

Id	1
Question	In photoelectric effect if intensity of light is doubled then maximum kinetic energy of photoelectrons will become -----.
A	Four time
B	double
C	No change
D	half
Answer	C

Id	2
Question	Frequency below which no electrons are emitted from metal surface when irradiated with electromagnetic radiation is:
A	Minimum frequency
B	Angular frequency
C	Maximum frequency
D	Threshold frequency
Answer	D

Id	3
Question	Fermi energy level for intrinsic semiconductors lies -----
A	At the center forbidden energy gap
B	Just below the conduction band
C	Just above the valence band
D	None
Answer	A

Id	4
Question	The shape of SF_4 according to VSEPR theory is -----
A	Square pyramidal
B	tetrahedral
C	trigonalbipyramidal
D	Square planar
Answer	C

Id	5
Question	Neutron is discovered by -----
A	Chadwik
B	Dalton
C	Rutherford
D	Yukawa
Answer	A

Id	6
Question	The element used for dating the ancient remains is -----
A	Ni
B	C^{12}
C	Cd
D	C^{14}
Answer	D

Id	7
Question	The electronic configuration of Chromium is given as $3d^5 4s^1$ instead $3d^4 4s^2$ why?
A	Adjustment of e-in orbital
B	Which affect the size of the atom
C	Additional stability
D	Decrease the ionic radii of element
Answer	C

Id	8
Question	The Complex which obeys 18 electron rule is -----
A	$Mn(CO)_3$
B	$Cr(CO)_6$
C	$V(CO)_6$
D	$Fe(CO)_4$
Answer	B

Id	9
Question	$[\text{NiCl}_4]^{2-}$ Is paramagnetic. Hence its geometry is -----
A	Square planar
B	tetrahedral
C	tetragonal
D	None of these
Answer	B

Id	10
Question	The ion which is expected to have Jahn-Teller distortion in an octahedral field is -----
A	Co^{3+} (strong field)
B	Co^{2+} (low-spin)
C	Ni^{2+}
D	Mn^{2+} (weak field)
Answer	B

Id	11
Question	Which one of the following is nonhemeiro-sulfur protein?
A	haemoglobin
B	myoglobin
C	cytochrome
D	rubredoxin
Answer	D

Id	12
Question	In addition to uranium, which other actinide occurs naturally in significant amounts?
A	Actinium
B	plutonium
C	protactinium
D	thorium
Answer	D

Id	13
Question	Wilkinson's catalyst is -----
A	$[RhCl(PPh_3)_3]$
B	$[Rh(PPh_3)_3]Cl$
C	$[RhCl(PEt_3)_3]$
D	None of these
Answer	A

Id	14
Question	Which one of the following metal is extracted from galena ore?
A	tin
B	lead
C	copper
D	silver
Answer	B

Id	15
Question	All the carbon atoms in diamond are ----- hybridized.
A	sp
B	sp^2
C	sp^3
D	All of these
Answer	C

Id	16
Question	Which one of the following is basic structure unit of sorosilicates?
A	$Si_2O_7^{-6}$
B	SiO_4^{-4}
C	$Si_6O_{18}^{-12}$
D	$Si_2O_6^{-4}$
Answer	A

Id	17
Question	For titration of weak acids with strong base, if K_a becomes smaller then at equivalence point -----
A	pH increases and Δ pH decreases
B	pH decreases and Δ pH increases
C	pH and Δ pH both increases
D	pH and Δ pH both increases
Answer	A

Id	18
Question	A flask contains 100 ml of 10mM of the acid HA ($pK_a=7.00$) solution whose pH is 7.00. after adding 1 mM of solid NaOH into the flast, the pH of solution will be -----
A	7.00
B	7.15
C	7.09
D	7.21
Answer	C

