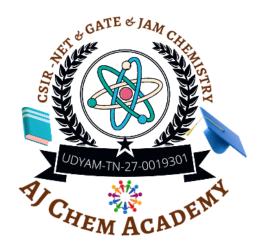


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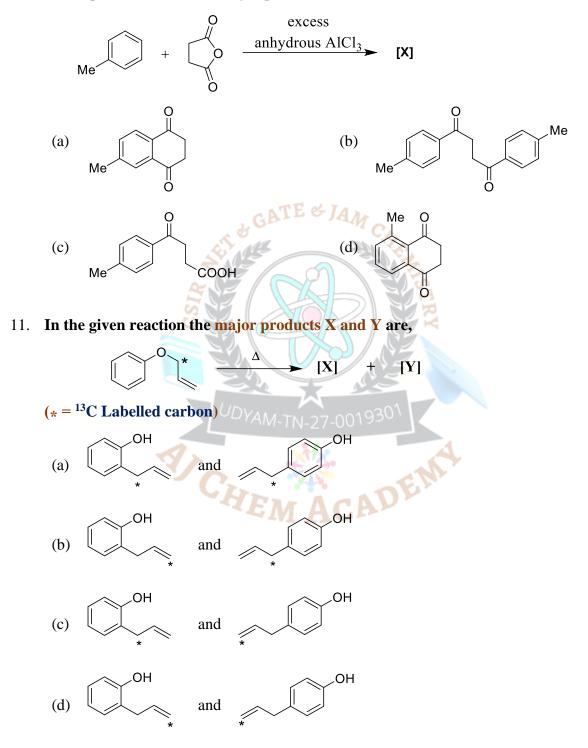
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9.1 - 9.20 Multiple Choice Question (MCQ), carry ONE mark each (for each wrong answer: - 1/3). 1. The <sup>M</sup> P-NMR spectrum of P <sub>4</sub> S <sub>3</sub> consists of (a) a singlet (b) a doublet and a triplet (c) a doublet and a quartet (d) two doublets. 2. The geometry around the central atom in CIF <sub>4</sub> <sup>+</sup> is (a) square planar (b) square pyramidal (c) octahedral (d) trigonal bipyramidal 3. The correct statement about the Cu-N bond distances in [Cu(NH <sub>3</sub> ) <sub>6</sub> ] <sup>2+</sup> is (a) all the bond distances are equal (b) the axial bonds are longer than the equatorial ones (c) the equatorial bonds are longer than the axial ones (d) all the bond distances are unequal 4. The reaction of phosgene with an excess of NH <sub>3</sub> produces (a) HN=C=O (b) H <sub>2</sub> N-C(C)P=O (c) (H <sub>2</sub> N) <sub>2</sub> C=O (d) (H <sub>2</sub> N) <sub>2</sub> CCl <sub>2</sub> 5. The number of metal-metal bonds in [(C <sub>5</sub> H <sub>5</sub> )Fe(CO)] <sub>2</sub> is (a) zero (b) one (c) two (d) three 6. The coordination number of the Ba <sup>2+</sup> tons in barium fluoride is 8. The coordination number of the fluoride ion is: (a) 8 (b) 4 (c) 1 (d) 2 7. In the transformation of oxyhaemoglobin to deoxyhaemoglobin (a) Fe <sup>2+</sup> in the low spin state changes to Fe <sup>2+</sup> in the bigh spin state (b) Fe <sup>2+</sup> in the low spin state changes to Fe <sup>2+</sup> in the low spin state (c) Fe <sup>2+</sup> in the high spin state changes to Fe <sup>2+</sup> in the low spin state (d) Fe <sup>2+</sup> in the high spin state changes to Fe <sup>2+</sup> in the low spin state (e) Fe <sup>2+</sup> in the high spin state changes to Fe <sup>2+</sup> in the low spin state (d) Fe <sup>2+</sup> in the high spin state changes to Fe <sup>2+</sup> in the low spin state (e) Fe <sup>2+</sup> in the high spin state changes to Fe <sup>2+</sup> in the low spin state 8. For the given compound the stereochemical notations are $\frac{Q^{H}}{Q} + \frac{Q^{H}}{Q} + \frac{Q}{Q} + \frac{Q}{$									
1. The <sup>31</sup> P-NMR spectrum of P <sub>4</sub> S <sub>3</sub> consists of <ul> <li>(a) a singlet</li> <li>(b) a doublet and a triplet</li> <li>(c) a doublet and a quartet</li> <li>(d) two doublets.</li> </ul> <li>The geometry around the central atom in ClF<sub>4</sub><sup>*</sup> is         <ul> <li>(a) square planar</li> <li>(b) square pyramidal</li> <li>(c) octahedral</li> <li>(d) trigonal bipyramidal</li> </ul> </li> <li>The correct statement about the Cu−N bond distances in [Cu(NH<sub>3</sub>)<sub>6</sub>]<sup>2+</sup> is         <ul> <li>(a) all the bond distances are equal</li> <li>(b) the axial bonds are longer than the equatorial ones</li> <li>(c) the equatorial bonds are longer than the axial ones</li> <li>(d) all the bond distances are unequal</li> </ul> </li> <li>The reaction of phosgene with an excess of NH<sub>3</sub> produces</li>		$\frac{\mathbf{Q.1} - \mathbf{Q.20} \text{ Mult}}{\mathbf{Mult}}$	iple Choice Questio	<u>n (MCQ), carry ONE</u>	<u>mark each (for</u>				
<ul> <li>(a) a singlet (b) a doublet and a triplet (c) a doublet and a quartet (d) two doublets.</li> <li>The geometry around the central atom in CIF<sub>4</sub> is (a) square planar (b) square pyramidal (c) octahedral (d) trigonal bipyramidal</li> <li>The correct statement about the Cu–N bond distances in [Cu(NH<sub>3</sub>)<sub>6</sub>]<sup>2+</sup> is (a) all the bond distances are equal (b) the axial bonds are longer than the equatorial ones (c) the equatorial bonds are longer than the axial ones (d) all the bond distances are unequal</li> <li>The reaction of phosgene with an excess of NH<sub>3</sub> produces (a) HN=C=O (b) H<sub>2</sub>N-C(CI)=O (c) (H<sub>2</sub>N)<sub>2</sub>C=O (d) (H<sub>2</sub>N)<sub>2</sub>Ccl<sub>2</sub></li> <li>The number of metal-metal bonds in [(C<sub>5</sub>H<sub>5</sub>)Fe(CO)]<sub>2</sub> is (a) zero (b) one (c) two (d) three</li> <li>The coordination number of the Ba<sup>2+</sup> tons in barium fluoride is 8. The coordination number of the Ba<sup>2+</sup> tons in barium fluoride is 8. The coordination number of the Ba<sup>2+</sup> tons in barium fluoride is 8. The coordination number of the Ba<sup>2+</sup> in the low spin state changes to Fe<sup>2+</sup> in the bigh spin state (b) fe<sup>2+</sup> in the low spin state changes to Fe<sup>3+</sup> in the bigh spin state (b) Fe<sup>2+</sup> in the bigh spin state changes to Fe<sup>3+</sup> in the bigh spin state (c) Fe<sup>2+</sup> in the bigh spin state changes to Fe<sup>3+</sup> in the bigh spin state (d) Fe<sup>2+</sup> in the bigh spin state changes to Fe<sup>3+</sup> in the bigh spin state (d) Fe<sup>2+</sup> in the bigh spin state changes to Fe<sup>3+</sup> in the bigh spin state (d) Fe<sup>2+</sup> in the bigh spin state changes to Fe<sup>3+</sup> in the bigh spin state (d) Fe<sup>2+</sup> in the bigh spin state changes to Fe<sup>3+</sup> in the bigh spin state (d) 2. For the given compound the stereochemical notations are (d) 2. For the given compound the stereochemical notations are (a) aromatic and has high dipole moment (b) aromatic and has no dip</li></ul>		_							
