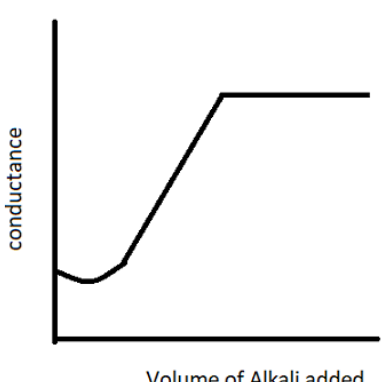


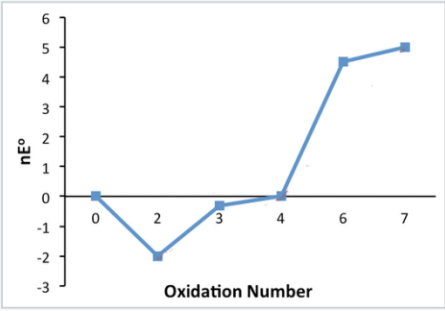
1.	The relative rate of diffusion of a gas (molar mass= 128) as compared to oxygen is (a) 2 times (b) 1/ 4 (c) 1/8 (d) 1/2
2.	At what temperature will hydrogen molecules have the same kinetic energy per mole as nitrogen molecules at 280 K? (a) 280 K (b) 40K (c) 400 K (d) 50 K
3.	Which as the highest boiling point? (a) 0.1 M Na ₂ SO ₄ (b) 0.1 M C ₆ H ₁₂ O ₆ (glucose) (c) 0.1 M MgCl ₂ (d) 0.1 M Al(NO ₃) ₃
4.	The number of atoms per unit cell in a simple cubic, face centred cubic and body centred cubic arrangement are respectively (a) 8, 14, 9 (b) 1, 4, 2 (c) 1, 2, 4 (d) 4, 1, 2
5.	At what angles for the first order diffraction, spacing between two planes respectively are λ and $\lambda/2$? (a) 0°, 90° (b) 90°, 0° (c) 30°, 90° (d) 90°, 30°
6.	The ability of an ion to bring about coagulation of a given colloid depends on (a) sign of the charge only (b) magnitude of charge only (c) both charge and magnitude (d) none of these
7.	The rate of reaction, $A + B_2 \longrightarrow AB + B$ is directly proportional to the concentration of A and independent of concentration of B ₂ , Hence, rate law is (a) $k [A] B_2$ (b) $k [A]^2 [B_2]$ (c) $k [A]$ (d) $k[B_2]$
8.	K_p/ K_c for the reaction $CO(g) + 1/2 O_2(g) \rightleftharpoons CO_2 (g)$ will be (a) 1 (b) \sqrt{RT} (c) $\frac{1}{\sqrt{RT}}$ (d) RT
9.	Rate constant of a first order reaction is 0.0693 min ⁻¹ . If we start with 20 mol/ L, it is reduced to 2.5 mol/L in (a) 10 min (b) 20 min (c) 30 min (d) 40 min
10.	The effect of a catalyst in a chemical reaction is to change the (a) activation energy (b) equilibrium concentration (c) heat of reaction (d) Final product
11.	If the enthalpy change for the transition of liquid water to steam is 300 kJ mol ⁻¹ at 27°C, the entropy of change for the process would be (a) 1000 JK ⁻¹ mol ⁻¹ (b) 10 JK ⁻¹ mol ⁻¹ (c) 1.0 JK ⁻¹ mol ⁻¹ (d) 0.1 JK ⁻¹ mol ⁻¹
12.	Select the correct statement (a) Joule-Thomson effect is zero in an ideal gas (b) Joule-Thomson coefficient $\mu_{J-T} = \frac{1}{C_p} \left[\frac{2a}{RT} - b \right]$ for a real gas (c) Both (a) and (b) (d) None of the above