Id	19
Question	The freezing point of a mixture containing 1.60 g of naphthalene (molar mass of naphthalene is 128 g mol^{-1}) and 20 g of benzene is 2.8°C and that of pure benzene is 5.5°C . what is the value of molal freezing point depression constant for benzene?
A	$5.1^\circ \text{C kg mol}^{-1}$
B	$4.3^\circ \text{C kg mol}^{-1}$
C	$4.8^\circ \text{C kg mol}^{-1}$
D	$5.5^\circ \text{C kg mol}^{-1}$
Answer	B

Id	20
Question	Which one of the following expression is used to determine number average relative molecule mass
A	$\frac{\sum n_i M_{r,i}}{\sum n_i}$
B	$\frac{\sum n_i M_{r,i}}{\sum n_i M_{r,i}^2}$
C	$\frac{\sum n_i M_{r,i}^2}{\sum n_i M_{r,i}}$
D	$\frac{\sum n_i M_{i,r}^2}{\sum n_i}$
Answer	A

Id	21
Question	For any polydispersed system, which of the following statement is true?
A	Number average relative molar mass is greater than mass average relative molar mass
B	Number average relative molar mass is less than mass average relative molar mass
C	Number average relative molar mass coincide with mass average relative molar mass
D	None of the above
Answer	B

Id	22
Question	The equitation of state applicable to Liquid-expanded films is,
A	$(\pi \times \pi_0)(A - A_0) = kT$
B	$(\pi \times \pi_0)(A_0 - A) = kT$
C	$(\pi_0 - \pi)(A - A_0) = kT$
D	$(\pi - \pi_0)(A - A_0) = kT$
Answer	D

Id	23
Question	In gaseous hydrogen at room temperature, an average molecule moves at about 1.77 km/s. what is its wavelength? (H_2 molecule weights $3.35 \times 10^{-27} \text{ kg}$)
A	2.12 nm
B	0.112 nm
C	1.2 nm
D	0.212 nm
Answer	B

Id	24
Question	Correct order of frequencies for CO_2 absorption is -----
A	Symmetric stretch > Asymmetric stretch > Bending
B	Bending > Symmetric stretch > Asymmetric stretch
C	Asymmetric stretch > Symmetric stretch > Bending
D	Bending > Asymmetric stretch > Symmetric stretch
Answer	C

Id	25
Question	Carbon-carbon bond type in allene is -----
A	$sp^3 - sp$
B	$sp^3 - sp^2$
C	$sp^2 - sp$
D	$sp^2 - sp^2$
Answer	C

Id	26
Question	An unusual form solid in which particles pack in an orderly but nonperiodic fashion is known as -----
A	Microcrystalline
B	Polycrystalline
C	Quasicrystalline
D	Amorphous
Answer	C

Id	27
Question	Which geometric criterion is essential for a crystal to have rhombohedral structure?
A	$a=b \neq c ; \alpha=\beta=\gamma=90^{\circ}$
B	$a \neq b \neq c ; \alpha=\beta=\gamma=90^{\circ}$
C	$a=b=c ; \alpha=\beta=\gamma \neq 90^{\circ}$
D	$a \neq b \neq c ; \alpha=\beta=90^{\circ} ; \gamma=\alpha$
Answer	C

Id	28
Question	The statement “two systems, each separately in thermal equilibrium with a third system, are in thermal equilibrium with each other” is a consequence of ----- law of thermodynamics
A	zeroth
B	first
C	second
D	third
Answer	A

Id	29
Question	<p>Consider the following reactions all at $25^{\circ}C$ and 1 atm:</p> $PbO(s) + S(s) + \frac{3}{2}O_2(g) = PbSO_4(s), \Delta H = -39.56 \text{ kJ/mol};$ $PbO(s) + H_2SO_4 \cdot 5H_2O(l) = PbSO_4(s) + 6H_2O(l), \Delta H = -5.57 \text{ kJ/mol};$ $SO_3(g) + 6H_2O(l) = H_2SO_4 \cdot 5H_2O(l), \Delta H = -9.82 \text{ kJ/mol};$ <p>where the symbols in parentheses following the chemical formulas indicate that the substances are in the solid (s), liquid (l), or gaseous (g) state. After applying Hess's law, what is the heat of reaction for $S(s) + \frac{3}{2}O_2(g) = SO_3(g)$ at $25^{\circ}C$ and 1 atm?</p>
A	-18.17 kJ/mol
B	-33.99 kJ/mol
C	-43.81 kJ/mol
D	-24.17 kJ/mol
Answer	D