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<ul> <li>(b) the axial bonds are longer than the equatorial ones</li> <li>(c) the equatorial bonds are longer than the axial ones</li> <li>(d) all the bond distances are unequal</li> <li>The reaction of phosgene with an excess of NH<sub>3</sub> produces <ul> <li>(a) HN=C=O</li> <li>(b) H<sub>2</sub>N-C(C)=O</li> <li>(c) (H<sub>2</sub>N)<sub>2</sub>C=O</li> <li>(d) (H<sub>2</sub>N)<sub>2</sub>CCl<sub>2</sub></li> </ul> </li> <li>The number of metal-metal bonds in [(C<sub>5</sub>H<sub>5</sub>)Fe(CO)]<sub>2</sub> is <ul> <li>(a) zero</li> <li>(b) one</li> <li>(c) two</li> <li>(d) three</li> </ul> </li> <li>The coordination number of the Ba<sup>2+</sup> ions in barium fluoride is 8. The coordination number of the fluoride ion is: Automatic and has high dipole moment</li> <li>(b) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>2+</sup> in the high spin state</li> <li>(c) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the low spin state</li> <li>(d) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the low spin state</li> <li>(d) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(d) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the low spin state</li> <li>(d) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the bigh spin state</li> <li>(d) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(e) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(f) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(d) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(e) arcmatic and has high dipole moment</li> <li>(f) arcmatic and has no dipole moment</li> <li>(h) arcmatic and has no dipole moment</li> </ul>	3.	The correct statem	ent about the Cu–N bo	nd distances in [Cu(NH <sub>3</sub>	$(3)_6]^{2+}$ is				
<ul> <li>(c) the equatorial bonds are longer than the axial ones</li> <li>(d) all the bond distances are unequal</li> <li><b>The reaction of phosgene with an excess of NH<sub>3</sub> produces</b></li> <li>(a) HN=C=O</li> <li>(b) H<sub>2</sub>N-C(C)=O</li> <li>(c) (H<sub>2</sub>N)<sub>2</sub>C=O</li> <li>(d) (H<sub>2</sub>N)<sub>2</sub>CCl<sub>2</sub></li> <li><b>The number of metal-metal bonds in [(C<sub>5</sub>H<sub>5</sub>)Fe(CO)]<sub>2</sub> is</b></li> <li>(a) zero</li> <li>(b) one</li> <li>(c) two</li> <li>(d) three</li> </ul> 6. The coordination number of the Ba <sup>2+</sup> tons in barium fluoride is 8. The coordination number of the fluoride ion is: <ul> <li>(a) 8</li> <li>(b) 4</li> <li>(c) 1</li> <li>(d) 2</li> </ul> 7. In the transformation of oxyhaemoglobin to deoxyhaemoglobin <ul> <li>(a) Fe<sup>2+</sup> in the low spin state changes to Fe<sup>2+</sup> in the high spin state</li> <li>(b) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>2+</sup> in the low spin state</li> <li>(c) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(d) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(d) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(d) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(d) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(e) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(f) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> </ul> 8. For the given compound the stereochemical notations are <ul> <li>(a) 2Z, 4R</li> <li>(b) 2Z, 4S</li> <li>(c) 2E, 4R</li> <li>(d) 2E, 4S</li> </ul> 9. The compound (j) 2Z, 4S <ul> <li>(c) 2E, 4R</li> <li>(d) 2E, 4S</li> </ul> 9. The compound join the optimum theorement <ul> <li>(b) aromatic and has no dipole moment</li> <li>(b) aromatic and has no dipole moment</li> </ul> (b) aromatic and has no dipole moment <ul> <li>(b) aromatic and has no dipole moment</li> </ul>		(a) all the bond dista	ances are equal						
<ul> <li>(d) all the bond distances are unequal</li> <li>The reaction of phosgene with an excess of NH<sub>3</sub> produces <ul> <li>(a) HN=C=O</li> <li>(b) H<sub>2</sub>N-C(C)=O</li> <li>(c) (H<sub>2</sub>N)<sub>2</sub>C=O</li> <li>(d) (H<sub>2</sub>N)<sub>2</sub>CCl<sub>2</sub></li> </ul> </li> <li>The number of metal-metal bonds in [(C<sub>5</sub>H<sub>5</sub>)Fe(CO)]<sub>2</sub> is <ul> <li>(a) zero</li> <li>(b) one</li> <li>(c) two</li> <li>(d) three</li> </ul> </li> <li>The coordination number of the Ba<sup>2+</sup> ions in barium fluoride is 8. The coordination number of the fluoride ion is: <ul> <li>(a) 8</li> <li>(b) 4</li> <li>(c) 1</li> <li>(d) 2</li> </ul> </li> <li>In the transformation of oxyhaemoglobin to deoxyhaemoglobin <ul> <li>(a) Fe<sup>2+</sup> in the low spin state changes to Fe<sup>2+</sup> in the high spin state</li> <li>(b) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(c) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(d) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(d) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(e) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(d) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(e) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(e) a 2Z, 4R</li> <li>(fe<sup>2+</sup>) (fe<sup>2+</sup>) is</li> <li>(a) aromatic and has high dipole moment</li> <li>(b) aromatic and has high dipole moment</li> <li>(b) aromatic and has no dipole moment</li> </ul> </li> </ul>		(b) the axial bonds a	are longer than the equato	orial ones					