13.	The efficiency of a Carnot's engine is 100% when (a) sink is placed at 0°C (b) sink is placed at 0 K (c) source is placed at 100 °C (d) source is placed at 400 °C
14.	The following mathematical expression is equal to $\left(\frac{\partial U}{\partial V}\right)_S$ (a) -Temperature (b) -Pressure (c) -Gibbs free energy (d) -Enthalpy
15.	A system in equilibrium is described by the gaseous phase equation $\text{Heat} + \text{SO}_2\text{Cl}_2 \rightleftharpoons \text{SO}_2 + \text{Cl}_2$ Which of the following statement is true? (a) Addition of Cl ₂ will shift the equilibrium towards right and temperature is raised (b) Addition of Cl ₂ will shift the equilibrium towards left and temperature is raised (c) Addition of Cl ₂ and SO ₂ will shift the equilibrium towards left and temperature is raised (d) Addition of Cl ₂ and SO ₂ will shift the equilibrium towards left and temperature is lowered
16.	The following graph represent the conductometric titration of  (a) Strong acid and strong base (b) Strong acid and weak base (c) Weak acid and strong base (d) Weak acid and weak base
17.	A weak monoacid base has pH = 10 at 0.01 M. % ionisation of base is (a) 0.01 % (b) 0.001 % (c) 0.0001% (d) 1.0 %

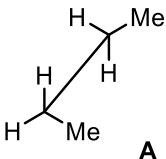
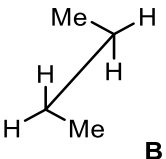
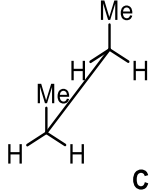
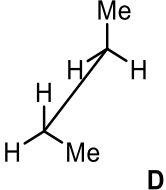
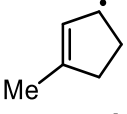
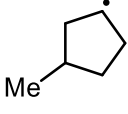
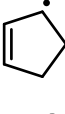

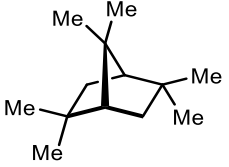
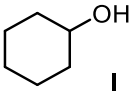
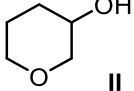
18.	The standard reduction potentials of Cu^{2+}/Cu and Cu^+/Cu are 0.339V and 0.518 V, respectively. The standard electrode potential of $\text{Cu}^{2+}/\text{Cu}^+$ half cell is (a) 0.16 V (b) -0.179 V (c) -0.16 V (d) +0.179 V
19.	The chemical potential is partial molal quantity of (thermodynamics parameter) (a) Entropy (b) Helmholtz work function (c) Gibbs free energy (d) Internal energy
20.	A saturated solution of sodium chloride is a (a) one phase system (b) two phase system (c) three phase system (d) none of these
21.	Debye-Huckel theory predicts (a) Variation of velocity constant with temperature (b) Variation of equivalent conductance with concentration (c) Variation of equivalent constant with Pressure (d) None of the above
22.	Distribution law cannot be applicable for a system in which I_2 is distributed in between (a) Water and alcohol (b) water and benzene (c) water and chloroform (d) water and diethyl ether
23.	When the solid compound AB and the liquid phase have identical composition at the maximum point on the freezing point curve, the corresponding temperature is said to beof the compound. (a) eutectic point (b) Congruent Melting Point (c) isotactic point (d) invariant point
24.	In uranyl oxalate actinometer, the concentration of used upis a measure of the intensity of radiation. (a) KMnO_4 (b) uranyl oxalate (c) iodine (d) oxalic acid
25.	Stark-Einstein law states about between reactant and product. (a) photochemical equivalence (b) photochemical equilibrium (c) photochemical balance (d) photochemical reversibility
26.	Which gas is adsorbed to the maximum extent on the given surface? (a) NH_3 (b) H_2 (c) N_2 (d) O_2
27.	Which of the following compounds shows both Frenkel and Schottky defects? (a) NaCl (b) AgCl (c) AgBr (d) KCl
28.	Polymer obtained by condensation polymerization is (a) polyethene (b) Teflon (c) PVC (d) phenol-formaldehyde resin
29.	The maximum work a system can perform is equal to the decrease in (a) Enthalpy change (ΔH) (b) Helmholtz work function change (ΔA) (c) Gibbs free energy change (ΔG) (d) none of these
30.	The salt bridge in the electrochemical cell serves to (a) increase the rate at which equilibrium is attained (b) increase the voltage of the cell (c) maintain electrical neutrality (d) increase the oxidation/reduction rate

