TEST SERIES GATE 2017

BOOKLET SERIES A

Paper Code: CY

Test Type: TEST SERIES

Duration: 3:00 Hours

CHEMISTRY-CY

Date: 14-01-2017

Maximum Marks: 100

Read the following instructions carefully:

1. Attempt all the questions.
2. This question paper consists of **2 sections**, General Aptitude (GA) for **15 marks** and the subject specific GATE paper for **85 marks**. Both these sections are compulsory. The GA section consists of **10** questions. Question numbers 1 to 5 are of 1-mark each, while question numbers 6 to 10 are of 2-mark each. The subject specific GATE paper section consists of **55** questions, out of which question numbers 11 to 35 are of 1-mark each, while question numbers 36 to 65 are of 2-mark each.
3. The question paper may consist of questions of **multiple choice type** (MCQ) and **numerical answer type**.
4. Multiple choice type questions will have four choices against (a), (b), (c), (d), out of which only **ONE** is the correct answer.
5. For numerical answer type questions, each question will have a numerical answer and there will not be any choices.
6. All questions that are not attempted will result in zero marks. However, wrong answers for multiple choice type questions (MCQ) will result in **NEGATIVE** marks. For all MCQ questions a wrong answer will result in deduction of ⅓ marks for a **1-mark** question and ⅔ marks for a **2-mark** question.
7. There is **NO NEGATIVE MARKING** for questions of **NUMERICAL ANSWER TYPE**.
8. Non-programmable type Calculator is allowed

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Q.1-Q. 5 carry ONE mark each.

1. Choose the word from the options given below that most nearly similar in the meaning of the ward **cognition.**
(a) Contradiction (b) Ignorance (c) Psychology (d) Percipience

2. **Marriage: Divorce :: Incorporate: ?**
(a) Dilute (b) Eraparate (c) Liquidate (d) Adulterate.

3. Choose the most appropriate words from the options given below to complete the following sentence.
He had a strong relish for public representation in his own person, but an extreme ..... of the like display in any other.
(a) Disrespect (b) Abhorrence (c) Grievance (d) Disappointment.

4. Select the most suitable phrase for the words underline in the given paragraph:
The scientist says that while be complete core meltdown at chernobyl was a major disaster, **it had fall for short of catastrophe** many nuclear power critics had feared, the so called 'China syndrome'. In that scenario the exposed core of a nuclear reactor become so hot that the molten material literally burns its way down through the earth. Chernobyl at least, proved that to be a myth.
(a) It fell far short of the catastrophe. (b) It fell far away of the catastrophe.
(c) It fell much short of the catastrophe. (d) It fell for shorter of the catastrophe.

5. One who believes that gaining pleasure is the most important thing in life.
(a) Hedonist (b) Headed (c) Harangue (d) Habitat

Q.6-Q. 10 carry TWO marks each.

6. A student has 60% chance of passing in english and 44% chance of passing in mathematics. What is the percentage probability that he will pass in both subjects?
(a) 44 (b) 60 (c) 26.4 (d) 56

7. After an increment of 7 in both the numerator and denominator, a fraction changes to 13/100 of original value. Find the original fraction.
(a) 175 (b) 250 (c) 178 (d) 375

8. There are 20, 000 people living in Adarsh Colony, Durg. Out of them 9000 subscribe to Star TV network and 12000 to Zee TV Network. If 4000 subscribe to both, how many do not subscribe to any of the two?
(a) 3000 (b) 1000 (c) 4000 (d) 2000

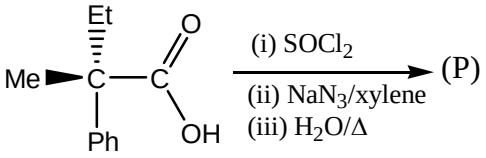
9. Find the number of zeros at the end of 1090!
(a) 270 (b) 268 (c) 271 (d) 278

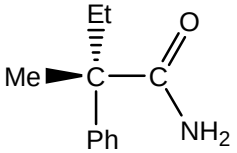
10. $8+88+888+.....$ n term, then sum is

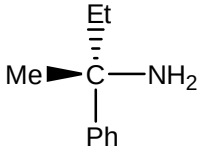
(a) $\frac{8\left(10^n-9n\right)}{81}$ (b) $\frac{8\left(10^{n+1}-10-9n\right)}{81}$ (c) $8\left(10^{n-1}-10\right)$ (d) $8\left(10^{n+1}-10\right)$

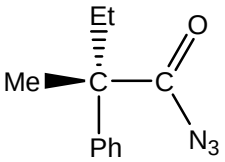
Q.11-Q.35 carry one mark each.

