Set **A**

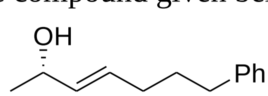
Entrance Test for Admission in M.Sc. Chemistry, 2017

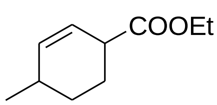
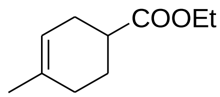
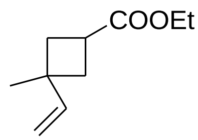
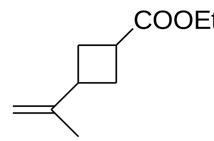
Total Marks: 100 (Each Question Carries 2 Marks) **Time: 2 hr**

Roll No.	**Invigilator's Signature**

General Instructions to the Candidate:

1. **Use of mobile phone is strictly prohibited inside the examination hall.**
2. **You must not communicate in any way with any other candidate in the examination hall.**
3. **Use the last page of the question paper for rough work.**
4. **You must not resort to any disorderly conduct inside the examination hall.**
5. **Write only the correct answer key (a or b or c or d) in the space provided.**

Sl. No.	Questions	Answer
1.	The pH of a 10^{-8} M solution of HCl in water is- (a) 8 (b) -8 (c) Between 7 and 8 (d) Between 6 and 7	
2.	When propyne is passed through red hot iron tube, the product obtained is- (a) Benzene (b) Cyclohexane (c) p-Xylene (d) Mesitylene	
3.	Nylon 6,6 is prepared by the condensation polymerization of: (a) Styrene and 1,3-butadiene (b) Ethylene glycol and terephthalic acid (c) Ethene and propene (d) Hexamethylene diamine and adipic acid	
4.	The IUPAC name for the compound given below is-  (a) (2R, 3Z)-7-phenylhept-3-en-2-ol (b) (2S, 3Z)-7-phenylhept-3-en-2-ol (c) (2R, 3E)-7-phenylhept-3-en-2-ol (d) (2S, 3E)-7-phenylhept-3-en-2-ol	

5.	The major product formed in the reaction of isoprene with ethyl acrylate is-  (a)  (b)  (c)  (d)	
6.	The number of nodes present in the HOMO of 1,3,5-hexatriene in its ground state is- (a) One (b) Two (c) Three (d) Zero	
7.	In the lowest energy chair conformation of cis-1,4-dimethylcyclohexane, the number of axial positions occupied by hydrogen atoms are- (a) 1 (b) 3 (c) 5 (d) 6	
8.	. If the % ee of a sample mixture is 70%, the % composition of R isomer, assuming R is the dominant/major isomer in the sample mixture, is- (a) 70% (b) 30% (c) 85% (d) 15%	
9.	Soybean is used to replace traditional inks in printer cartridges, highlighting which of the green chemistry principles? (a) Atom economy (b) Use of Renewable Feedstock (c) Reduce derivatives (d) Prevent waste	
10.	Proton magnetic resonance is studied in (a) Microwave region (b) Infrared region (c) Visible region (d) Radiofrequency region	
11.	Number of ^{1}H NMR and ^{13}C NMR signals for p-xylene are respectively (a) 2 and 3 (b) 2 and 4 (c) 3 and 2 (d) 4 and 3	
12.	In Lassaignes test, on boiling sodium thiocyanate with ferrous sulfate will produce (a) NaSCN (b) $Fe(SCN)_2$ (c) $Fe(SCN)_3$ (d) $Na_4[Fe(CN)_6]$	

13.	Product of the following reaction is $Me_2CuLi + CH_3CH_2Br \longrightarrow$ (a) $CH_3CH_2CH_3$ (b) $CH_2{=}CH_2$ (c) $CH_3CH{=}CH_2$ (d) CH_3CH_3	
14.	Which of the following on reaction with but-2-yne forms cis-but-2-ene (a) Li/NH_3 (b) $Pd/BaSO_4$ (c) Ni (d) $LiAlH_4$	
15.	Product of the following reaction is $(CH_3CH_2CH_2)_3B + H_2O_2 \xrightarrow{OH^-}$ (a) $CH_3CH_2CH_2OH$ (b) $CH_3CH(OH)CH_3$ (c) $CH_2(OH)CH_2CH_2OH$ (d) CH_3COCH_3	
16.	Which reagent does not give carbonyl compound on reaction with nitriles (a) $SnCl_2$,HCl ; H_2O (b) DIBAL-H, H_2O (c) RCOCl, $AlCl_3$ (d) RMgX, H_2O	
17.	Amine that forms yellow oily compound on reaction with HNO_2 is (a) $PhNH_2$ (b) $PhCH_2NH_2$ (c) Me_3N (d) Piperidine	
18.	The dissociation constant of *n*-butyric acid at 25 °C is 1.515×10^{-5} and the molar conductance at infinite dilution is 382.42×10^{-4} mho m^2 mol^{-1}. The specific conductance (in mho m^2 mol^{-1}) of the acid at 0.01 M solution is (a) 0.1488 (b) 0.01488 (c) 1.488 (d) 14.88	
19.	The effective activation energy for an effective rate constant $k^{'} = 2\frac{k_2}{k_3}\left(\frac{k_1}{k_5}\right)^{1/2}$ is (a) $E_a^{'} = E_{a(2)} - E_{a(3)} + \frac{1}{2}\left(E_{a(5)} - E_{a(1)}\right)$ (b) $E_a^{'} = E_{a(1)} - E_{a(3)} + \frac{1}{2}\left(E_{a(2)} - E_{a(5)}\right)$ (c) $E_a^{'} = E_{a(2)} - E_{a(3)} + \frac{1}{2}\left(E_{a(1)} - E_{a(5)}\right)$ (d) $E_a^{'} = E_{a(3)} - E_{a(2)} + \frac{1}{2}\left(E_{a(1)} - E_{a(5)}\right)$	