31.	<p>A titration of oxalic acid solution was performed with 0.01 N solution of KMnO_4. Of different activities given below, which one leads to a method error in the measurement:</p> <p>(a) using uncalibrated burette (b) carrying out the titration at room temperature (c) reading burette with lower meniscus (d) rinsing the pipette with oxalic acid solution before use</p>
32.	<p>Chemical oxygen demand for waste water can be expressed as:</p> <p>(a) $\mu\text{g} / \text{mL}$ (b) mg / mL (c) ppt (d) $\mu\text{g} / \text{L}$</p>
33.	<p>A 0.1 M aqueous solution of sodium carbonate was prepared by weighing 1.06 g of anhydrous material, dissolving it into about 70 mL of water and making up the volume to 100 mL. Standard solution of which of the following substances can be used to standardize the prepared sodium carbonate solution?</p> <p>(a) oxalic acid (b) succinic acid (c) monosodium oxalate (d) potassium hydrogen phthalate</p>
34.	<p>Among the following, identify the replicates in chemical analysis.</p> <p>(a) ten students performed gravimetric determination of a solution of silver nitrate by precipitating silver chloride by pipetting 25 mL each of the given stock solution (b) one student determined hardness of three samples of water by performing one titration each of the three solutions with standard EDTA (c) one student standardized 100 mL of dilute sodium hydroxide solution by titrating 10 mL each of the solution three times with standard acid solution. (d) one student analyzed the given 10mL, 25 mL and 50 mL of ferric chloride solutions for gravimetric determination of iron</p>
35.	<p>In the solvent extraction of Fe(III) from 6 molar HCl solution containing 200 mg at pH 4.4, using oxine, a single extraction results into extraction of 100 mg of Fe(III), while at pH 6.4, about 5 mg of Fe(III) gets extracted. What is pH 4.4 called?</p> <p>(a) pK_a (b) pK_b (c) $\text{pH}_{1/2}$ (d) $\text{pH}_{2/3}$</p>
36.	<p>Which of the following electrode combinations cannot be used for determination of pH of an aqueous solution?</p> <p>(a) silver / silver chloride electrode with standard hydrogen electrode (b) standard hydrogen electrode with another standard hydrogen electrode through salt bridge (c) standard hydrogen electrode with standard calomel electrode (d) a glass electrode coupled with a standard calomel electrode</p>
37.	<p>Which of the following conditions is true when there is no weight loss in a DTG curve?</p> <p>(a) $dW/dt \neq 0$ (b) $dW/dt = 0$ (c) $dW/dt > 1$ (d) $dW/dt < 1$</p>