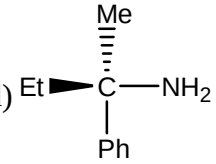
11. The product (P) is



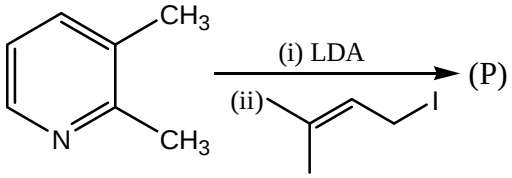
(a) 

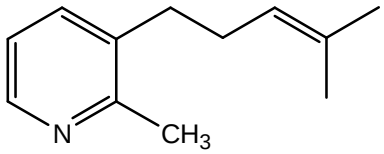
(b) 

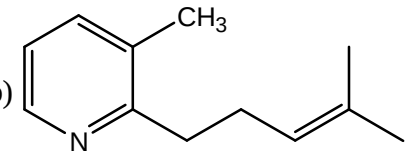
(c) 

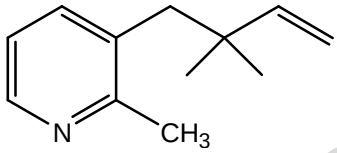
(d) 

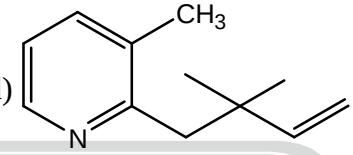
12. The product (P) is



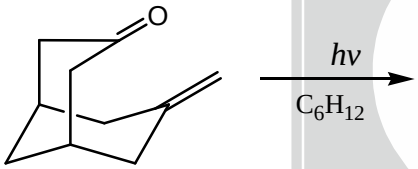
(a) 

(b) 

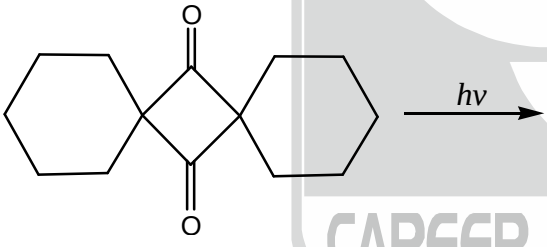
(c) 

(d) 

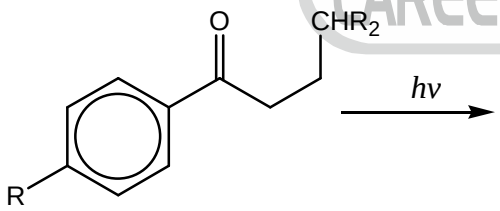
13. Match the following

(1) 

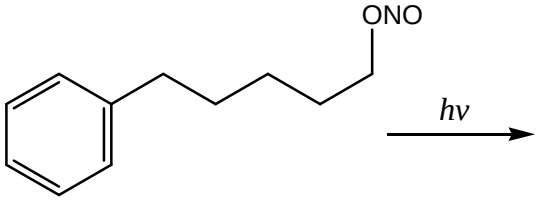
(A) Norrish type-I

(2) 

(B) Norrish type-II

(3) 

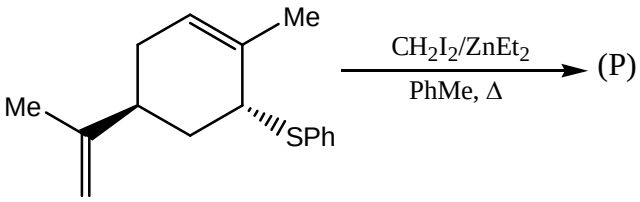
(C) Paterno Buchi reaction

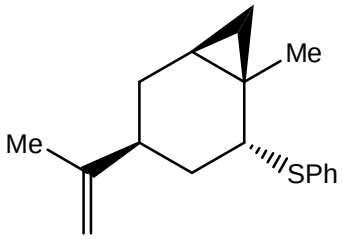
(4) 

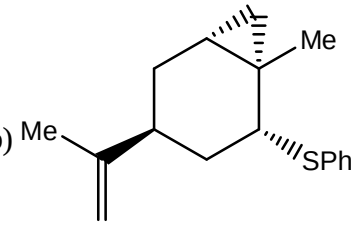
(D) Barton reaction

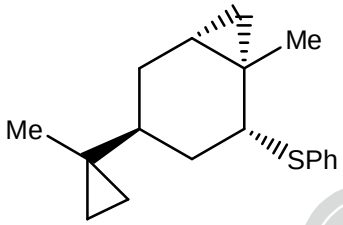
(a) 1-C, 2-A, 3-B, 4-D
(b) 1-C, 2-B, 3-A, 4-D
(c) 1-B, 2-A, 3-C, 4-D
(d) 1-A, 2-B, 3-C, 4-D

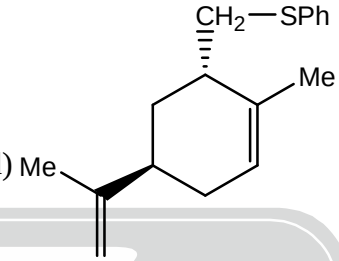
14. The product in the following reaction is



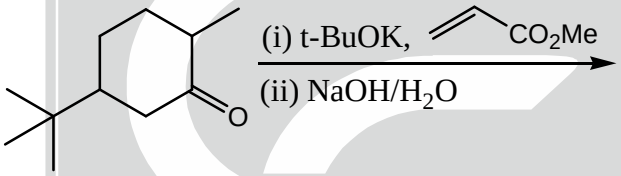
(a) 

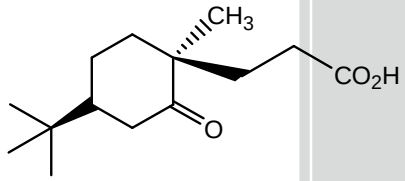
(b) 

