RAMAKRISHNA MISSION VIDYAMANDIRA

Belur Math, Howrah – 711 202

ADMISSION TEST – 2015

CHEMISTRY (Honours)

Date : 18-06-2015 **Full Marks : 50** Time: 11·00 a.m – 12·30 p.m

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Instructions for the candidate

Answer all the questions given below. Each question carries 2 marks. Tick (✓) the correct option. The tick must be very clear — if it is smudgy or not clear, no marks will be awarded.

Name of the student : _____

Application No. : _____

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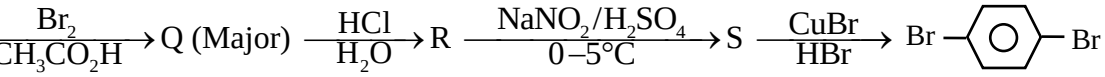
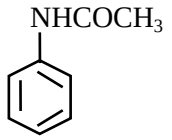
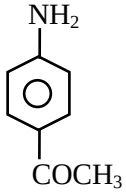
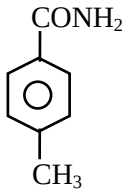
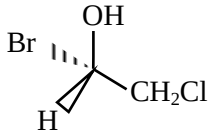
1. $P(C_8H_9NO) \xrightarrow[CH_3CO_2H]{Br_2} Q\ (Major) \xrightarrow[H_2O]{HCl} R \xrightarrow[0-5°C]{NaNO_2/H_2SO_4} S \xrightarrow[HBr]{CuBr}$ 

From the above reaction sequence the starting compound P is

a)  b)  c)  d) none of these

2. The correct name of the following compound is



a) (S) – 1 – Bromo – 2 – chloroethanol
b) (R) – 1 – Bromo – 2 – Chloroethanol
c) (R) – 1 – Chloro – 2 – bromoethanol
d) (S) – 1 – Chloro – 2 – bromoethanol

3. Which one of the following is the correct order of acidity—

a) Picric acid ⟩ Paranitrophenol ⟩ Metanitrophenol ⟩ Phenol

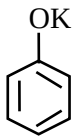
b) Picric acid ⟩ Metanitrophenol ⟩ Paranitrophenol ⟩ Phenol

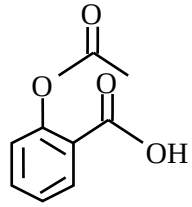
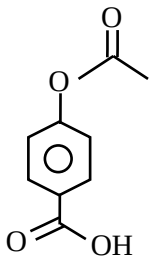
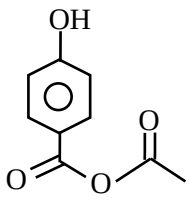
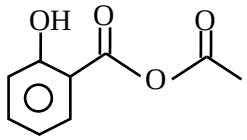
c) Paranitrophenol ⟩ Metanitrophenol ⟩ Picric acid ⟩ Phenol

d) None of these

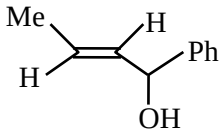
4. 2 – Bromopropane $\xrightarrow[NaOH]{aq}$ (A) $\xrightarrow[300°C]{Cu}$ (B) $\xrightarrow{Ba(OH)_2}$ (C) $\xrightarrow[\Delta]{I_2}$ (D) (Which gives iodoform test). The name of (D) is

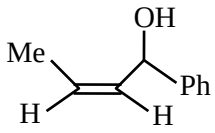
a) 4 – Methylpent – 3 – en – 2 – one
b) 2 – Methylpent – 2 – en – 4 – one
c) 3 – Hexenone
d) Cyclohexanone

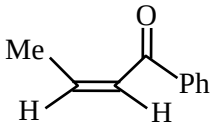
5.  $+ CO_2 \xrightarrow[4-7\ atm]{120-140°C} P\ (major) \xrightarrow[HCl]{dil} Q \xrightarrow[Pyridine]{Ac_2O} R$. The structure of R is

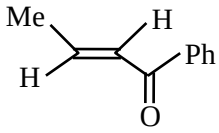
a)  b)  c)  d) 