46.	Alpha-graphite and beta-graphite have (a) Same hybridization of C orbitals but different chemical properties (b) Different hybridization of C orbitals and different chemical properties (c) Hexagonal structure (d) Different arrangement of stacks of layers
47.	Beryl and Emerald , respectively, are examples of (a) Both cyclic silicates, (b) Sheet silicates and orthosilicates (c) cyclic silicate and disilicate (d) pyrosilicate and sheet silicate
48.	Which of the following hydroxides is basic in character? (a) Be(OH) ₂ (b) B(OH) ₃ (c) Al(OH) ₃ (d) TlOH
49.	The anion, S ₂ O ₄ ²⁻ is named as (a) Thiosulphate (b) dithionate (c) dithionite (d) tetrathionate
50.	Which of the following is the most acidic? (Hint: Consider the dissociation of the first proton in case of more than one H present) (a) H ₄ P ₂ O ₇ (b) H ₃ PO ₃ (c) H ₃ PO ₄ (d) H ₂ PO ₄ ⁻
51.	The hybridization of Cl atom orbitals in ClF ₃ and its shape are, respectively, (a) sp ² , trigonal planar (b) sp ³ , trigonal pyramidal (c) dsp ³ , trigonal planar (d) dsp ³ , bent T
52.	The hydrophobicity of silicones is due to the presence of (a) Si-O-Si framework (b) Si-O-R groups (c) Si-R groups (d) Si-OH groups at the exterior
53.	Doping of Indium in Silicon results in the (a) formation of an n-type semiconductor (b) addition of a conduction band with lower energy than that in Si (c) addition of a valence band (d) increase in the band gap

54.	<p>Given below is Frost diagram of an element. What does it indicate about the stability of various oxidation states of the element?</p>  <p>(a) Oxidation state 3 is more stable than 2 and 4 (b) Oxidation state 4 is less stable than 3 and 6 (c) 2 is the least stable oxidation state (d) Species with oxidation states 3 and 6 are unstable</p>
55.	<p>Which of the following 2 reactions are possible?</p> <p>i. $2\text{FeCl}_3 + \text{SnCl}_2 \rightarrow 2\text{FeCl}_2 + \text{SnCl}_4$ ii. $2\text{FeCl}_2 + \text{SnCl}_4 \rightarrow 2\text{FeCl}_3 + \text{SnCl}_2$ iii. $\text{PbCl}_2 + \text{SnCl}_4 \rightarrow \text{SnCl}_2 + \text{PbCl}_4$ iv. $\text{SnCl}_2 + \text{PbCl}_4 \rightarrow \text{PbCl}_2 + \text{SnCl}_4$</p> <p>(a) i and ii (b) i and iii (c) i and iv (d) ii and iv</p>
56.	<p>Oxidation of ferrous ion by Ce^{4+} and KMnO_4 is attempted in separate reactions. The following is expected to happen.</p> <p>(a) Ce^{4+} is not a good oxidizing agent and hence, will not oxidize Fe^{2+} quantitatively. (b) KMnO_4 is a stronger oxidizing agent with Mn in +7 oxidation state and hence the reaction with KMnO_4 will be faster. (c) Both are strong oxidizing agents and hence both reactions will be equally fast. (d) The reaction with Ce^{4+} is a complementary reaction while that with KMnO_4 is non-complementary. Hence, the reaction with Ce^{4+} will be faster.</p>
57.	<p>The product formed in the reaction where 3 Cl^- ligands in $[\text{PtCl}_4]^{2-}$ are successively substituted by one each of NH_3, NO_2^- and py (= pyridine) in the same order is</p> <p>(a) $\text{Trans-}[\text{Pt}(\text{py})(\text{NH}_3)(\text{Cl})(\text{NO}_2)]$ (b) $\text{Trans-}[\text{Pt}(\text{Cl})(\text{NH}_3)(\text{py})(\text{NO}_2)]$ (c) $\text{Trans-}[\text{Pt}(\text{Cl})(\text{py})(\text{NH}_3)(\text{NO}_2)]$ (d) $\text{Trans-}[\text{Pt}(\text{Cl})_2(\text{NH}_3)(\text{py})]$</p>
58.	<p>The entropy change during a ligand substitution reaction following A mechanism is</p> <p>(a) Positive (b) Negative (c) Zero (d) Either positive or negative</p>
59.	<p>Which of the following can behave as a reducing agent?</p> <p>(a) $\text{Fe}(\eta^5\text{-C}_5\text{H}_5)(\text{CO})_3$ (b) $\text{Mn}(\eta^5\text{-C}_5\text{H}_5)(\text{CO})_3$ (c) $\text{Cr}(\eta^5\text{-C}_5\text{H}_5)(\text{CO})_3$ (d) $\text{Co}(\eta^5\text{-C}_5\text{H}_5)(\text{CO})_2$</p>