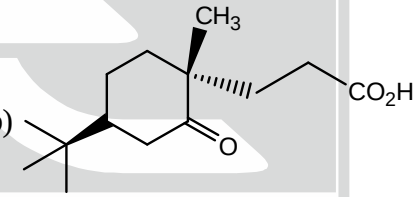
(c) 

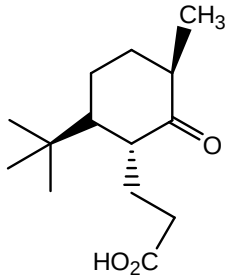
(d) 

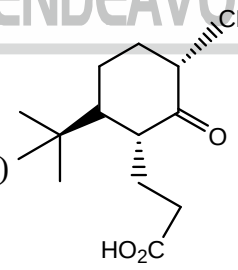
15. The major product in the following reactions is



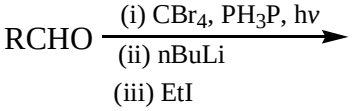
(a) 

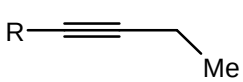
(b) 

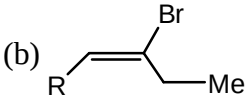
(c) 

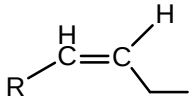
(d) 

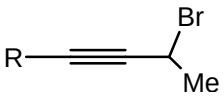
16. Major product formed in the following reaction is



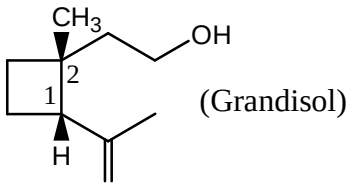
(a) 

(b) 

(c) 

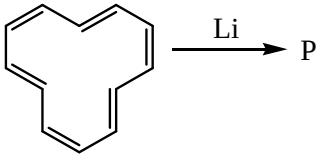
(d) 

17. The correct absolute configuration of grandisol at the marked centre is



(Grandisol)

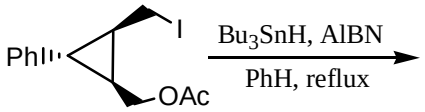
(a) 1R, 2S (b) 1S, 2S (c) 1R, 2R (d) 1S, 2R

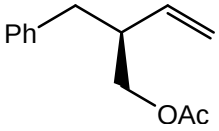
18. 

The product 'P' is:

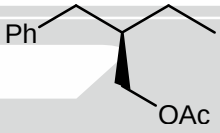
(a) Non-aromatic (b) Aromatic (c) Antiaromatic (d) Homoaromatic

19. Product and intermediate formed in following reaction

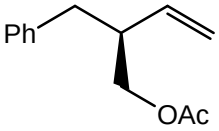


(a) 

, carbene

(b) 

, radical

(c) 

, radical

(d) 

, carbene

20. U^{235} nucleus splits into two new nuclei whose mass numbers are in the ratio of 2 : 1. The ratio of the radii of the new nuclei is

(a) 1.26 : 1 (b) 63 : 2 (c) 63 : 21 (d) 8 : 1

21. Consider the following reactions

$$Ag^{+}(aq) + e^{-} \longrightarrow Ag(s) \qquad E^{0} = 0.80V$$

$$AgSO_4(s) + 2e^{-} \longrightarrow 2Ag(s) + SO_4^{2-}(aq) \qquad E^{0} = 0.05$$

The value of K_{sp} for Ag_2SO_4 is

(a) 1×10^{-8} (b) 1×10^{-9} (c) 1×10^{-5} (d) 1×10^{-4}

22. In a magnetic field of strength 2.349 T, the resonance frequency of ^{15}N nuclei is 10.13 MHz. The resonance frequency of ^{15}N in a magnet of 11.745T is _____Hz.

23. The probability of finding a free particle inside the right hand half of a 1-Dimmensional box of length L is _____%.

24. If 0.0033 M of a substance quenches the fluoresence efficiency by 25%. The value of the stern volmer constant in M^{-1} is _____

25. Which of the following statement is/are ***FALSE*** about hemocyanin (Hc)

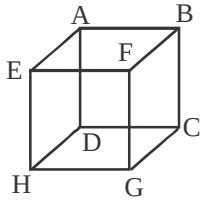
(a) It is a non heme-Non-Fe O_2 transport Protein

(b) The oxidized Hc contains two Cu(+2) and O_2^{2-} at their active site.

(c) Two His and one cys residue are present at their active site.

(d) The reduced form of Hc is colourless whereas the oxidized form at Hc is coloured and the colour arises due to LMCT

26. The indices of the face diagonals AF and CH in the following figure are respectively.



(a) $(\bar{1}\,\bar{1}\,0)$ and $(\bar{1}\,1\,0)$ (b) $(1\,\bar{1}\,0)$ and $(1\,1\,0)$

(c) $(\bar{1}\,1\,0)$ and $(\bar{1}\,\bar{1}\,0)$ (d) $(1\,1\,0)$ and $(1\,\bar{1}\,0)$

27. In Langmuir adsorption of a gas on to a solid surface the value of slope and intercept was found to be $0.45\ cm^{-3}$ and 5×10^{3} Torr cm^{-3} respectively. The value of distribution coefficient will be _____(10^{-5})

28. The correct intensity of Mossbauer lines for potassium ferricyanide in the effect of external magnetic field will be.