20.	Which of the following statement(s) is/are correct? I) The packing fraction of body centered cubic lattice is 0.68. II) The coordinates of the atoms in a body centered cubic unit cell are (0,0,0) and $\left(\frac{1}{2},\frac{1}{2},\frac{1}{2}\right)$ III) In the powder diffraction pattern of a body centered cubic cell $h+k+l$=odd are absent. (a) I and II (b) I and III (c) I, II and III (d) Only I	
21.	A 10^{-4} M solution of a chromophore shows 50% transmittance at a certain wavelength using a path length of 0.5 cm. The molar extinction coefficient of the chromophore at this wavelength is (a) 6020 $M^{-1}cm^{-1}$ (b) 3010 $M^{-1}cm^{-1}$ (c) 1500 $M^{-1}cm^{-1}$ (d) 5000 $M^{-1}cm^{-1}$	
22.	A particle is constrained in a one dimensional box of length $2a$ and with potential $V(x) = \infty$; $x < -a$, $x > a$ and $V(x) = 0$; $-a \le x \le a$. Energy difference between levels n=3 and n=2 is a) $\frac{5h^2}{8ma^2}$ b) $\frac{9h^2}{8ma^2}$ c) $\frac{9h^2}{32ma^2}$ d) $\frac{5h^2}{32ma^2}$	
23.	A compound of M and X atoms has a cubic unit cell. M atoms are at the corners and body centre positions and X atoms are at face centre positions of the cube. The molecular formula of the compound is (a) M_2X_3 (b) MX (c) M_3X_2 (d) MX_2	
24.	Using the fundamental equation $\partial H = TdS + VdP$ the Maxwell relation is- a) $(\partial S/\partial P)_T = -(\partial V/\partial T)_P$ b) $(\partial T/\partial V)_S = (\partial P/\partial S)_T$ c) $(\partial S/\partial V)_P = (\partial P/\partial T)_V$ d) $(\partial T/\partial P)_S = (\partial V/\partial S)_P$	
25.	1 mol of CO_2, 1 mol of N_2 and 2 mol of O_2 were mixed at 300 K. The entropy of mixing is (a) 6 R ln2 (b) 8 R ln2 (c) 16 R ln2 (d) $\frac{8\text{ R ln2}}{300}$	

26.	Given that E_0 (Fe^{3+}, Fe) = -0.04 V and E_0 (Fe^{2+}, Fe) = -0.44 V, the value of E_0 (Fe^{3+}, Fe^{2+}) is (a) 0.76 V (b) -0.40 V (c) -0.76 V (d) 0.40 V	
27.	The freezing point constant for water is 1.86 K kg mol^{-1}. The change in freezing point when 0.01 mol glucose is added to 1 kg water is (a) 1.86 K (b) -1.86 K (c) 0.186 K (d) -0.0186 K	
28.	Cu^{64} is radioactive and show a first order decay with 12.8 hour half-life. A scientist performing an experiment measured the activity of a Cu^{64} sample at the beginning and at the end of his experiment. The final activity was found to be 20% of the initial activity. The time taken by the scientist to perform his experiment is (a) 27.7 hour (b) 28.7 hour (c) 29.7 hour (d) 72.7 hour	
29.	For a 4 particle system, available non-degenerate energy levels are 0E, 1E, 2E and 3E. The total energy of the system is always 6E. The total number of possible macrostates is (a) 3 (b) 4 (c) 5 (d) 6	
30.	1 mole Helium is heated at constant volume from 25^0C to 45^0C. Assuming Helium to be an ideal gas the change in internal energy (ΔU) of the system is (a) 249.42 J (b) 294.24 J (c) 415.70 J (d) 514.70 J	
31.	Entropy of adsorption of gas molecules on a metal surface is (a) Always positive (b) Always negative (c) Both positive or negative (d) No change	
32.	Slope of the Log k (k = rate constant) versus pH plot in acid-base catalyzed reaction in acidic medium is (a) -1 (b) +1 (c) Zero (d) None of these	
33.	If the ratio of composition of oxidized and reduced species in electrochemical cell, is given as [O]/[R] = e^3 the correct potential difference will be (a) $E - E^{o'} = RT/nF$ (b) $E - E^{o'} = 3RT/nF$ (c) $E - E^{o'} = -3RT/nF$ (d) $E - E^{o'} = -RT/nF$	