60.	A mixture of aqueous ZnCl_2 and AlCl_3 is treated with excess of concentrated sodium hydroxide solution. The result should be the formation of (a) Zn(OH)_2 precipitate (b) Al(OH)_3 precipitate (c) Both Zn(OH)_2 and Al(OH)_3 precipitates (d) Clear solution
61.	Metals A and B have same valence electron configuration and similar radii. Metal A crystallizes in HCP lattice while metal B forms a BCC lattice. (a) Metals A and B can form a superlattice (b) Metals A and B can form an interstitial alloy (c) Metals A and B can form a random substitution alloy over a limited range of composition (d) They can not form any alloy
62.	Which of the following statements is true about iron and its alloys? (a) Cast iron is softer than pure iron (b) Steel is a substitutional alloy (c) The hardness of steel is due to the occupation of interstitial sites (d) Steel is harder than cast iron
63.	The lanthanide ions having a stable oxidation state other than +3 are (a) La, Gd (b) Er, Lu (c) Gd, Lu (d) Eu, Yb
64.	Which of the following isotopes are fissile but artificially produced? (a) ^{238}U , ^{239}Pu (b) ^{233}U , ^{238}U (c) ^{235}U , ^{238}U (d) ^{233}U , ^{239}Pu
65.	Which of the following metal ions are involved at the active site of nitrogenase enzyme? (a) Zn, Cu (b) Mg, Fe (c) Fe, Mo (d) Mn, Co
66.	Which of the following is Wilkinson's catalyst? (a) $[\text{IrCO}(\text{PPh}_3)_3]$ (b) $[\text{RhCl}(\text{PPh}_3)_3]$ (c) $\text{Co}_2(\text{CO})_8$ (d) $\text{RuCl}_2(\text{PPh}_3)_4]$
67.	A sulphide ore is generally roasted to the oxide before reduction because (a) Enthalpy of formation of CO_2 is highly negative while that of CS_2 is positive (b) Metal sulphides are generally more stable than metal oxides (c) Sulphide ores can not be reduced at all (d) No reducing agent is found suitable for a sulphide ore
68.	Which of the following metals is the strongest reducing agent? (a) Cs (b) Ce (c) Cu (d) Cr
69.	The point symmetry of thiosulphate anion is (a) C_1 (b) C_{2v} (c) C_{3v} (d) T_d