<ul> <li>4. The reaction of phosene with an excess of NH<sub>3</sub> produces <ul> <li>(a) HN=C=O</li> <li>(b) H<sub>2</sub>N-C(Cl)=O</li> <li>(c) (H<sub>2</sub>N)<sub>2</sub>C=O</li> <li>(d) (H<sub>2</sub>N)<sub>2</sub>CCl<sub>2</sub></li> </ul> </li> <li>5. The number of metal-metal bonds in [(C<sub>5</sub>H<sub>5</sub>)Fe(CO)]<sub>2</sub> is <ul> <li>(a) zero</li> <li>(b) one</li> <li>(c) two</li> <li>(d) three</li> </ul> </li> <li>6. The coordination number of the Ba<sup>2+</sup> ions in barium fluoride is 8. The coordination number of the fluoride ion is: <ul> <li>(a) 8</li> <li>(b) 4</li> <li>(c) 1</li> <li>(d) 2</li> </ul> </li> <li>7. In the transformation of oxyhaemoglobin to deoxyhaemoglobin</li> <li>(a) Fe<sup>2+</sup> in the low spin state changes to Fe<sup>2+</sup> in the high spin state</li> <li>(b) Fe<sup>2+</sup> in the low spin state changes to Fe<sup>2+</sup> in the low spin state</li> <li>(c) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the low spin state</li> <li>(d) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the low spin state</li> <li>(d) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the low spin state</li> <li>(d) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the low spin state</li> <li>(d) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the low spin state</li> <li>(d) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the low spin state</li> <li>(e) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the low spin state</li> <li>(f) fe<sup>2</sup> for the given compound the stereochemical notations are</li> <li>(f) for for the given compound the stereochemical notations are</li> <li>(a) 2Z, 4R</li> <li>(b) 2Z, 4S</li> <li>(c) 2E, 4R</li> <li>(d) 2E, 4S</li> </ul> <li>9. The compound for for for for the f</li>		(c) the equatorial bo	onds are longer than the a	xial ones					
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<ul> <li>5. The number of metal-metal bonds in [(C<sub>5</sub>H<sub>5</sub>)Fe(C0)]<sub>2</sub> is <ul> <li>(a) zero</li> <li>(b) one</li> <li>(c) two</li> <li>(d) three</li> </ul> </li> <li>6. The coordination number of the Ba<sup>2+</sup> ions in barium fluoride is 8. The coordination number of the fluoride ion is: <ul> <li>(a) 8</li> <li>(b) 4</li> <li>(c) 1</li> <li>(d) 2</li> </ul> </li> <li>7. In the transformation of oxyhaemoglobin to deoxyhaemoglobin <ul> <li>(a) Fe<sup>2+</sup> in the low spin state changes to Fe<sup>2+</sup> in the high spin state</li> <li>(b) Fe<sup>2+</sup> in the low spin state changes to Fe<sup>2+</sup> in the low spin state</li> <li>(c) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the low spin state</li> <li>(d) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the low spin state</li> <li>(d) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(d) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the low spin state</li> <li>(e) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(f) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(d) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(e) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(f) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(h) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(h) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(h) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(h) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> </ul> </li> <li>8. For the given compound the stereochemical notations are     <ul> <li>(h) 2Z, 4X</li> <li>(h) 2Z, 4X</li></ul></li></ul>	4.	The reaction of ph	osgene with an excess of	NH <sub>3</sub> produces					
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<ul> <li>(a) 8 (b) 4 (c) 1 (d) 2</li> <li>7. In the transformation of oxyhaemoglobin to deoxyhaemoglobin</li> <li>(a) Fe<sup>2+</sup> in the low spin state changes to Fe<sup>2+</sup> in the high spin state</li> <li>(b) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the low spin state</li> <li>(c) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the low spin state</li> <li>(d) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(e) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(f) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(d) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(e) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(f) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(d) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(e) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(f) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(h) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(h) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(h) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(h) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(h) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>(h) 2Z, 4R (h) 2Z, 4S (c) 2E, 4R (h) 2E, 4S</li> <li>(h) acomptoid (j) ji s</li> <li>(h) aromatic and has high dipole moment</li> <li>(h) aromatic and has no dipole moment</li> <li>(h) aromatic and has no dipole moment</li> </ul>	6.	The coordination	number of the Ba <sup>2+</sup> ion	s in barium fluoride is 8	. The coordination				