34.	Which of the following configuration will show large Jahn-Teller distortion (a) d^5, high spin (b) d^3 (c) d^9 (d) d^{10}	
35.	Raman spectroscopy deals with (a) Change in the dipole moment (b) Molecules with unpaired spin (c) Change in polarizability tensor (d) Magnetic moment	
36.	Intense color of $KMnO_4$ is due to (a) d-d transition (b) Ligand to metal charge transfer transition (c) Metal to ligand charge transfer transition (d) Intraligand л- л* transition	
37.	Which one of the following molecules is having regular geometry (a) CH_4 (b) NH_3 (c) PH_3 (d) PCl_5	
38.	Which one of the following molecules does not obey 18 electron rule (a) $Fe(C_5H_5)_2$ (b) $[HPt(PMe_3)_3]^+$ (c) $[Fe_2(CO)_8]^{2-}$ (d) $Cr(CO)_6$	
39.	Which one of the following molecules is having **closo** structure (a) $C_2B_3H_5Fe(CO)_3$ (b) B_4H_{10} (c) B_5H_9 (d) B_5H_{11}	
40.	Oxidation number of **Fe-atom** with physiological role of some iron proteins are given below. Mention the correct answer. (a) Hemoglobin contains Fe^{3+} and its function is oxygen transport in plasma (b) Hemoglobin contains Fe^{2+} and its function is oxygen storage (c) Transferrin contains Fe^{3+} and its function is Fe transport *via* plasma (d) Transferrin contains Fe^{3+} and its function is Fe storage	
41.	The ground term for d^2 configuration is (a) $^4F_{9/2}$ (b) $^3F_2$ (c) $^6G_3$ (d) ^4F	

42.	For oxidative addition reaction between MeI and $IrX(CO)L_2$ (X= halogen) the correct order of X for decreasing rate of oxidative addition is (a) X=Cl ≈ Br > F > I (b) X=F > Cl > Br > I (c) X= I > Br > Cl ≈ F (d) X= F > Cl ≈ Br > I	
43.	d-d transition is not observed in compound (a) $[Cu(NH_3)_4]^{2+}$ (b) $[Ti(H_2O)_6]^{3+}$ (c) $[CrO_4]^{2-}$ (d) None of the above	
44.	The magnetic susceptibility of a paramagnetic material is (a) Independent of temperature (b) Decreases with increase in temperature (c) Increases with increase in temperature (d) None of the above	
45.	The pair of gaseous molecules/ions having tetrahedral structure is: (a) $SnCl_4$, XeF_4 (b) $SnCl_4$, PH_4^+ (c) ICl_4^-, PH_4^+ (d) $SnCl_4$, ICL_4^-	
46.	Oxymyoglobin $Mb(O_2)$ and oxyhemoglobin $Hb(O_2)_4$ respectively , are (a) Paramagnetic and Paramagnetic (b) Diamagnetic and Diamagnetic (c) Diamagnetic and Paramagnetic (d) Paramagnetic and Diamagnetic	
47.	The correct electronic configuration and spin-only magnetic moment of Gd^{3+}(at. No. 64) are (a) $[Xe]4f^7$ and 7.9 BM (b) $[Xe]4f^7$ and 8.9 BM (c) $[Xe]4f^6 5d^1$ and 7.9 BM (d) $[Rn]5f^7$ and 7.9 BM	
48.	In the following reaction…… $[PtCl_4]^{2-} + NO_2^- \longrightarrow A \xrightarrow{NH_3} B$ Compound B is (a) *trans*-$[PtCl_2(NO_2)(NH_3)]$ (b) *cis*-$[PtCl_2(NO_2)(NH_3)]$ (c)*trans*-$[PtCl_2(NH_3)_2]$ (d) *cis*-$[PtCl_2(NO_2)_2]$	
49.	The correct order of stability of difluorides is: (a) $GeF_2 > SiF_2 > CF_2$ (b) $CF_2 > SiF_2 > GF_2$ (c) $SiF_2 > GeF_2 > CF_2$ (d) $CF_2 > GF_2 > SiF_2$	

50.	The complex that absorbs light of shortest wavelength is: (a) $[CoF_6]^{3-}$ (b) $[Co(H_2O)_6]^{3+}$ (c) $[Co(NH_3)_6]^{3+}$ (d)$[Co(ox)_3]^{3-}$ (ox = $C_2O_4^{2-}$)	

Examiner's Signature **Scrutiniser's Signature**

ROUGH WORK

ROUGH WORK