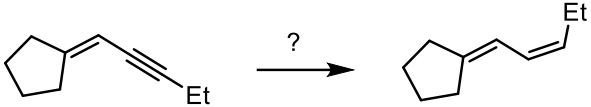
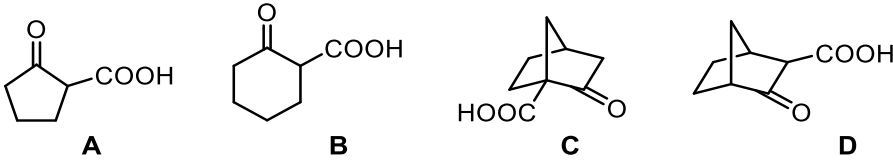
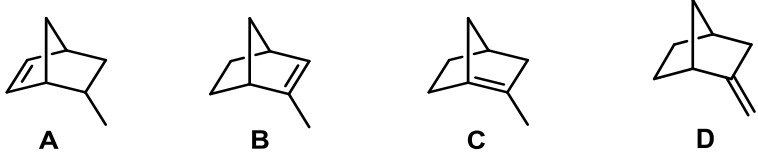
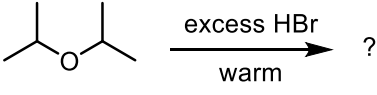
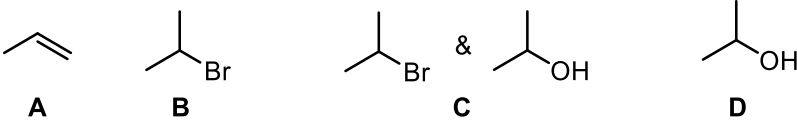
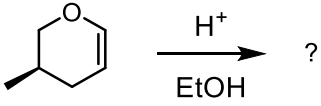
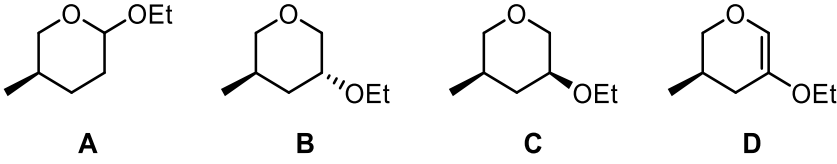
70.	<p>Aqueous ammonia is added to an aqueous solution containing chlorides of Ag^+, Al^{3+}, Fe^{3+}, Cu^{2+} and Ni^{2+} to attain $\text{pH} \approx 10$ and the solution filtered. Which of these ions will go in solution in complexed form?</p> <p>(a) Ag^+, Al^{3+}, Fe^{3+} (b) Cu^{2+}, Ni^{2+}, Ag^+ (c) Al^{3+}, Fe^{3+}, Cu^{2+} (d) Fe^{3+}, Cu^{2+}, Ni^{2+}</p>
71.	<p>Which of the following structures is most stable, with minimum potential energy?</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>A</p> </div> <div style="text-align: center;">  <p>B</p> </div> <div style="text-align: center;">  <p>C</p> </div> <div style="text-align: center;">  <p>D</p> </div> </div>
72.	<p>How many structural isomers one can give for a compound with the formula of $\text{C}_2\text{H}_2\text{F}_4$?</p> <p>A. One; B. Two; C. Three; D. Four</p>
73.	<p>Which free radical is most stable?</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>A</p> </div> <div style="text-align: center;">  <p>B</p> </div> <div style="text-align: center;">  <p>C</p> </div> <div style="text-align: center;">  <p>D</p> </div> </div>
74.	<p>How many chiral centres are present in the following compound?</p> <div style="text-align: center;">  </div> <p>A. Zero; B. One; C. Two; D. Three</p>
75.	<p>Which statement is correct for the following two compounds?</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>I</p> </div> <div style="text-align: center;">  <p>II</p> </div> </div>
A B C D	<p>The hydroxyl in both I and II is oriented in equatorial position, in its most stable conformation. The hydroxyl in both I and II is oriented in axial position, in its most stable conformation. The hydroxyl in I will be axial, while it is equatorial in II, in its most stable conformation. The hydroxyl in I will be equatorial, while it is axial in II, in its most stable conformation.</p>
76.	<p>How many stereoisomers are possible for 2,4-hexadiene?</p> <p>A. Zero; B. Two; C. Three; D. Four</p>

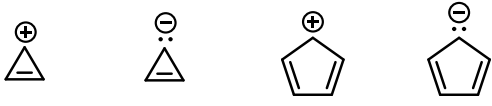
77.	Which order of reactivity is appropriate for the following compounds when treated with aqueous sodium hydroxide?
A	
B	
C	
D	