<ul> <li>7. In the transformation of oxyhaemoglobin to deoxyhaemoglobin</li> <li>(a) Fe<sup>2+</sup> in the low spin state changes to Fe<sup>2+</sup> in the high spin state</li> <li>(b) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>2+</sup> in the low spin state</li> <li>(c) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the low spin state</li> <li>(d) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>8. For the given compound the stereochemical notations are</li> <li>(a) 2Z, 4R</li> <li>(b) 2Z, 4S</li> <li>(c) 2E, 4R</li> <li>(d) 2E, 4S</li> <li>(e) aromatic and has high dipole moment</li> <li>(f) aromatic and has no dipole moment</li> </ul>		number of the fluo	ride ion is: AM-TN-27	-0019301					
<ul> <li>(a) Fe<sup>2+</sup> in the low spin state changes to Fe<sup>2+</sup> in the high spin state</li> <li>(b) Fe<sup>2+</sup> in the low spin state changes to Fe<sup>3+</sup> in the low spin state</li> <li>(c) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the low spin state</li> <li>(d) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>8. For the given compound the stereochemical notations are</li> <li>(a) 2Z, 4R</li> <li>(b) 2Z, 4S</li> <li>(c) 2E, 4R</li> <li>(d) 2E, 4S</li> <li>(e) aromatic and has high dipole moment</li> <li>(f) aromatic and has no dipole moment</li> <li>(f) aromatic and has no dipole moment</li> </ul>		(a) 8	(b) 4	(c) 1	(d) 2				
<ul> <li>(b) Fe<sup>2+</sup> in the low spin state changes to Fe<sup>3+</sup> in the low spin state</li> <li>(c) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>2+</sup> in the low spin state</li> <li>(d) Fe<sup>2+</sup> in the high spin state changes to Fe<sup>3+</sup> in the high spin state</li> <li>8. For the given compound the stereochemical notations are <ul> <li></li></ul></li></ul>	7.	In the transformat	ion of oxyhaemoglobin	to deoxyhaemoglobin					
(c) $Fe^{2+}$ in the high spin state changes to $Fe^{2+}$ in the low spin state (d) $Fe^{2+}$ in the high spin state changes to $Fe^{3+}$ in the high spin state 8. For the given compound the stereochemical notations are $\int_{-\frac{P}{P}}^{\frac{P}{P}} (-P) + \int_{0}^{\frac{P}{P}} (-P) + \int_{0}^{\frac{P}{P} (-P) $		(a) $Fe^{2+}$ in the low spin state changes to $Fe^{2+}$ in the high spin state							
(d) $Fe^{2+}$ in the high spin state changes to $Fe^{3+}$ in the high spin state 8. For the given compound the stereochemical notations are figure field = 0 (a) 2Z, 4R (b) 2Z, 4S (c) 2E, 4R (d) 2E, 4S (a) aromatic and has high dipole moment (b) aromatic and has no dipole moment (b) aromatic and has no dipole moment (b) aromatic and has no dipole moment (c) 2E, 4R (d) 2E, 4S (c) 2E, 4R (d) 2E, 4S (		(b) $Fe^{2+}$ in the low spin state changes to $Fe^{3+}$ in the low spin state							
8. For the given compound the stereochemical notations are $ \begin{array}{c}  & & \\  & & \\  & & \\  & & \\  & & \\  & (a) 2Z, 4R & (b) 2Z, 4S & (c) 2E, 4R & (d) 2E, 4S \\   & & \\  & &$		(c) $Fe^{2+}$ in the high	spin state changes to Fe <sup>2</sup>	<sup>2+</sup> in the low spin state					
$ \begin{array}{c} &                                   $		(d) $Fe^{2+}$ in the high	spin state changes to Fe <sup>3</sup>	<sup>3+</sup> in the high spin state					
<ul> <li>(a) 2Z, 4R</li> <li>(b) 2Z, 4S</li> <li>(c) 2E, 4R</li> <li>(d) 2E, 4S</li> <li>(e) 2E, 4S</li> <li>(f) 2E, 4S</li> <li>(g) 2E, 4S</li> &lt;</ul>	8.	For the given com	pound the stereochemica	al notations are					
<ul> <li>(a) 2Z, 4R</li> <li>(b) 2Z, 4S</li> <li>(c) 2E, 4R</li> <li>(d) 2E, 4S</li> <li>(e) 2E, 4S</li> <li>(f) 2E, 4S</li> <li>(g) 2E, 4S</li> &lt;</ul>			OH						
<ul> <li>9. The compound is</li> <li>(a) aromatic and has high dipole moment</li> <li>(b) aromatic and has no dipole moment</li> </ul> Tiruchirappalli – 620 024 <a href="https://www.csircoaching.com">www.csircoaching.com</a> <a href="https://www.csircoaching.com">ajchemacademy@gmail.com</a>			$\gamma$	OH					
<ul> <li>9. The compound is</li> <li>(a) aromatic and has high dipole moment</li> <li>(b) aromatic and has no dipole moment</li> </ul> Tiruchirappalli – 620 024 <a href="https://www.csircoaching.com">www.csircoaching.com</a> <a href="https://www.csircoaching.com">ajchemacademy@gmail.com</a>				0					
The compound       is         (a) aromatic and has high dipole moment         (b) aromatic and has no dipole moment         Tiruchirappalli – 620 024         www.csircoaching.com	0	(a) 2Z, 4R	(b) 2Z, 4S	(c) 2E, 4R	(d) 2E, 4S				
(b) aromatic and has no dipole moment Tiruchirappalli – 620 024 www.csircoaching.com ajchemacademy@gmail.com	9.	The compound	is						
(b) aromatic and has no dipole moment Tiruchirappalli – 620 024 www.csircoaching.com ajchemacademy@gmail.com		(a) aromatic and has	s high dipole moment						
Tiruchirappalli – 620 024     www.csircoaching.com     ajchemacademy@gmail.com									
			-						
	Tiruc	chirappalli – 620 024	www.csircoaching.	<u>com</u> <u>ajchen</u>	nacademy@gmail.com				