(a) 3:4:1:3:4:1 (b) 1:3:4:4:3:1 (c) 3:5:1:1:5:3 (d) 3:4:1:1:4:3

29. Fac and Mer- $M_{A_3B_3}$ isomers have the point group

(a) C_{2v} and C_{3v} (b) C_{3v} and C_{2v} (c) C_1 and C_{2v} (d) D_{3h} and C_{2v}

30. 14 gm oxygen at 0°C and 10 atom is subjected to reversible adiabatic expansion to a pressure of 1 atom. The workdone is

(a) 11.82 atm L (b) –11.82 atm L (c) 1192 atm L (d) –1192 atm L

31. Value of vander waal constant 'b' for the gases follow the order as

(a) $He > H_2 > O_2 > CO_2$ (b) $O_2 > H_2 > He > CO_2$

(c) $He > H_2 > O_2 > CO_2$ (d) $CO_2 > O_2 > H_2 > He$

32. The increasing order of rate of ligand exchange is:-

(a) $[PF_6]^-$, SF_6, $[SiF_6]^{2-}$, $[AlF_6]^{3-}$ (b) $[AlF_6]^{3-}$, $[SiF_6]^{2-}$, $[PF_6]^-$, SF_6

(c) SF_6, $[PF_6]^-$, $[SiF_6]^{2-}$, $[AlF_6]^{3-}$ (d) $[AlF_6]^{3-}$, SF_6, $[PF_6]^-$, $[SiF_6]^{2-}$

33. The Following process gives a polymer $CH_3Cl + Si \xrightarrow[300^\circ C]{Cu} (A) \xrightarrow{H_2O} (B) \xrightarrow[\Delta]{\text{polymerisation}} (C)$

The (A) can also be formed by CH_3MgCl and $SiCl_4$ in 1 : 1 ratio. Then the type of polyer (C) is

(a) Cross linked polymer (b) Linear chain polymer

(c) Dimer (d) Cyclic polymer

34. The cluster having arachno type structure is

(a) $\left[Ir_4(CO)_{12}\right]$ (b) $\left[Rh_6(CO)_{16}\right]$ (c) $\left[Os_6(CO)_{18}\right]^{2-}$ (d) $\left[Ru_5C(CO)_{16}\right]$

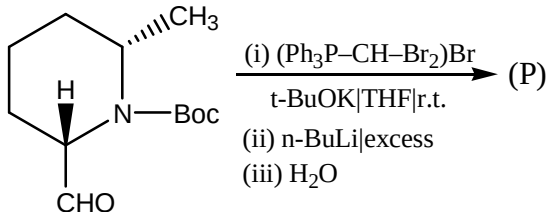
35. Arrange the following anions in the increasing order of their oxidizing power

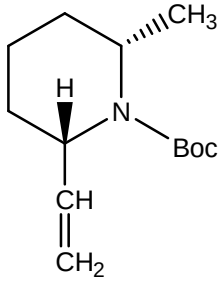
(a) $ClO^- < ClO_2^- < ClO_3^- < ClO_4^-$ (b) $ClO_2^- < ClO^- < ClO_3^- < ClO_4^-$

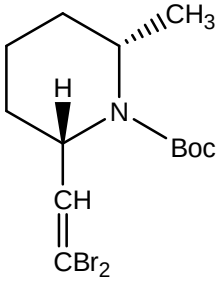
(c) $ClO_4^- < ClO_3^- < ClO_2^- < ClO^-$ (d) $ClO_4^- < ClO^- < ClO_2^- < ClO_3^-$

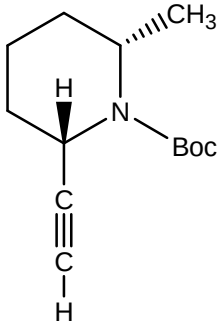
Q.36-Q.65 carry TWO marks each.

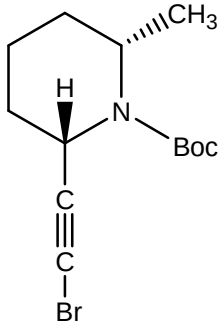
36. The product (P) is



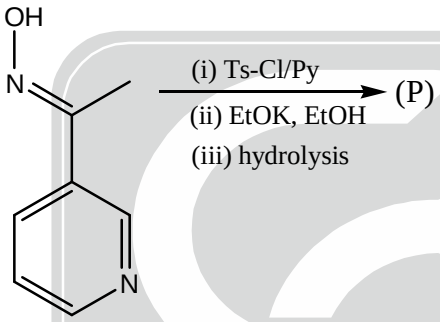
(a) 

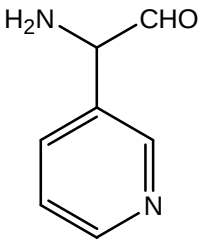
(b) 

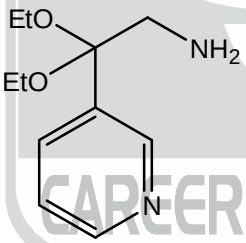
(c) 

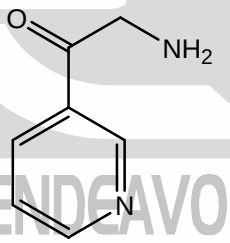
(d) 