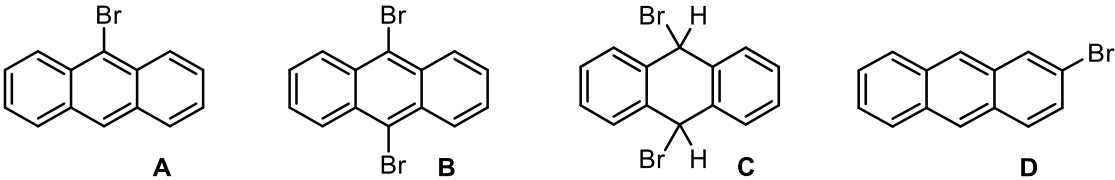
78.	Which of the following compounds will have highest boiling point?				
	<table style="width: 100%; border: none;"> <tr> <td style="text-align: center;"><chem>CH3CH2CH2CH2OCH3</chem> A</td> <td style="text-align: center;"><chem>CH3CH2CH2CH2CH2Cl</chem> B</td> </tr> <tr> <td style="text-align: center;"><chem>CH3CH2CH2CH2CH2OH</chem> C</td> <td style="text-align: center;"><chem>CH3CH2CH2CH2CH2NH2</chem> D</td> </tr> </table>	<chem>CH3CH2CH2CH2OCH3</chem> A	<chem>CH3CH2CH2CH2CH2Cl</chem> B	<chem>CH3CH2CH2CH2CH2OH</chem> C	<chem>CH3CH2CH2CH2CH2NH2</chem> D
<chem>CH3CH2CH2CH2OCH3</chem> A	<chem>CH3CH2CH2CH2CH2Cl</chem> B				
<chem>CH3CH2CH2CH2CH2OH</chem> C	<chem>CH3CH2CH2CH2CH2NH2</chem> D				

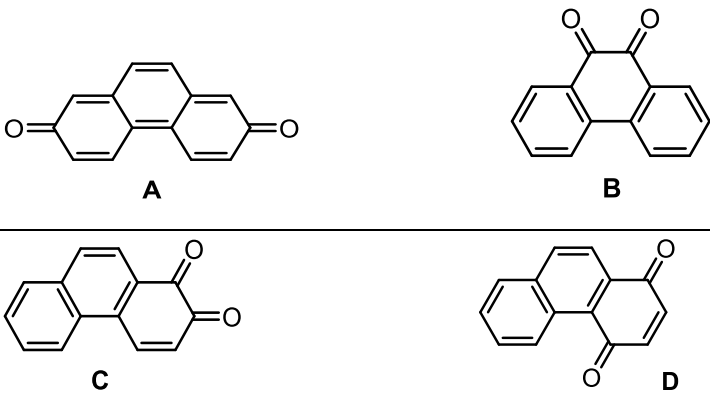
79.	What product is formed when the following halohydrin is treated with NaOH?				
	<table style="width: 100%; border: none;"> <tr> <td style="text-align: center;"> A</td> <td style="text-align: center;"> B</td> <td style="text-align: center;"> C</td> <td style="text-align: center;"> D</td> </tr> </table>	 A	 B	 C	 D
 A	 B	 C	 D		

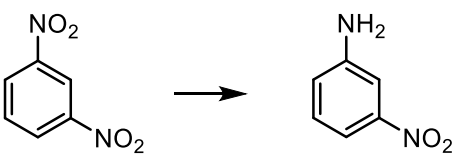
80.	Which position is most reactive for electrophilic substitution of 2-hydroxy naphthalene?

81.	<p>Which is the most stable condition for the following conversion?</p> 
A B C D	<p>H₂, 10% Pd-C (Catal.) H₂, 5% Rh-Alumina (Catal.) LiAlH₄, dry Et₂O H₂, Pd on BaSO₄, 2% quinoline (Catal.)</p>
82.	<p>Which of the following compounds will NOT undergo decarboxylation?</p>
	
83.	<p>Which of the following compounds will NOT produce a monocyclic compound on ozonolysis reaction?</p>
	
84.	<p>Predict main product of the following reaction.</p> 
	
85.	<p>Suggest major product of the following reaction.</p> 
	

86.	Which of the following compounds is/are aromatic in nature?
 I II III IV	
	A. I and II B. II and IV C. I and IV D. III and IV