- (c) non-aromatic and has high dipole moment
- (d) anti-aromatic and has no dipole moment

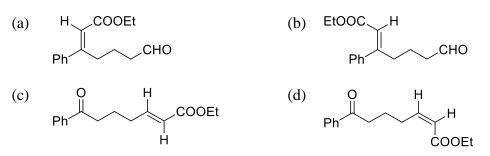
#### 10. In the given reaction, the major product-X is:



12. In the given reaction, the major product-X is:

0





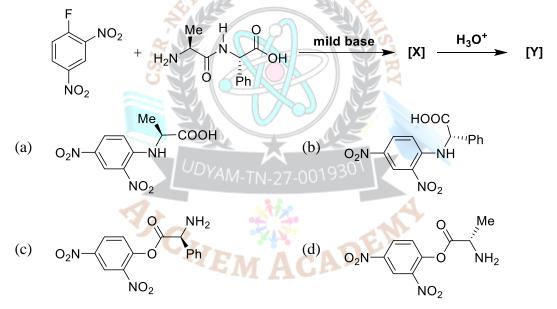
13. The most suitable reagent combination to bring out the following transformation is



(a) PhCOCl and pyridine

(b) DCC and PhCOOH

- (c) PhBr, CO and Pd(PPh<sub>3</sub>)<sub>4</sub> (d) EtOOC–N=N–COOEt, PPh<sub>3</sub> and PhCOOH
- 14. In the given two steps reaction sequence, the major product-Y is:



- 15. Among the following, the system that would require the least amount of thermal energy to bring its temperature to 80 °C is:
  - (a) 200 g of water at 40 °C (b) 100 g of water at 20 °C
  - (c) 150 g of water at 50 °C (d) 300 g of water at 30 °C
- 16. Among the following, the reaction that is accompanied by a decrease in the entropy is,

(a) 
$$N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$$
 (b)  $C_6H_{12}O_{6(s)} + 6O_{2(g)} \rightarrow 6CO_{2(g)} + 6H_2O_{(l)}$   
(c)  $PCl_{5(s)} \rightarrow PCl_{3(l)} + Cl_{2(g)}$  (d)  $2H_2O_{(l)} \rightarrow 2H_{2(g)} + O_{2(g)}$ 

17. The number of degrees of freedom of a system consisting of solid sucrose in equilibrium with an aqueous solution of sucrose is

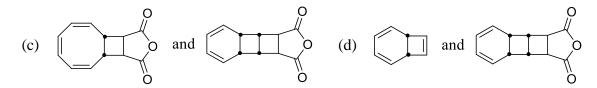


## 4 GATE - 2009 - CY(a) 0 (b) 1 (c) 2(d) 3 18. The lowest allowed energy is equal to zero for (b) a rigid rotor (a) the hydrogen atom (c) a harmonic oscillator (d) a particle in a 3-dimensional box 19. According to the Debye-Hückel limiting law, if the concentration of a dilute aqueous solution of KCl is increased 4-fold, the value of $\ln \gamma_{\pm}$ will $(\gamma_{\pm}$ is the molal mean ionic activity coefficient) (a) decrease by a factor of 2 (b) increase by a factor of 2 (c) decrease by a factor of 4 (d) increase by a factor of 4. 20. For the parallel first order reaction shown below $z \xrightarrow{k_2} x \xrightarrow{k_1} y$ the value of $k_1$ is $1 \times 10^{-4}$ s<sup>-1</sup>. If the reaction starts from X, the ratio of the concentrations of Y and Z at any given time during the course of the reaction is found to be $\frac{[Y]}{[Z]} = \frac{1}{4}$ The value of k<sub>2</sub> is: (a) $1 \times 10^{-4} \text{ s}^{-1}$ (b) $2.5 \times 10^{-5} \text{ s}^{-1}$ (c) $4 \times 10^{-4} \text{ s}^{-1}$ (d) $4 \times 10^{4} \text{ s}^{-1}$ Q.21 - Q.60 Multiple Choice Question (MCQ), carry TWO marks each (for each wrong answer: - 2/3). The correct order of $v_{CO}$ for the following compounds, in the IR spectrum is: 21. $[Mo(CO)_3(NMe_3)_3] \longrightarrow FMACP[Mo(CO)_3(P(OPh)_3)_3]$ Ι Π $[Mo(CO)_3(PCl_3)_3]$ $[Mo(CO)_3(PMe_3)_3]$ Ш IV (a) I > II > III > IV (b) IV > I > II > III (c) IV > II > III > I (c) III > I > IV > II22. 2.5 g of an iron compound upon suitable treatment yielded 0.391 g of iron(III) oxide.

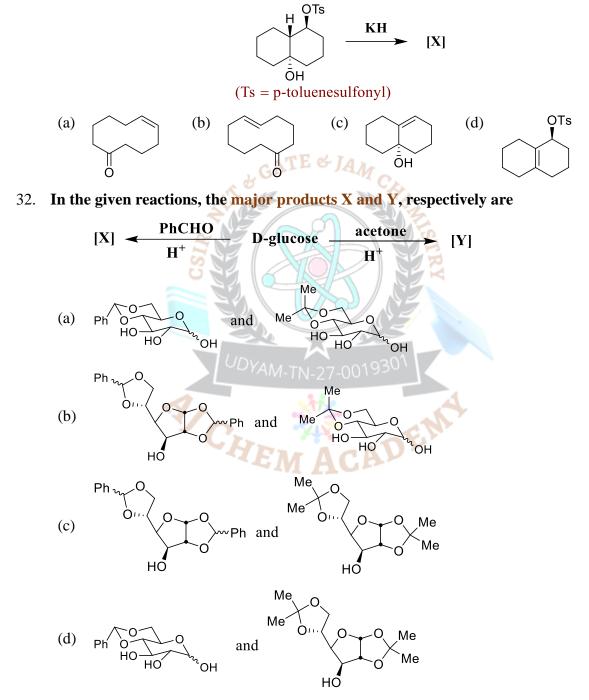
- The percentage of iron in the compound is (Atomic weight of Fe: 55.847, O: 15.994) (a) 10.94 (b) 12.15 (c) 11.31 (d) 9.11 <sup>23.</sup> In the reaction,  $Ph_3P \xrightarrow{Mel} [X] \xrightarrow{n-BuLi} [Y]$ ; the compounds X and Y, respectively are
  - (a)  $[Ph_3P(Me)I]$ ;  $Ph_3P=CH-CH_2-CH_2-CH_3$  (b)  $[Ph_3P(Me)][I]$ ;  $Ph_3P=CH_2$