6. $CH_3-C\equiv C-H+CH_3MgBr \rightarrow CH_4+A \xrightarrow{PhCHO} B \xrightarrow[\text{Lindlar's catalyst}]{H_2}$ C; The structure of C is

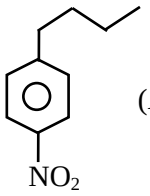
a) 

b) 

c) 

d) 

7. An organic compound on ozonolysis gives 4 – Methylheptane – 2, 6 – dione. The name of the organic compound is
   a) 4-Methylhepta-1, 5-diene
   b) 1, 2, 4-Trimethylcyclopentene
   c) 4-Methylhepta-2, 5-diene
   d) None of these

8. The correct method to prepare the following compound (A) is 

(A)

a)  $\xrightarrow[AlCl_3]{CH_3CH_2CH_2CH_2Cl} \xrightarrow[H_2SO_4]{HNO_3}$

b)  $\xrightarrow[AlCl_3]{CH_3CH_2CH_2COCl} \xrightarrow[HCl]{Zn-Hg} \xrightarrow[H_2SO_4]{HNO_3}$

c)  $\xrightarrow[AlCl_3]{CH_3CH_2CH_2COCl} \xrightarrow[H_2SO_4]{HNO_3} \xrightarrow[HCl]{Zn-Hg}$

d)  $\xrightarrow[AlCl_3]{CH_3CH_2CH_2COCl} \xrightarrow[\bar{O}H|\Delta]{KMnO_4} \xrightarrow[H_2SO_4]{HNO_3}$

9. The correct order of hybridisation of the central atom in the following species NH_3, $[PtCl_4]^{2-}$, PCl_5 and BCl_3 is
   a) dsp^2, dsp^3, sp^2, sp^3 b) sp^3, dsp^2, dsp^3, sp^2 c) dsp^2, sp^2, sp^3, dsp^3 d) sp^3, sp^2, dsp^3, dsp^2

10. The size of the ions changes in the order
    a) $Cl^{7+} > Si^{4+} > Mg^{2+} > Na^+$ b) $Na^+ > Mg^{2+} > Si^{4+} > Cl^{7+}$
    c) $Cl^{7+} > Na^+ > Mg^{2+} > Si^{4+}$ d) $Mg^{2+} > Na^+ > Cl^{7+} > Si^{4+}$

11. What is the equivalent weight of $KMnO_4$ when acts as an oxidising agent in alkaline, neutral and acidic medium (Atomic weight of potassium and Manganese are 39·0 and 55 respectively)
    a) 158, 39·50, 31·60 b) 158, 52·70, 31·60 c) 79, 39·50, 31·60 d) 79, 52·7, 31·60

12. What is the pH of the solutions of (i) 1×10^{-3}M HCl and (ii) 1×10^{-3}M H_2SO_4?
    a) 3 and 3 b) 3 and 2·699 c) 3 and 3·1 d) 3·1 and 3·1

13. If the ionisation energy of hydrogen atom is 13·6ev, the expected 3rd ionisation energy of lithium atom is
    a) 122·4 eV b) 40·6 eV c) 81·6 eV d) None of these

14. Which of the following reactions will not occur spontaneously?
    a) $I_2+2Br^- \rightarrow 2I^-+Br_2$ b) $F_2+2Cl^- \rightarrow 2F^-+Cl_2$ c) $Br_2+2I^- \rightarrow 2Br^-+I_2$ d) $2I^-+Cl_2 \rightarrow 2Cl^-+I_2$

15. The wavelength of the second line in the visible spectrum of atomic hydrogen is
    (Given, $R_H = 1\cdot096776\times10^7 m^{-1}$)
    a) $4\cdot86\times10^{-7}$ m b) $9\cdot72\times10^{-7}$ m c) $2\cdot42\times10^{-7}$ m d) None of these

16. A 50 ml solution of pH = 1 mixed with 50 ml solution of pH = 2. The pH of the resulting mixture will be nearly
    a) 1·26 b) 1·5 c) 1·76 d) None of these

