b) current, applied potential
c) time, applied potential d) current, concentration

Q15 Which of the following represents the ilkovic equation?

- a) $i_d = 708nCD^{1/2} m^{1/3} t^{1/6}$ b) $i_d = 708nCD^{1/3} m^{2/3} t^{1/6}$
 c) $i_d = 708nCD^{1/2} m^{2/3} t^{1/6}$ d) $i_d = 708nCD^{1/2} m^{2/3} t^{1/3}$

Q16 Which of the following detectors is commonly used in gas chromatography?

- a) Fluorescence b) Flame ionization c) Atomic absorbance d) All



Q17 Which of the following methods is based on minimal current flow?

- a) coulometry b) voltammetry c) potentiometry d) amperometry

Q18 In aqueous medium a mixture of KI and I_2 converts thiosulfate to:

- a) $S_4O_6^{2-}$ b) SO_4^{2-} c) $S_2O_6^{2-}$ d) $S_2O_4^{2-}$

Q19 Boranes with formula $B_nH_n^{4-}$ have

- a) n bonding orbitals and n antibonding orbital
 b) total $2n+4$ electrons in bonding orbitals
 c) $n+1$ framework bonding orbitals
 d) framework with n corners of $(n+2)$ cornered polyhedron

Q20 Uranium exhibits several oxidation states because

- a) It is an inner transition element b) Its atomic number is high
 c) 5f orbitals participate in bonding d) It forms strong bond with oxygen

Q21 CO bond order is lowest in

- a) Uncoordinated CO b) CO bridging two metals
 c) CO bonded to one metal d) CO bridging three metals

Q22 CFSE of transition metal complexes can be determined by

- a) UV-visible spectroscopy b) IR spectroscopy
 c) Microwave spectroscopy d) NMR spectroscopy

Q23 The fine structure and intensity ratios expected in the proton NMR spectrum of $^{14}NH_4^+$ ion (for $^{14}N, I = 1$) are

- a) singlet b) doublet, 1:1
 c) triplet, 1:1:1 d) triplet, 1:2:1

Q24 In which one of the following pairs the species have similar geometry?

- a) CO_2 and SO_2 b) NH_3 and BH_3
 c) CO_3^{2-} and SO_3^{2-} d) SO_4^{2-} and ClO_4^-

Q25 The species which has a square planar structure is

- a) BF_4^- b) $FeCl_4^-$ c) SF_4 d) XeF_4

Q26 Which one of the following statements concerning radioactive decay is true?

- a) The half-life of a radioactive isotope depends on the amount of radioactive material present
 b) The activity of a radioactive isotope is inversely proportional to its decay constant
 c) The activity of a radioactive isotope decays hyperbolically with time
 d) The half-life is inversely proportional to the decay constant



25 JUN 2017

Q27 At very low pressures, the van der Waals equation can be reduced to:

- a) $P(V - b) = RT$ b) $PV = RT + Pb$
✓ c) $PV = RT$ d) $PV + a/V = RT$

Q28 Aqueous titanium (IV) solution develops intense orange colour on addition of H_2O_2 . The colour is due to

- a) d - d transition b) $n - \pi^*$ transition of peroxo group
c) reduction of the Ti(IV) to Ti (III) ✓ d) charge transfer transition.

Q29 For which one of the following ions, the colour is NOT due to a d-d transition?

- ✓ a) CrO_4^{2-} b) $Cu(NH_3)_4^{4+}$ c) $Ti(H_2O)_6^{3+}$ d) CoF_6^{3-}

Q30 Which one of the following is most easily reduced?

- ✓ a) $V(CO)_6$ b) $Cr(CO)_6$ c) $Fe(CO)_5$ d) $Ni(CO)_4$

Q31 Which one of the following complex ions shows the minimum intensity of absorption in the uv-visible region?

- a) $[Cr(H_2O)_6]^{2+}$ b) $[V(H_2O)_6]^{2+}$
✓ c) $[Mn(H_2O)_6]^{2+}$ d) $[Co(H_2O)_6]^{2+}$

Q32 The expected spin-only magnetic moments for $[Fe(CN)_6]^{4-}$ and $[FeF_6]^{3-}$ respectively are

- a) 1.73 and 7.73 B.M. b) 1.73 and 5.92 B.M.
c) 0.0 and 1.73 B.M. ✓ d) 0.0 and 5.92 B.M.

Q33 Borax is used in preparing

- a) soda glass b) pyrex glass c) opal glass ✓ d) portland cement

Q34 The complex with spin-only magnetic moment of 4.9 BM is:

- a) $[Fe(H_2O)_6]^{2+}$ b) $[Fe(CN)_6]^{3-}$ c) $[Fe(CN)_6]^{4-}$ ✓ d) $[Fe(H_2O)_6]^{3+}$

Q35 The Reformatsky reaction is often used for preparing of

- a) α - hydroxy ester ✓ b) β - hydroxy ester
c) α -halo ester d) β -halo ester

Q36 The stability of the free radical is enhanced by the presence of

- a) electron donating substituent
b) electron withdrawing substituent
✓ c) both electron donating and electron withdrawing substituents
d) None of them