0

				P(Me)][I];
	(c) $[Ph_3P(Me)_2]; Ph_3P$	-		P(Me)][I]; └─
24.	The <sup>1</sup> H-NMR spectrum	n of HD consists o	fa	
	(a) singlet (b)	1:1 doublet	(c) 1:1:1 triplet	(d) 1:2:1 triplet
25.	The X-ray powder pat	tern of NaCl show	vs an intense cone at $\theta$	= 15.87° using X-
	rays of wavelength 1.5	$54  imes 10^{-8}$ cm. The	e spacing between the <b>j</b>	<mark>planes</mark> (in Å) of NaCl
	crystal is			
	(a) 1.41 (l	b) 2.82	(c) 4.23	(d) 5.63
26.	Among the following,	the <mark>isoelectronic</mark> a	nd isostructural pair is	
	(a) $CO_2$ and $SO_2$ (b)	(5) SO <sub>3</sub> and SeO <sub>3</sub>	(c) $NO_2^+$ and $TeO_2$	(d) $SiO_4^{4-}$ and $PO_4^{3-}$
27.	Two samples have been	n given to you : [N	liCl <sub>2</sub> (PPh <sub>3</sub> ) <sub>2</sub> and [PdC	$[l_2(PPh_3)_2].$
	A physical method that	it can be used to id	lentify these compound	s unambiguously is
	(a) HPLC		(b) magnetic sus	ceptibility
	(c) <sup>13</sup> C-NMR spectrosco	уру	(d) Mössbauer s	pectroscopy
28.	In the reaction HSO	$\overline{4}_{(aq)} + OH_{(aq)} \leftrightarrow$	$SO_4^{2-}(aq) + H_2O_{(l)},$ the	e conjugate acid-base
	pairs are			
	(a) $HSO_4^-$ and $SO_4^{2-}$ ; $H_2$	O and OH <sup>-</sup>	(b) $HSO_4^-$ and $H_3O^+$	; $SO_4^{2-}$ and $OH^{-}$
	(c) $HSO_4^-$ and $OH^-$ ; SO	$_4^{2-}$ and $H_2O$	(d) $HSO_4^-$ and $OH^-$ ;	$SO_4^{2-}$ and $H_3O^+$
29.	Designate the following	g complexes X, Y	and Z as inert or labile	:
	x		Y	Ζ
	$[Al(C_2O_4)_3]^{3-}$		$[I_20)_6]^{2+}$	$[Cr(C_2O_4)_3]^{3-}$
	(a) X and Y are inert; Z	is labile	(b) X and Z are lab	ile; Y is inert
	(c) X is inert; Y and Z a	re labile	(d) X is labile; Y an	nd Z are inert
30.	In the reaction sequen	ce, X and Y, respe	ctively, are	
		+ <u>Ο</u> <u>Δ</u>	$\rightarrow$ [X] $\xrightarrow{\Delta}$ [Y]	
	(a)		(b)	and $0$

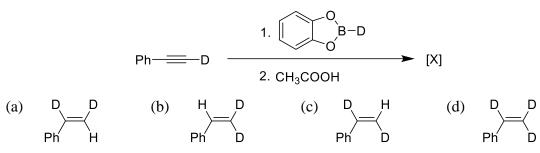


31. The major product-X in the given reaction is (based on the preferred conformation)

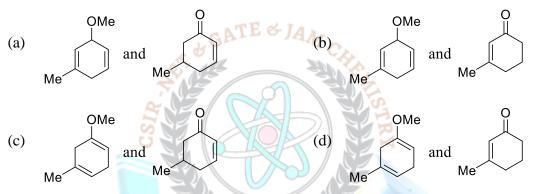


33. In the given reaction, the major product-X is

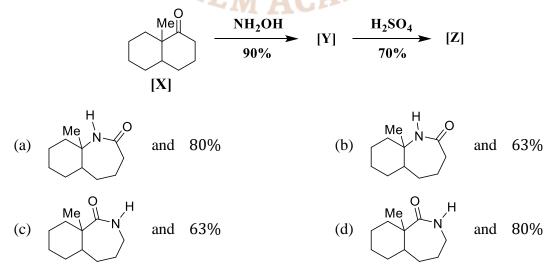




34. Reaction of *m*-methylanisole with lithium in liquid ammonia and t-butyl alcohol at -33 °C generates compound-X as the major product. Treatment of the compound-X with dilute sulphuric acid produces compound-Y as the major product. The compounds X and Y, respectively, are



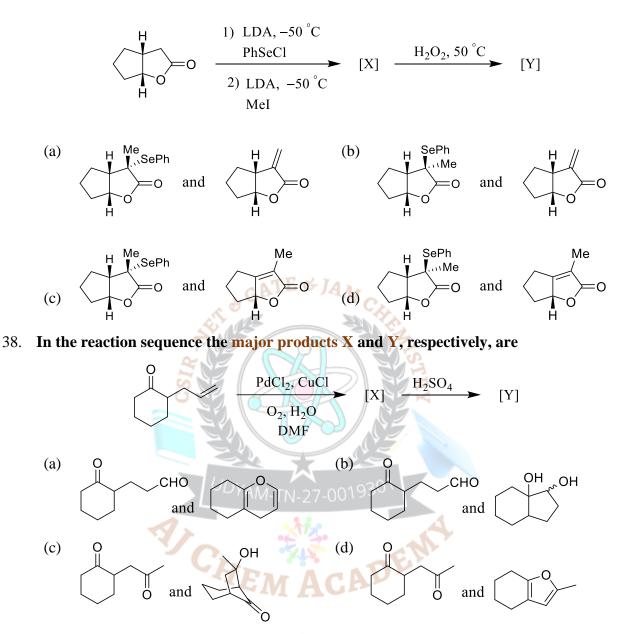
- 35. The number of signals that appear in the broad-band decoupled <sup>13</sup>C-NMR spectrum of ortho-, meta- and para-dichlorobenzenes, respectively, are
  (a) 3, 4 and 2
  (b) 3, 3 and 2
  (c) 4, 4 and 2
  (d) 3, 4 and 4
- 36. In the given reaction sequence, the structure of the major product-Z and the overall yield for its formation from the ketone-X, are



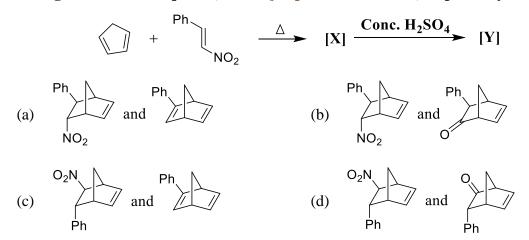
37. In the given reaction sequence, the major products X and Y respectively, are:

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39. In the given reaction sequence, the major products X and Y, respectively are