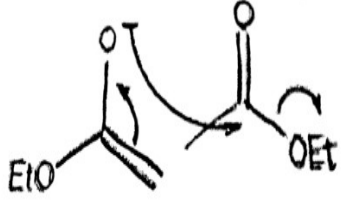
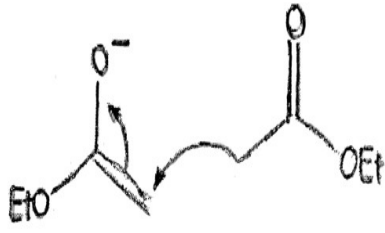
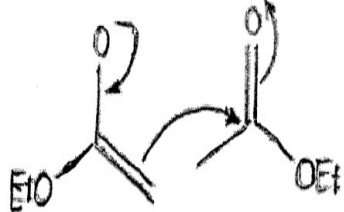
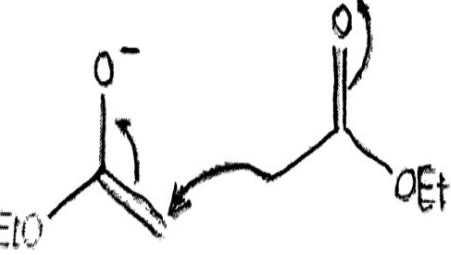
Id	30
Question	“It is impossible to devise a continuously cycling engine that produces no effect other than the extraction of heat from a reservoir at one temperature and the performance of an equal amount of mechanical work”. This is -----
A	Clausius statement
B	Kelvin statement
C	Caratheodory statement
D	Gibbs statement
Answer	B

Id	31
Question	For the equilibrium of any isolated system it is necessary and sufficient that, in all possible variations of the state of the system that do not alter its energy, the variation of its ----- shall either vanish or be negative.
A	enthalpy
B	Internal pressure
C	entropy
D	Heat capacity
Answer	C

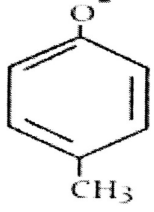
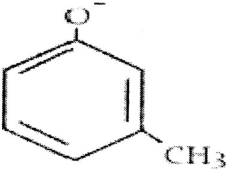
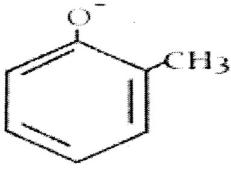
Id	32
Question	For the equilibrium of any isolated system it is necessary and sufficient that, in all possible variations of the state of the system that do not alter its entropy, the variation of its ----- shall either vanish or be positive.
A	energy
B	enthalpy
C	Specific heat capacity
D	Partial molar volume
Answer	A

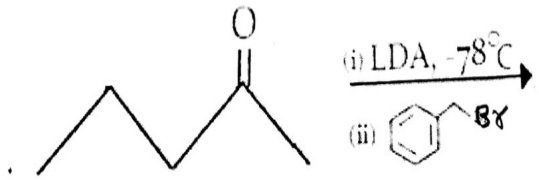
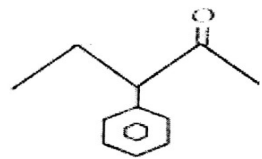
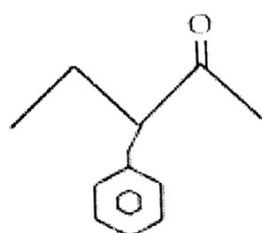
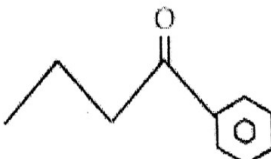
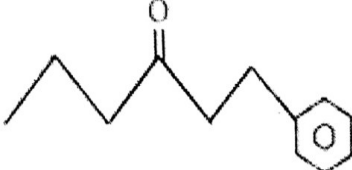
Id	33
Question	Coefficient of thermal expansion (α) is given by
A	$\frac{1}{V} \left(\frac{\partial V}{\partial T} \right)_P$
B	$-\frac{1}{V} \left(\frac{\partial V}{\partial T} \right)_P$
C	$\frac{1}{V^2} \left(\frac{\partial V}{\partial T} \right)_P$
D	$-\frac{1}{V^2} \left(\frac{\partial V}{\partial T} \right)_P$
Answer	A