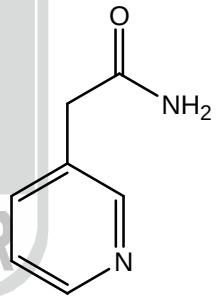
37. The major product (P) is



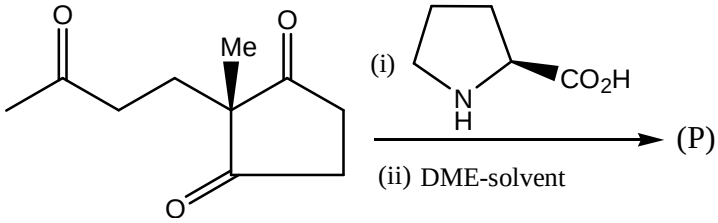
(a) 

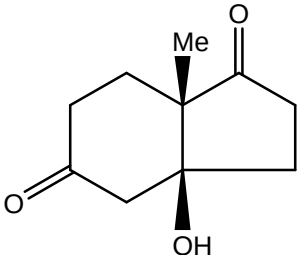
(b) 

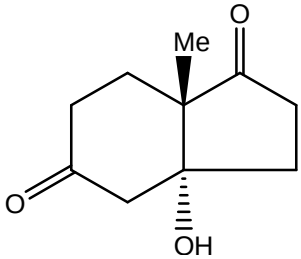
(c) 

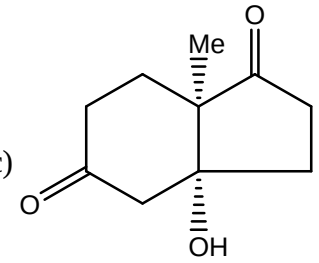
(d) 

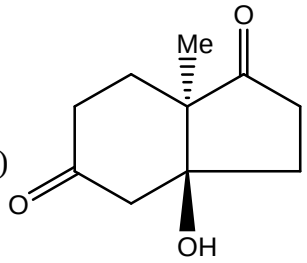
38. The product (P) is



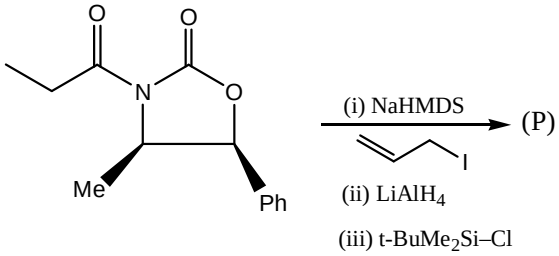
(a) 

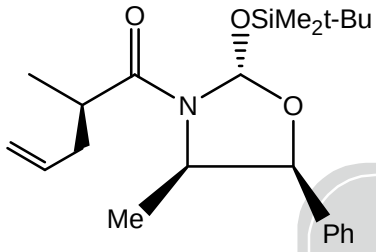
(b) 

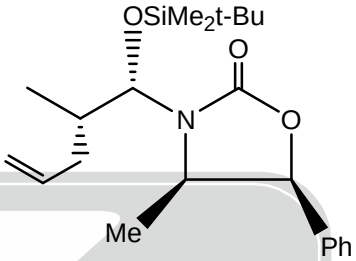
(c) 

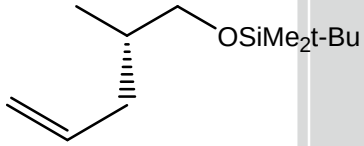
(d) 

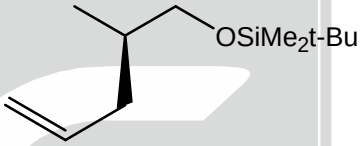
39. The product (P) is



(a) 

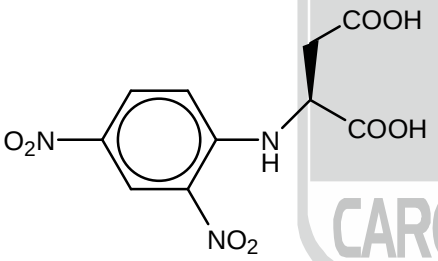
(b) 

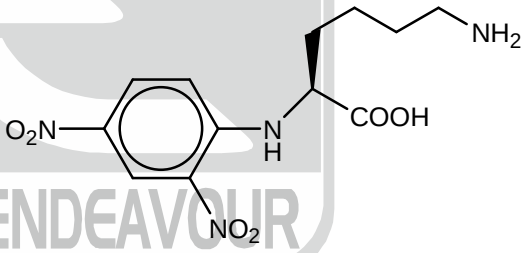
(c) 

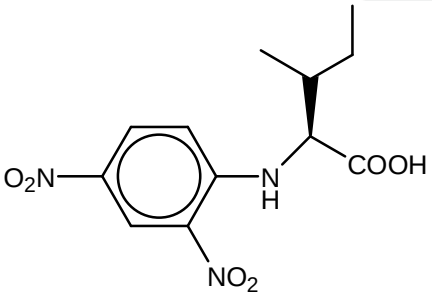
(d) 