40. In the given photochemical reaction, formation of the compound-X can be inferred

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by the disappearance of the <sup>1</sup>H-NMR signal at

	by the usappearance		) hv	
		MeO	CD <sub>3</sub> OD [X]	
	<sup>1</sup> <b>H NMR</b> : $\delta$ 9.7(2)	LH, s), 7.8(1H, d, J	8.0 Hz), 7.1 - 6.8 (2H,	m), <b>3.9</b> ( <b>3</b> H, s),
	2.5 (3H	, s) ppm		
	(a) δ 9.7 ppm	(b) δ 7.8 ppm	(c) δ 3.9 ppm	(d) δ 2.5 ppm
41.	The half-life $(t_{1/2})$ for	the hydrolysis of	an ester varies with the	e initial concentration
	of the reactant $([E]_0)$ a	s follows:		
	$[E]_0/10^{-2} \text{ mol } L^{-1}$	5.0	4.0	3.0
	t <sub>1/2</sub> / s	240	300	400
	The order of the react	ion is: b GB-	CA	
	(a) 0	(b) 1	(c) 2	(d) 3
42.	The fluorescence life	time of a molecul	e in solution is 10 ns	5. If the fluorescence
	quantum yield is 0. 1,	the rate constant o	f fluorescence decay is:	:
	(a) $1 \times 10^9  \mathrm{s}^{-1}$	(b) $1 \times 10^8 \text{ s}^{-1}$	(c) $1 \times 10^7 \text{ s}^{-1}$	(d) $9 \times 10^7 \text{ s}^{-1}$
43.	The fundamental vib	rational wavenum	bers for H <sub>2</sub> and I <sub>2</sub> a	are 4403.2 cm <sup>-1</sup> and
	214.5 cm <sup>-1</sup> , respectiv	vely. The relative	population of the first	st excited vibrational
	states of these two mo	lecules compared t	o their respective grou	nd states at 300 K are
	respectively:	e en	s	
	(a) $6.75 \times 10^{-1}$ and 3.	VNN -		$^{0}$ and 3.57 × 10 <sup>-1</sup>
	(c) $3.57 \times 10^{-6}$ and 6.	$75 \times 10^{-1}$	(d) $3.57 \times 10^{-1}$	and $6.75 \times 10^{-1}$
44.	The degeneracy of a c	uantum particle i	n a cubic box having e	nergy four times that
	of the lowest energy is			
	(a) 3	(b) 6	(c) 1	(d) 4
45.	The rotational Rama	n spectrum of <sup>19</sup> F <sub>2</sub>	shows a series of Stol	xes lines at 19230.769
	cm <sup>-1</sup> , 19227.238 cm <sup>-</sup>	<sup>1</sup> and 19223.707 cr	n <sup>-1</sup> . The rotational con	nstant for <sup>19</sup> F <sub>2</sub> in GHz
	is:			
	(a) 26.484	(b) 52.968	(c) 105.936	(d) 3.531
46.	The de-Broglie wavel	ength for a He ato	m travelling at 1000 n	$ns^{-1}$ (typical speed at
	room temperature) is			
	(a) $99.7 \times 10^{-12}$ m	(b) $199.4 \times 10^{-12}$	m (c) $199.4 \times 10^{-18}$	m (d) $99 \times 10^{-6}$ m
47.	Given that the stand	ard molar enthalp	oies of formation of N	$O_{(g)}$ and $NO_{2}_{(g)}$ are,



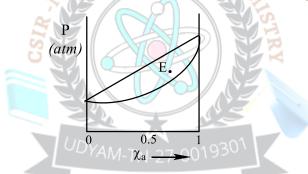
10

respectively, 90.3 kJ mol<sup>-1</sup> and 33.2 kJ mol<sup>-1</sup>, the enthalpy change for the reaction  $2NO_{(g)} + O_{2(g)} \rightarrow 2NO_{2(g)}$  is

- (a) 16.6 kJ (b) -57.1 kJ (c) -114.2 kJ (d) 57.1 kJ
- 48. Among the following, the equilibrium which is NOT affected by an increase in pressure is

(a) 
$$2SO_{3(g)} \leftrightarrow 2SO_{2(g)} + O_{2(g)}$$
 (b)  $H_{2(g)} + I_{2(s)} \leftrightarrow 2HI_{(g)}$   
(c)  $C_{(s)} + H_2O_{(g)} \leftrightarrow CO_{(g)} + H_{2(g)}$  (d)  $3Fe_{(s)} + 4H_2O_{(g)} \leftrightarrow Fe_3O_{4(s)} + 4H_{2(g)}$ 

- 49. The free energy change (ΔG) of 1 mole of an ideal gas that is compressed isothermally from 1 atm to 2 atm is:
  (a) RT ln2
  (b) -2RT → (c) -RT ln2
  (d) 2RT
- 50. Two liquids B and C form an ideal solution. In the figure below, the vapour pressure 'P' of this solution is shown as a function of the mole fraction,  $\varkappa_B$ , of component B.



(b) 0.53 (c) 0.65

Given a state of this vapour-liquid mixture whose overall composition corresponds to point-E in the figure, the mole fraction of B in the vapour phase is approximately