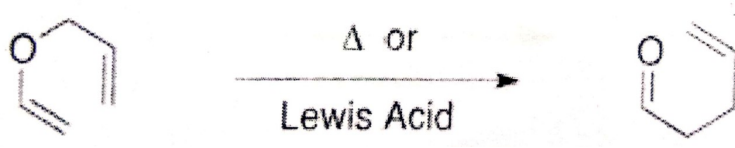
Id	34
Question	The vapour pressure of 0.5 M aqueous KNO_3 solution at $100^\circ C$ is 749.7 Torr. What is the activity of water in the solution at $100^\circ C$?
A	0.9218
B	0.9864
C	1.0023
D	1.0230
Answer	B

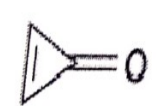
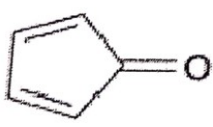
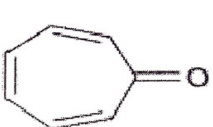
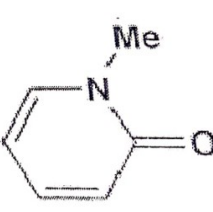
Id	35
Question	Which of the following mechanism shows the correct curve arrow of the reaction of the enolate ion from ethyl acetate with ethyl acetate in the Claisen condensation?
A	
B	
C	
D	
Answer	C

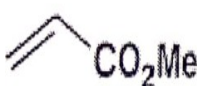

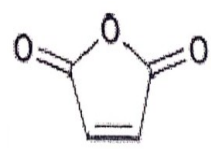

Id	36
Question	The major reason that phenol is a better Bronsted acid than cyclohexanol is -----
A	It is a better proton donor
B	The cyclohexyl group is an electron donating group by induction, which destabilizes the anion formed in the reaction
C	Phenol is able to stabilize the anion formed in the reaction by resonance
D	The phenyl group is an electron withdrawing group by induction, which stabilizes the anion formed in the reaction
Answer	C

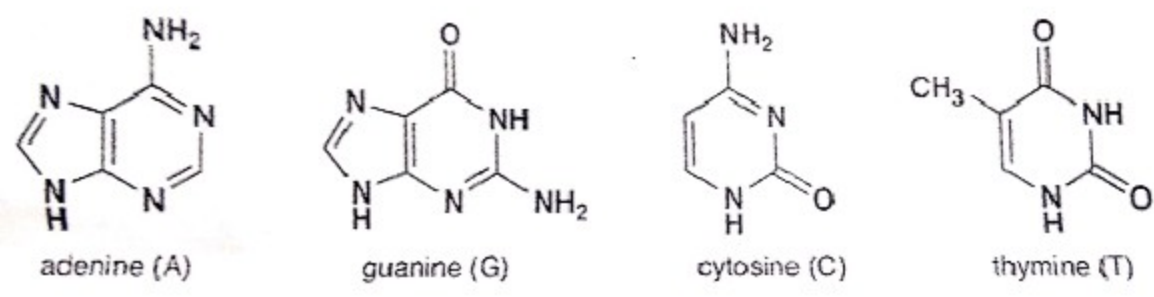
Id	37
Question	<p>What is the correct order of acidic strength?</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>I</p> </div> <div style="text-align: center;">  <p>II</p> </div> <div style="text-align: center;">  <p>III</p> </div> </div>
A	I > II > III
B	II > I > III
C	III > II > I
D	I > III > II
Answer	B