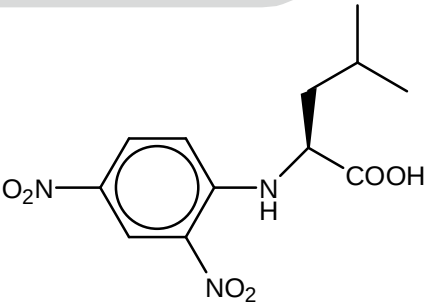
40. The following peptide chain upon treatment with Sangers reagent followed by hydrolysis gives the

ILe–Trp–Lys–His–Asp

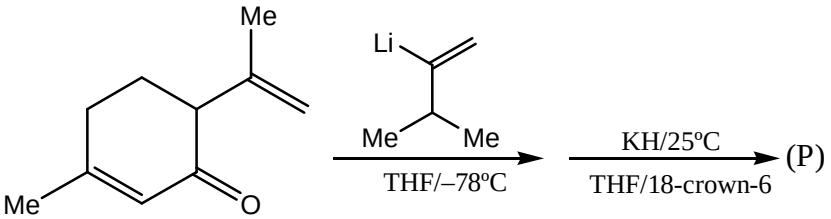
(a) 

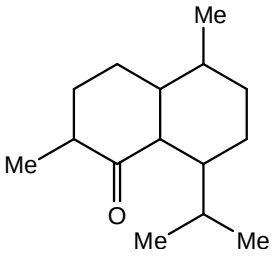
(b) 

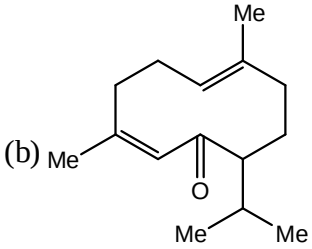
(c) 

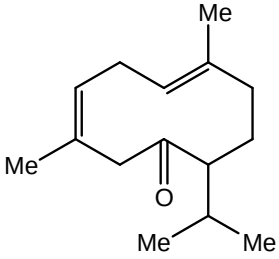
(d) 

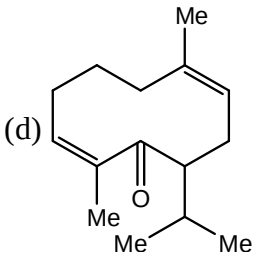
41. The major product (P) is



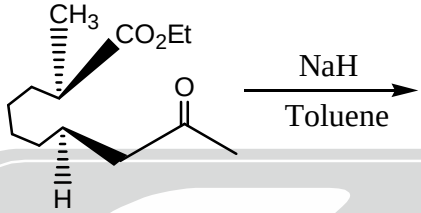
(a) 

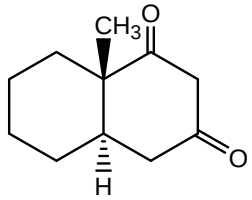
(b) 

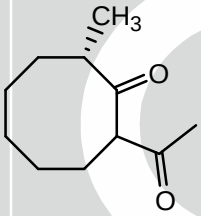
(c) 

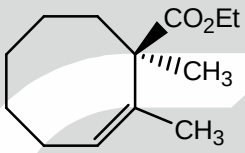
(d) 

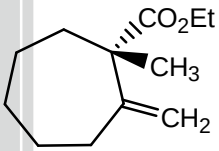
42. The major product in the reaction is:



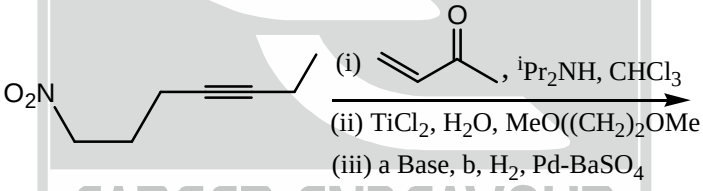
(a) 

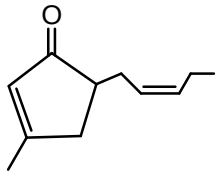
(b) 

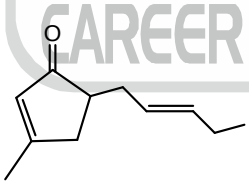
(c) 

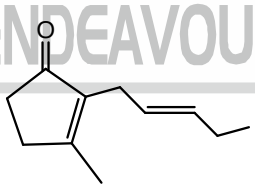
(d) 

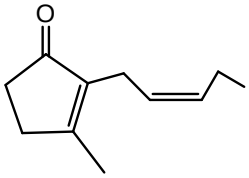
43. In the following reaction, major product is

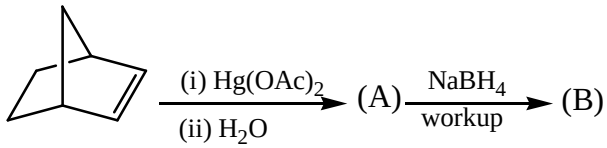


(a) 

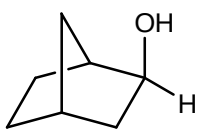
(b) 

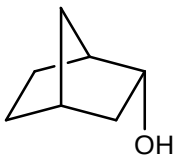
(c) 

(d) 

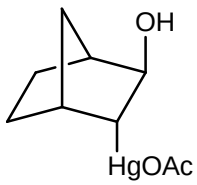
44. 