87.	What main product is obtained when anthracene is treated with liquid bromine in CCl_4 at low temperature?
 A B C D	

88.	What major product is obtained when phenanthrene is subjected to oxidation with $\text{K}_2\text{Cr}_2\text{O}_7$ in dilute sulfuric acid?
 A B C D	

89.	Suggest appropriate reagent and condition for the following conversion.
	
A	Sn (metal) and HCl
B	Zn-Hg, HCl
C	H_2 , Pd-C (Catal.)
D	$(\text{NH}_4)_2\text{S}$

90.	Some molecules show phosphorescence due to _____.
A	Singlet to triplet crossing
B	Singlet to ground state transition
C	Triplet to ground state transition
D	Ground state to triplet excitation

91.	Which of the following compounds can exist in two geometrical isomeric forms?
	A. I and II B. II and III C. I and IV D. III and IV

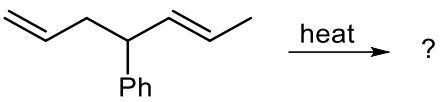
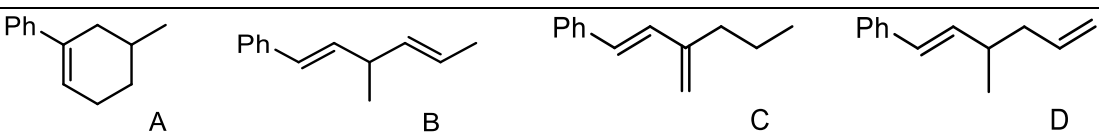
92.	Which of the following compounds are examples of heteroannular dienes?
	A, I and II; B, Only II; C, I, III and IV; D, II and IV

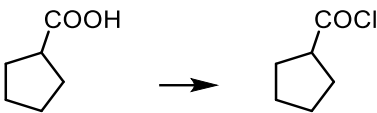
93.	Which carbohydrate is main component of "Table Sugar"?
	A. Sucrose B. Maltose C. Glucose D. Lactose

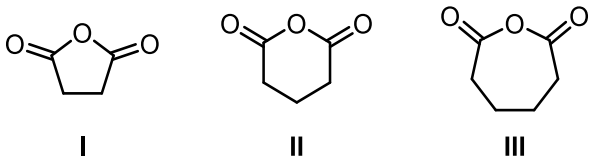
94.	The Kiliani-Fischer synthesis involves _____.
A	Lengthening of chain length of carbohydrate.
B	Shortening of chain length of carbohydrate.
C	The number of carbons remains unchanged.
D	The number of carbons remains unchanged, but involves oxidation.

95.	Which of the following four isomers will react faster, when heated with NaOH to give 1,2-dimethylcyclohex-1-ene?

96.	What is the best way to distinguish methanol and ethanol in the laboratory?
A	By Iodoform Test
B	By Lucas Test
C	By Tollen's Reagent Test
D	Hinsberg Test

97.	What is the major product formed in the following reaction? 
	

98.	In the following reaction, what change is observed in the IR stretching frequency of carbonyl group? 
A	The stretching of cyclopentanecarboxylic acid (1790 cm^{-1}) shifts to 1705 cm^{-1} in its acid chloride.
B	The stretching of cyclopentanecarboxylic acid (1715 cm^{-1}) shifts to 1690 cm^{-1} in its acid chloride.
C	The stretching of cyclopentanecarboxylic acid (1735 cm^{-1}) shifts to 1710 cm^{-1} in its acid chloride.
D	The stretching of cyclopentanecarboxylic acid (1705 cm^{-1}) shifts to 1790 cm^{-1} in its acid chloride.

99.	Which of the following compounds will show “quintet” signal (five line), due to spin-spin coupling? 
A	Only I
B	Only II
C	Only III
D	I and II

100.	Which of the following compounds is used as a standard in H-NMR spectroscopy? A. Me_4Si B. Me_4C C. Me_2O D. D_2O
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