Id	38
Question	<p>What is the product for the given reaction?</p>  <p>The reaction shows 2-pentanone reacting with (i) LDA at -78°C and (ii) benzyl bromide ($\text{C}_6\text{H}_5\text{CH}_2\text{Br}$).</p>
A	 <p>Structure A: 2-ethyl-1-phenylethan-1-one</p>
B	 <p>Structure B: 2-ethyl-2-phenylbutan-3-one</p>
C	 <p>Structure C: 1-phenylbutan-1-one</p>
D	 <p>Structure D: 2-phenyl-2-pentanone</p>
Answer	D

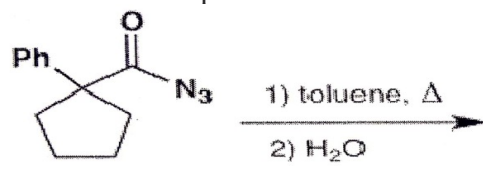
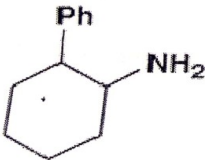
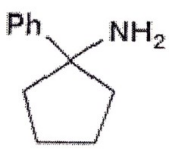
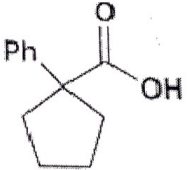
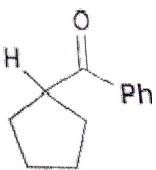
Id	39
Question	Which of the following is the name reaction of the given reaction? 
A	Wolff's rearrangement
B	Favorskii rearrangement
C	Pinacol rearrangement
D	Claisen rearrangement
Answer	D

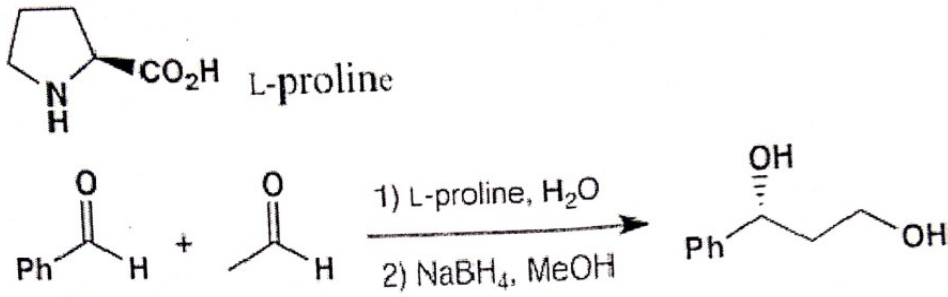
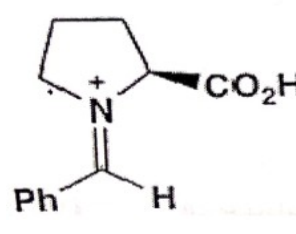
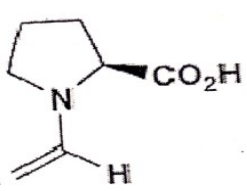
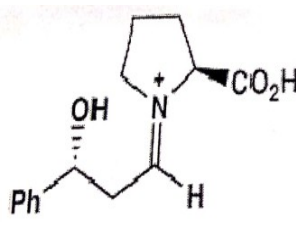
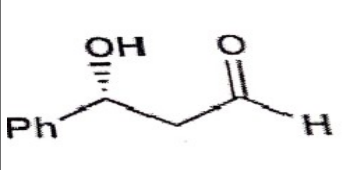
Id	40
Question	Which compound is not aromatic?
A	
B	
C	
D	
Answer	B


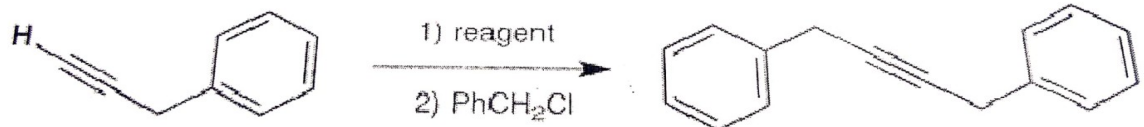
Id	41
Question	Which of the following dienophiles is the most reactive with buta-1, 3 -diene?
A	
B	
C	
D	
Answer	C