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(a) 0.25
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(d) 0.80
```

Common data for Q. 51 and Q. 52:

Treatment of  $W(CO)_6$  with 1 equivalent of  $Na(C_5H_5)$  in THF solution gives the ionic compound-M. Reaction of M with glacial acetic acid results in product N. The <sup>1</sup>H NMR spectrum of N displays two singlets of relative intensity 5:1. When N is heated, hydrogen gas is evolved and O is produced; O may also be prepared by refluxing  $W(CO)_6$  with cyclopentadiene and H<sub>2</sub> is also produced. Treatment of O with an equivalent of Br<sub>2</sub> produces P. (Use the 18-electron rule as your guide).

- 51. The compounds M and N, respectively, are
  - (a)  $[(C_5H_5)W(CO)_3]$ Na and  $[(C_5H_5)W(CO)_3H]$
  - (b)  $[(C_5H_5)W(CO)_4]$ Na and  $[(C_5H_5)W(CO)_4H]$
  - (c)  $[(C_5H_5)W(CO)_3]$ Na and  $[(C_5H_5)W(CO)_4H]$
  - (d)  $[(C_5H_5)W(CO)_4]$ Na and  $[(C_5H_5)W(CO)_3H]$

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#### 52. The compounds O and P, respectively, are

- (a)  $[(C_5H_5)W(CO)_3]_2$  and  $[(C_5H_5)W(CO)_3Br]$
- (b)  $[(C_5H_5)W(CO)_4]$  and  $[(C_5H_5)W(CO)_2Br(THF)]$
- (c)  $[(C_5H_5)W(CO)_2(THF)_2]$  and  $[(C_5H_5)W(CO)_3Br]$
- (d)  $[(C_5H_5)W(CO)_3]_2$  and  $[(C_5H_5)W(CO)_2Br(THF)]$

Common data for Q. 53 and Q. 54:

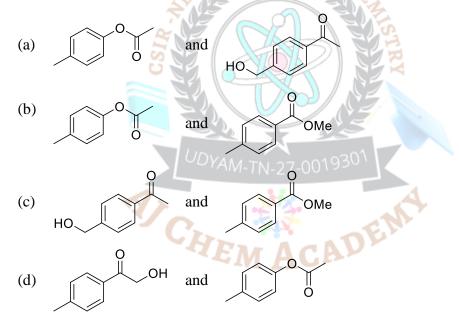
An organic compound-X (C<sub>9</sub>H<sub>10</sub>O) exhibited the following spectral data.

**IR** : 1680 cm<sup>-1</sup>

<sup>1</sup>H NMR : δ 7.8 (2H, d, J 7.5 Hz), 7.2 (2H, d, J 7.5 Hz), 2.7(3H, s) and 2.4 (3H, s)

Compound X on treatment with *m*-chloroperbenzoic acid produced two isomeric compounds Y (major) and Z (minor).

53. Compounds Y and Z, respectively, are



#### 54. Compounds Y and Z can be differentiated by carrying out basic hydrolysis, because

- (a) Y produces 4-methylphenol and Z is unaffected
- (b) Y produces 4-methylphenol and Z produces 4-methylbenzoic acid
- (c) Y is unaffected and Z produces 4-methylbenzoic acid
- (d) Y is unaffected and Z produces 4-methylphenol

#### Common data for Q. 55 and Q. 56:

#### Character table for the point group $C_{2v}$ is given below:

$C_{2v}$	Ε	<b>C</b> <sub>2</sub>	$\sigma_v(xz)$	$\sigma_v(yz)$		
A <sub>1</sub>	1	1	1	1	Z	$x^2, y^2, z^2$
<b>A</b> <sub>2</sub>	1	1	-1	-1	Rz	ху

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		-1				
<b>B</b> <sub>2</sub>	1	-1	-1	1	$\mathbf{y}, \mathbf{R}_{\mathbf{x}}$	yz

- 55. The reducible representation corresponding to the three translational degrees of freedom,  $\Gamma_{tr}$ , is:
  - (a) 3, 1, 1, 1 (b) 3, -1, 1, 1 (c) 3, -1, -1, -1 (d) 3, 1, -1, -1
- 56. The asymmetric stretching mode of the  $H_2O$  is shown below. The molecular plane is yz and the symmetry axis of  $H_2O$  is z.

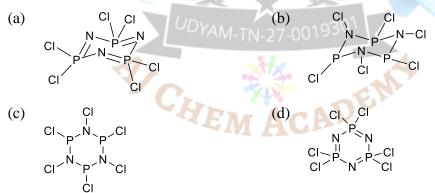
This vibration transforms as the irreducible representation

(a) 
$$A_1$$
 (b)  $B_1$  (c)  $A_2$  (d)  $B_2$ 

Linked Answer type Q.57 and Q.58.

Triphosphazene is prepared by reacting X and Y in equimolar ratio at 120-150 °C using appropriate solvents

- 57. The reaction X and Y, respectively, are
  (a) PCl<sub>3</sub>; NH<sub>3</sub>
  (b) PCl<sub>5</sub>; NH<sub>3</sub>
  (c) PCl<sub>5</sub>; NH<sub>4</sub>Cl
  (d) PCl<sub>3</sub>; NH<sub>4</sub>Cl
- 58. The structure of triphosphazene is



**Statement for Linked Q.59 and Q.60:** 

In the reaction mechanism given below,

$$X + Y \xrightarrow{k_1, E_{A,1}} Z \xrightarrow{k_3, E_{A,3}} P$$

'k 's represent rate constants, 'E<sub>A</sub>'s represent activation energies, and  $k_2 \gg k_3$ 

- 59. The overall rate constant ( $k_{overall}$ ) for the formation of P can be expressed as (a)  $k_1k_3/k_2$  (b)  $k_1$  (c)  $k_1/(k_2 + k_3)$  (d)  $k_1/(k_2 - k_3)$
- 60. The overall activation energy  $(E_{A, overall})$  for the formation of P can be expressed as



(a) 
$$\frac{E_{A,1} \cdot E_{A,3}}{E_{A,2}}$$

(b) E<sub>A,1</sub>

(c)  $E_{A,1} + E_{A,3} - E_{A,2}$ 

(d) 
$$\frac{E_{A,1}}{E_{A,2} + E_{A,3}}$$

Q.No	Ans	Q.No	Ans		Q.No	Ans		Q.No	Ans
1.	С	16.	а		31.	b		46.	а
2.	d	17.	С		32.	d		47.	С
3.	b	18.	b		33.	С		48.	d
4.	С	19.	а		34.	d		49.	а
5.	b	20.	С		35.	а		50.	d
6.	b	21.	С		36.	b		51.	а
7.	а	22.	а		37.	а		52.	а
8.	d	23.	b	CATE	38.	С		53.	b
9.	а	24.	С		39.	b		54.	b
10.	С	25.	b	K	40.	а	1	55.	b
11.	b	26.	b	100	41.	С	0	56.	b
12.	С	27.	b		42.	С	F.	57.	С
13.	d	28.	а		43.	b		58.	d
14.	а	29.	d		44.	С		59.	а
15.	С	30.	b		45.	а		60.	С

### Answer Key

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