The major product (B) in the above synthetic transformation is

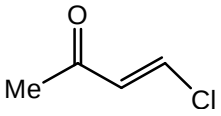
(a) 

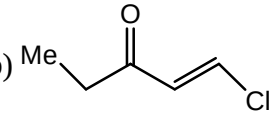
(b) 

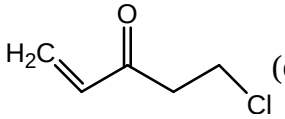
(c) mixture of (a) and (b)

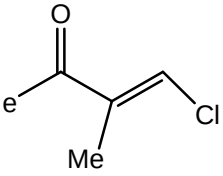
(d) 

45. Propionyl chloride is reacted with acetylene gas in presence of $AlCl_3$ an obtained compound A. The NMR data of compound A are given, identify it.
A: ^1H NMR: 0.96 (t, J 7.0 Hz, 3H), 2.40 (q, J 7.0 Hz, 2H), 6.31 (d, J 14.0 Hz, 1H), 7.11 (d, J 14.0 Hz, 1H).

(a) 

(b) 

(c) 

(d) 

46. At 298K, the EMF of the cell

$$Pt\,|\,H_2\,(1\,bar)\,|\,H^+\,(solution)\,||\,Cl^-\,|\,Hg_2Cl_2\,|\,Hg$$

is 0.7530 V. If pH of the solution is 8. Calculate E^0 of

$$Hg_2Cl_2\,(s) + 2e^- \longrightarrow 2Hg\,(\ell) + 2Cl^-\,(aq)$$

(a) 0.28 (b) 0.53 (c) 0.84 (d) 0.65

47. Two aqueous uni-univalent electrolyte system A and B are at different temperature T_A and T_B and C_A and C_B concentrations, respectively. Their Debye-Hückel lengths will equal if $\frac{T_A}{C_A} \times \frac{C_B}{T_B}$ will be _____

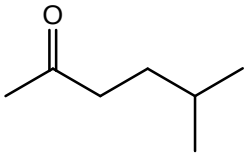
48. The most populated rotational state for HCl (B = 8.5 cm^{-1}) at 300 K is _____

49. We consider a gas of N diatomic non-interacting diatomic molecule in thermal equilibrium at temprature T. The rotational partition function of gas is:

(a) $\frac{V^N}{h^{3N}}(2\pi mkT)^{3N/2}$ (b) $\frac{8\pi^2 IkT}{h^2}$ (c) $\frac{V}{h^3}(2\pi mkT)^{3/2}$ (d) $\left(\frac{8\pi^2 IkT}{h^2}\right)^N$

50. Consider an orthorhombic unit cell of dimension a = 450 pm b = 650 pm and c = 400 pm. The perpendicular distance between the (1, 1, 0) Plane _____Pm.

51. The m/z value of the detectable fragment formed by McLafferty like rearrangement of the following compound in mass spectrometer is _____



52. If the electron were spin 3/2 particle, in stead of spin 1/2 when 20 electron were placed in a 3-D cubical box then energy level of highest occupied electron will be

[Given a = box dimension]

(a) $\frac{9h^2}{8ma^2}$ (b) $\frac{6h^2}{8ma^2}$ (c) $\frac{12h^2}{8ma^2}$ (d) $\frac{11h^2}{8ma^2}$

53. For unnormalized wave-function, $\psi(r,\theta,\phi) = \sin\theta\cos\phi\left(\frac{2r}{a_0} - \left(\frac{r}{a_0}\right)^2\right)\exp\left(-\frac{r}{a_0}\right)$, the most probable element is

(a) H (b) He^+ (c) Li^{2+} (d) Be^{3+}

54. For a reaction taking place in three steps, the rate constants are k_1, k_2 and k_3 and the overall rate is $K = \frac{k_1 k_3}{k_2}$.

If the energy of activation E_1, E_2 and E_3 are 60, 30 and 10 kJ/mole respectively. The overall energy of activation is _____.

55. Reaction $A \rightarrow 2B$ proceeds via following sequence of steps :-

$$A \rightarrow C \qquad \Delta H = q_1$$

$$C \rightarrow D \qquad \Delta H = q_2$$

$$\frac{1}{2} D \rightarrow B \qquad \Delta H = q_3$$

The heat of reaction is

(a) $q_1 - q_2 + 2q_3$ (b) $q_1 + q_2 - 2q_2$ (c) $q_1 + q_2 + 2q_3$ (d) $q_1 + 2q_2 - 2q_3$

56. K_{sp} of AgCl is 1.5×10^{-10}. The solubility in an aqueous solution containing 0.01 M $AgNO_3$ is

(a) $2.15 \times 10^{-6}\ g\,L^{-1}$ (b) $1.5 \times 10^{-8}\ g\,L^{-1}$ (c) $2.15 \times 10^{-8}\ g\,L^{-1}$ (d) $1.5 \times 10^{-6}\ g\,L^{-1}$

57. The lowest energy visible spectra band of an octahedral nickel (II) complex is due to the transition

(a) $^3T_{2g} \leftarrow {}^3T_{1g}$ (b) $^3A_{2g} \leftarrow {}^3T_{1g}$ (c) $^3T_{2g} \leftarrow {}^3A_{2g}$ (d) $^3T_{1g} \leftarrow {}^3A_{2g}$

58. The crystal of $KCoF_3$ show three absorption bands in its absorption spectrum at 7150 cm^{-1}, 15200 cm^{-1} and 19200 cm^{-1}. In this compound Co^{2+} ion is surrounded octahedrally by six F^- ligands. The magnitude of Δ_0 is _____ (cm^{-1}).