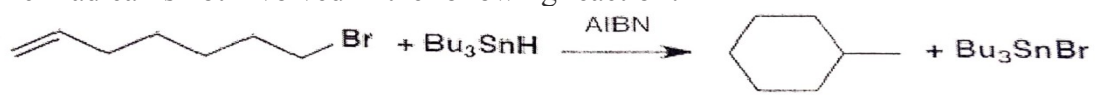

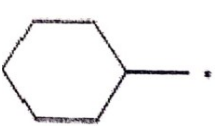

Id	42
Question	The following are the four heteroaromatic bases found in DNA. Which base pair can form three hydrogen bonds?
	 <p>adenine (A) guanine (G) cytosine (C) thymine (T)</p>
A	A-C
B	A-T
C	G-C
D	G-T
Answer	C

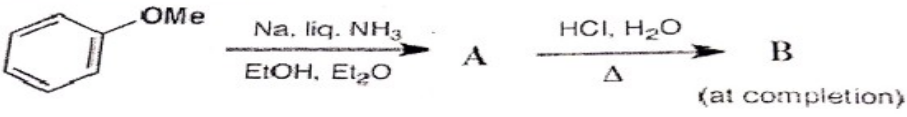
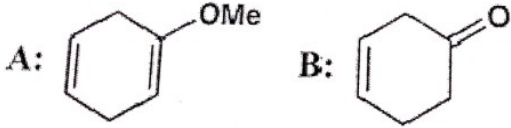
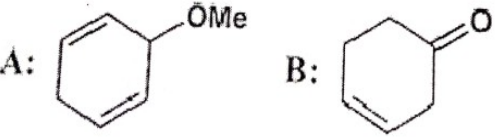
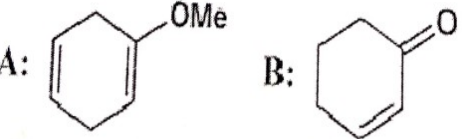
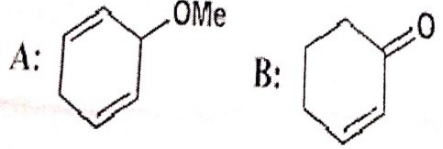
Id	43
Question	Which of the following amino acids has the highest isoelectric point?
A	$ \begin{array}{c} \text{CO}_2^- \\ \\ \text{H}_3\text{N}^+ - \text{C} - \text{H} \\ \\ \text{H} \\ \text{glycine} \end{array} $
B	$ \begin{array}{c} \text{CO}_2^- \\ \\ \text{H}_3\text{N}^+ - \text{C} - \text{H} \\ \\ \text{CH}_2\text{OH} \\ \text{serine} \end{array} $
C	$ \begin{array}{c} \text{CO}_2^- \\ \\ \text{H}_3\text{N}^+ - \text{C} - \text{H} \\ \\ \text{CH}_2\text{CH}_2\text{CO}_2^- \\ \text{glutamic acid} \end{array} $
D	$ \begin{array}{c} \text{CO}_2^- \\ \\ \text{H}_3\text{N}^+ - \text{C} - \text{H} \\ \\ (\text{CH}_2)_4\text{NH}_3^+ \\ \text{lysine} \end{array} $
Answer	D