17. Two flasks A and B have equal volumes. A is maintained at 300K and B at 600K; while A contains H_2 gas and B has an equal mass of CH_4 gas. Assuming ideal behaviour for both the gases find out the correct answer
    a) B flask has the molecules with faster velocity
    b) B flask has greater molar kinetic energy
    c) B flask is having greater no. of collisions with the walls
    d) B flask contains greater no. of molecules

18. Which one of the following is incorrect?
    a) The gas with the equation $\left(P+\frac{a}{v^2}\right)v = RT$ can be liquefied
    b) T_C is the maximum temperature at which a gas cannot be liquefied
    c) The Boyle temp for a van der Waals gas is defined as $T_B = \frac{a}{Rb}$
    d) Average speed of molecules of a gas in a container moving only in one dimension is zero

19. The following standard enthalpies of formation for some molecules are given as
    Acetic acid = $-0\cdot5\,MJ\,mol^{-1}$; Carbon-di-oxide = $-0\cdot4\,MJ\,mol^{-1}$; Water = $-0\cdot3\,MJ\,mol^{-1}$
    The $\Delta H°$ of combustion of acetic acid is
    a) $+0\cdot9$ MJ mol^{-1} b) $-0\cdot9$ MJ mol^{-1} c) $-0\cdot2$ MJ mol^{-1} d) $-2\cdot1$ MJ mol^{-1}

20. Which of the following changes have no effect on the chemical equilibrium in the thermal decomposition of $CaCO_3$?
    a) temp. elevation b) an increase in the amount of the initial substance
    c) pressure decrease d) a change in CO_2 concentration

21. Aqua regia, a 3:1 mixture (by volume) of concentrated HCl and HNO_3 was developed by alchemists as a means to dissolve gold. $Au(s)+NO_3^+(aq)+Cl^-(aq)=AuCl_4^-(aq)+NO_2(g)$
    Gold is too noble to react with HNO_3. Two half reactions are
    $Au^{3+}(aq)+3e^-=Au(s)$ E° = 1·5V
    $AuCl_4^-(aq)+3e^-=Au(s)+4Cl^-$ E° = 1·0V
    The formation constant of $AuCl_4^-$ from Au^{3+} and Cl^- is
    a) $5\cdot2\times10^{25}$ b) $2\cdot6\times10^{25}$ c) $1\cdot3\times10^{25}$ d) None of these

22. A solution with a volume of 1 dm^3 is saturated with PbI_2.The concentration of I^- ions is 2·7 mol dm^{-3}.The solubility product of PbI_2 is
    a) $3\cdot6\times10^{-6}$ b) $2\cdot0\times10^{-8}$ c) $9\cdot8\times10^{-9}$ d) $4\cdot9\times10^{-9}$

23. 3·00 mol of CO_2 gas expands isothermally (in thermal contact with the surroundings; t = 15°C) against a fixed external pressure of 1·00 bar. The initial and final volume of gas are 10 dm^3 and 30dm^3, respectively. Choose the correct option for change in the entropy of the system (ΔS_{sys}) and surroundings (ΔS_{surr})
    a) $\Delta S_{sys}>0;\Delta S_{surr}=0$ b) $\Delta S_{sys}>0;\Delta S_{surr}<0$ c) $\Delta S_{sys}<0;\Delta S_{surr}>0$ d) $\Delta S_{sys}=0;\Delta S_{surr}=0$

24. Which of the following statements is incorrect?
    a) Molecularity and order have same meaning for the elementary reactions
    b) Pre-exponential factor for a reaction is temperature independent
    c) Acid catalyzed ester hydrolysis reaction is a pseudo 1st order reaction
    d) For gas phase reaction, the increment in internal pressure increased the reaction rate

25. One mole of an ideal monatomic gas at 27°C expands adiabatically from 1 lit to 10 lit, against constant pressure, P. Which one is not correct?
    a) Adiabatic reversible work done is temperature dependent
    b) $W_{ad}=-P(V_2-V_1)$ c) Adiabatic reversible work is equal to irreversible one
    d) Entropy change for system is zero

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