59. The rate of electron transfer in the following reaction is rapid because

$$\left[Ru(NH_3)_6\right]^{2+} + \left[Ru(NH_3)_6\right]^{3+} \rightarrow \left[Ru(NH_3)_6\right]^{3+} + \left[Ru(NH_3)_6\right]^{2+}$$

(a) It is an inner sphere reaction

(b) It is an outer sphere reaction.

(c) Electron transfer takes place from π^* of $\left[Ru(NH_3)_6\right]^{2+}$ to π^* of $\left[Ru(NH_3)_6\right]^{3+}$ without any input of energy.

(d) Electron transfer takes place from σ^* of $\left[Ru(NH_3)_6\right]^{2+}$ to σ^* of $\left[Ru(NH_3)_6\right]^{3+}$ with any input of energy.

60. $Mn_2(CO)_{10} \xrightarrow{Na} A \xrightarrow{Br} B \xrightarrow{\Delta} C$

The product A, B and C are respectively.

(a) $\left[Mn(CO)_6\ Na\right], \left[\eta^1 C_3H_5Mn(CO)_5\right], \left[\eta^3 C_3H_5Mn(CO)_5\right]$

(b) $\left[Mn(CO)_5\ Na\right], \left[\eta^3 C_3H_5Mn(CO)_5\right], \left[\eta^3 C_3H_5Mn(CO)_4\right]$

(c) $Na\left[Mn(CO)_5\right], \left[\eta^1 C_3H_5Mn(CO)_5\right], \left[\eta^3 C_3H_5Mn(CO)_5\right]$

(d) $Na\left[Mn(CO)_5\right], \left[\eta^1 C_3H_5Mn(CO)_5\right], \left[\eta^3 C_3H_5Mn(CO)_4\right]$

61. Consider the following statements
(I) In the Fischer Carbene, the carbene carbon acts as a σ-donor and π – aceptor.
(II) The Fischer carbene carbon is singlet and nucleophilic in nature.
(III) The bond between the metal and the carbene carbon atom has double bond character.
(IV) The rotational barrier across the M—C in schrock carbene is high and the carbene carbon is electrophilic.
(V) Schrock carbene generally does not follow 18 electron rule.
Which of the following statement is not correct.
(a) II, III and V (b) II, III and I (c) I, II, III and IV (d) II, III and IV

62. A potassium salt 'A' reacts with dil. HCl to produce a colourless gas. This colourless gas turns lime water milky and the excess of this gas destroys milkiness. The compound 'A' is:
(a) KCl (b) K_2SO_4 (c) KNO_3 (d) K_2CO_3.

63. Which of the following trivalent lanthanide ions has a relatively stable bivalent oxidation state:
(a) Nd^{3+} (b) Sm^{3+} (c) Eu^{3+} (d) Tm^{3+}

64. Ground state term for F_2 and H_2^+ are respectively.
(a) $^2\Sigma_g^+$ and $^1\Sigma_g^+$ (b) $^2\Sigma_u^+$ and $^1\Sigma_g^+$ (c) $^1\Sigma_g^+$ and $^2\Sigma_g^+$ (d) $^1\Sigma_g^+$ and $^2\pi_g$

65. PCl_5 exists as $[PCl_4]^+[PCl_6]^-$ in solid state. The shape of PCl_4^+ and PCl_6^- is :
(a) Square planar and octahedral (b) Tetrahedral and distorted octahedral.
(c) Tetrahedral and octahedral (d) Square planar and caped octahedral.

Space for rough work

CHEMISTRY - CY

Date: 14-01-2017

GATE TEST SERIES-A

ANSWER KEY

1. (d)	**2.** (c)	**3.** (b)	**4.** (a)	**5.** (a)
6. (a)	**7.** (a)	**8.** (a)	**9.** (a)	**10.** (b)
11. (b)	**12.** (b)	**13.** (a)	**14.** (d)	**15.** (a)
16. (a)	**17.** (d)	**18.** (b)	**19.** (c)	**20.** (a)
21. (c)	**22.** (49.5 to 50.5)	**23.** (50)	**24.** (905 to 915)	**25.** (c)
26. (d)	**27.** (8.8 to 9.2)	**28.** (d)	**29.** (b)	**30.** (b)
31. (d)	**32.** (c)	**33.** (a)	**34.** (d)	**35.** (c)
36. (c)	**37.** (c)	**38.** (a)	**39.** (c)	**40.** (d)
41. (b)	**42.** (c)	**43.** (c)	**44.** (a)	**45.** (b)
46. (a)	**47.** (1)	**48.** (3)	**49.** (d)	**50.** (365 to 375)
51. (58)	**52.** (a)	**53.** (c)	**54.** (40)	**55.** (c)
56. (a)	**57.** (c)	**58.** (8040 to 8060)	**59.** (c)	**60.** (d)
61. (d)	**62.** (d)	**63.** (c)	**64.** (c)	**65.** (c)