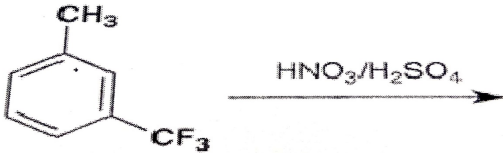
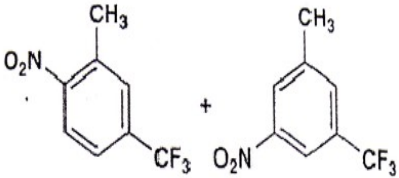
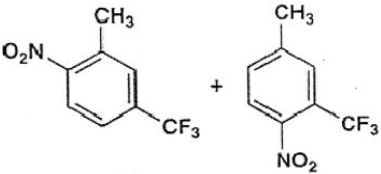
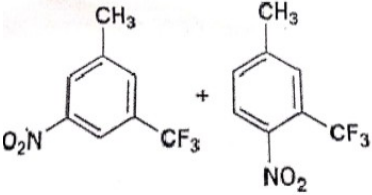
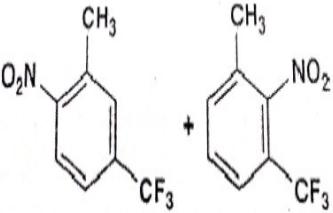
Id	44
Question	<p>Which is the main product of the following reaction of an acyl azide?</p>  <p>The reaction shows 1-phenylcyclopentanecarboxylic azide reacting with 1) toluene, Δ and 2) H_2O. The azide group is represented as N_3.</p>
A	 <p>Structure of 1-phenylcyclohexanecarboxamide.</p>
B	 <p>Structure of 1-phenylcyclopentanecarboxamide.</p>
C	 <p>Structure of 1-phenylcyclopentanecarboxylic acid.</p>
D	 <p>Structure of 1-phenylcyclopentanecarboxaldehyde.</p>
Answer	B

Id	45
Question	<p>An α-amino acid, L-proline, can be used as a catalytic chiral auxiliary for a stereoselective aldol reaction. Which of (a)-(d) is not involved in the following transformation?</p>  <p> <chem>C1CCNC1C(=O)O</chem> L-proline <chem>c1ccc(cc1)C=O</chem> + <chem>CC=O</chem> $\xrightarrow[2) \text{NaBH}_4, \text{MeOH}]{1) \text{L-proline, H}_2\text{O}}$ <chem>c1ccc(cc1)C(O)CCO</chem> </p>
A	
B	
C	
D	
Answer	A

Id	46
Question	<p>A disconnection of 1,4-diphenylbut -2-yne is given below followed by possible corresponding synthetic reactions. Which of (a)-(d) does not include a suitable first reagent?</p> <p>Disconnection:</p>  <p>synthetic steps for the disconnection shown:</p> 
A	BuLi, THF
B	EtMgBr, Et_2O
C	NaOEt, EtOH
D	$NaNH_2, NH_3$
Answer	C

Id	47
Question	<p>Which radical is not involved in the following reaction?</p> 
A	
B	
C	
D	$Bu_3Sn\cdot$
Answer	A

Id	48
Question	<p>Which combination of compounds in (a)-(d) identifies A and B in the following reaction sequence?</p> 
A	
B	
C	
D	
Answer	C

Id	49
Question	<p>Which pair of compounds are the most probable main products of the following reaction?</p>  <p>The reaction shows 3-methylbenzotrifluoride (a benzene ring with a methyl group at the top and a trifluoromethyl group at the meta position) reacting with $\text{HNO}_3/\text{H}_2\text{SO}_4$ to produce two possible pairs of products.</p>
A	 <p>Pair A consists of 3-methyl-4-nitrobenzotrifluoride and 3-methyl-5-nitrobenzotrifluoride.</p>
B	 <p>Pair B consists of 3-methyl-2-nitrobenzotrifluoride and 3-methyl-6-nitrobenzotrifluoride.</p>
C	 <p>Pair C consists of 3-methyl-4-nitrobenzotrifluoride and 3-methyl-6-nitrobenzotrifluoride.</p>
D	 <p>Pair D consists of 3-methyl-2-nitrobenzotrifluoride and 3-methyl-5-nitrobenzotrifluoride.</p>
Answer	B

Id	50
Question	What is the value of mean molal activity coefficient for $0.5 \times 10^{-3} \text{ mol/kg}$ KCl (aq) at 25°C in assuming Debye-Huckel limiting law validity.
A	0.925
B	0.974
C	0.036
D	-0.036
Answer	B